

**INNOVATIVE POLICIES
AND INSTITUTIONS
TO SUPPORT
AGRO-INDUSTRIES
DEVELOPMENT**



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Edited by

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Preface

As part of its mandate to lead international efforts in achieving food security for the world's growing population, the Food and Agriculture Organization of the United Nations (FAO) promotes the development of agro-industries through its technical programmes, including activities in the areas of policy advice, capacity building, advocacy, awareness raising, investment promotion, and resource mobilization. This work is spearheaded by FAO's Rural Infrastructure and Agro-Industries Division (AGS), which is engaged in field and normative activities in many developing countries worldwide.

Since 2008, in collaboration with the United Nations Industrial Development Organization (UNIDO) and the International Fund for Agricultural Development (IFAD), FAO has organized a number of global and regional events focusing on promoting the development of agro-industries, the first of these being the *Global Agro-Industries Forum*, held in New Delhi, India, in April 2008. Subsequent events took place in China, Peru and Nigeria, focusing respectively on Asia, Latin America and Africa. These fora aimed to build up a shared vision about the drivers critical to the future development of agro-industries, the key factors affecting their competitiveness, and potential areas for priority action. Appropriate policies and institutions, as key elements of a business environment conducive to investments in agro-industries, emerged as priority action areas in the expert discussions held in these events.

Against this backdrop, FAO–AGS, in collaboration with the International Association of Agricultural Economists (IAAE), convened a workshop on 'Innovative Policies and Institutions to Support Agro-Industries Development', as part of the technical programme of IAAE's 2009 Triennial Conference in Beijing, China. The workshop

gathered researchers, government officials, private sector representatives and development practitioners together, to discuss proven, innovative approaches to promote the development of competitive, equitable, and inclusive agro-industries.

This publication presents the papers commissioned by FAO from qualified researchers and development practitioners through a competitive process held internationally. Comprising 12 chapters and preceded by an editorial overview, the papers cover a wide range of country and regional experiences on the design, implementation and evaluation of policies and institution strengthening programmes and projects. It is hoped that collectively they can represent an important contribution to policy-makers and other professionals interested in promoting the development of agro-industries.

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CHAPTER 1

Introduction: Innovative policies and institutions to support agro-industries development

CARLOS A. DA SILVA AND NOMATHEMBA MHLANGA

Defined as a component of the manufacturing sector where value is added to agricultural raw materials through processing and handling operations, agro-industries are an important source of employment and income generation worldwide (da Silva *et al.*, 2009). Indeed, in most developing countries agro-industries are dominant in terms of their contribution to value-added in manufacturing. In agriculture-based countries, this contribution is as high as 66 percent, whereas in transforming and urbanized countries it reaches 38 percent and 37 percent respectively (Wilkinson and Rocha, 2009).

Investments in agro-industries are known to have significant multiplier effects through both their backward and forward linkages along the value chains. Agro-processing enterprises generate demand for agricultural raw materials; this in turn creates work opportunities at the farm level and contributes to increased demand for agricultural inputs such as fertilizers, feeds and veterinary products, to name a few. The demand for ancillary agro-processing inputs, such as packaging items and product ingredients, tends also to rise with new investments in agro-industries. By the same token, economic activity is generated in the downstream areas of logistics, distribution and service provision.

Many types of agro-processing and handling enterprises can be operated feasibly at the small- and medium-scale level, using low cost, labour intensive technologies. As such, small- and medium-scale enterprises, most of which are labour intensive, predominate in much of the agro-industrial sectors of the developing world. With a tendency to be located close to their sources of raw materials, agro-processing enterprises favour the attraction of investment to the rural space and thus are an important driver in the creation of non-farm rural employment. High levels of female

labour are another characteristic of employment generated by agro-industries, with women in the workforce amounting to as much as 90 percent in some specific agro-industrial segments of developing countries (Wilkinson and Rocha, 2009).

Increases in *per capita* incomes, higher urbanization, and growing numbers of women in the workforce have led to greater demand for processed foods, further propelling the importance of agro-industries development. Globally, total processed foods sales per year are estimated at well over US\$3 trillion, or about three-quarters of the total food sales internationally (Rabobank, 2008).

The recognized benefits of agro-industries development have led governments and other players in international development promotion to pay increasing attention to the experiences and approaches that have been conducive to investments in this sector. What lessons can be learned in agro-industrial development promotion worldwide, that can be valuable to the design of policies and strategies to favour investments, improve efficiency, and foster competitiveness and inclusiveness in this economic sector? To help address this question, the Rural Infrastructure and Agro-industries Division (AGS) of FAO launched a competitive process to seek the contributions of scholars, researchers and development practitioners: these parties were invited to an agro-industrial development workshop held in Beijing, China, August 2009, as part of the technical programme of the Triennial Conference of the International Association of Agricultural Economists.

The chapters in this book were presented and discussed at the Beijing workshop, and can be classified broadly into three central themes that form the structure of the book:

- ▶ models and approaches to agro-industrial development;
- ▶ agro-industrial development experiences in Africa, Latin America and Asia;
- ▶ international experiences in commodity and technology development.

The first four chapters discuss alternative business models and approaches to agro-industrial development. In Chapter 2, Edward Mabaya explores the use of business networks as an innovative institution to support the development of agro-industries. Business networks are contrasted with other innovative institutions such as business clusters and technology parks. Unlike the latter, business networks are not bound by geography, and therefore do not necessarily involve direct face-to-face meetings or direct transacting among members. However, they are similar to business clusters in that business networks can either be vertical networks, horizontal networks, or cross-sectoral networks. After analysing business networks in the context of both the micro and macro environments facing agro-industries, Mabaya outlines the essential conditions for successful business networks. Using the empirical case study of the Seeds of Development Program – a network of 30 emerging seed companies in nine African countries – the author illustrates how such business networks can impact industry structure, participants' conduct, and overall economic performance. Mabaya identifies 10 lessons critical to establishing

and maintaining successful small- and medium-sized enterprise (SME) business networks. He concludes the chapter by outlining five steps that can be adapted for the formulation and implementation of SME business networks in the agro-industrial sector and insights on the possible role of government in such networks.

Public–private partnerships (PPPs) as a mechanism for facilitating agro-industries development, particularly in areas where there is partial or complete market failure, are explored in Chapter 3 by Sukhpal Singh. The author compares and contrasts the Indian experience of PPPs with that of Thailand. The chapter concludes with suggestions on strategies for managing and creating an enabling environment for PPPs. These include a sound legal and regulatory environment, common goals among participating entities, and clarity on institutional roles. Specific to the agribusiness sector, the author emphasises focus on assessing the role of the PPP across the entire value chain to mitigate against possible bottlenecks. One of the major conclusions of the analysis is that government has an important role in promoting and facilitating the participation of the private sector.

In Chapter 4, Francisco J. Bueso, Mario Cáceres, Edward Moncada and Luis F. Osorio empirically evaluate the effectiveness of the United States Agency for International Development (USAID) Export Promotion Program for SMEs in El Salvador, which was implemented over a six-year period. They detail how a combination of targeted training/technical assistance and funding accelerated the development of export-oriented small and medium agro-industries in El Salvador. The example shows how aid can be used effectively to address challenges faced by SMEs in accessing advanced technologies and international markets, particularly as regards compliance with international food standards and quality. The chapter draws attention to the important role of research and development (R&D) by academic institutions and research centres in agro-industrial development, and how this R&D can be applied to leverage donor funding. Additionally, the authors' analysis identifies business networks as an important element for a successful agribusiness export sector in El Salvador, through their role of facilitating knowledge flow.

In Chapter 5, John Wilkinson, Clovis Dorigon, and Luiz Carlos Mior review two decades of interventions in the western region of the State of Santa Catarina, Brazil. These interventions were designed to promote small and medium agro-industries as a strategy for the sustainable renewal of the family farm sector, together with its food processing traditions. In particular, the authors examine the different instruments and policies directed at forms of organization, financing, technological models, management and marketing, and explore the importance of social networks in sustaining these emerging organizations and markets. They argue that a key explanation for the emergence and persistence of these new models of agro-industrial development in the region has been the diversity of the actors and the experiments undertaken, as well as the partnerships between public and private interventions. Using the agro-industry pilot project PRONAF (National Program for the Strengthening of Family Agriculture) as an example, the authors

illustrate the critical role played by public policy in aiding the development of large-scale agribusinesses in parallel with family-based enterprises. Additionally, they highlight the important role of civil society in facilitating the successful and sustainable development of agro-industries.

Chapters 6 to 9 present agro-industrial development experiences in selected African countries, China and India. An emerging and consistent theme in these chapters is that policies and institutions must evolve to address the prevailing economic and social circumstances in the global market and in their respective economies. In Chapter 6, Paul Thangata, Malcolm Blackie and Paul Seward revisit the subject of public-private partnerships in agro-industries development, but focusing on PPPs formulated to improve market access for producers and suppliers. Three models from Kenya, Malawi and Tanzania – the Farmer Input Promotions (FIPS) partnership model, the Malawi Agriculture Partnership (MAP) model, and the Tanzania Agricultural Partnership (TAP) model – are used to elaborate on strategies for the development of smallholder farms. Such partnerships provide platforms for knowledge sharing among public and private sector actors and also empower farmers to make informed choices about the most appropriate inputs for their needs. The authors introduce a four-step PPP framework for agricultural input subsidy programmes in sub-Saharan Africa.

Mustapha Jouili discusses agro-industrial investment promotion in Tunisia in Chapter 7, focusing on fiscal and financial incentives provided by the Government of Tunisia under the Code for the Encouragement of Investment (CEI) and the National Upgrade Program. Through the programmes, the Government of Tunisia sought to improve quality standards and reduce transaction costs for its key sectors, including agriculture. The programmes have been instrumental in increasing the competitiveness of agro-industrial enterprises. They have also been successful in attracting investment in the sector and are inclusive of small producers. For instance, they have enlisted particular incentives for small and medium enterprises (SMEs) in agriculture, industry and services, whereby SMEs can benefit from an equity participation from the State and a grant covering part of the expenditures incurred for feasibility studies and technical assistance. However, Jouili notes that investment in agro-industries in Tunisia remains hampered by several constraints, mainly related to insufficient supply and poor quality of raw materials for agro-processing. The supply problem is exacerbated by high post-harvest losses, poor packaging, lack of suitable warehousing and cold storage facilities, weak organization among producers, and unnecessary multiple handling, all of which lead to high transaction costs and contribute to low product quality. These are the areas that the author suggests should be addressed by institutions and new policy measures.

The Chinese experience, detailed in Chapter 8 by Hugh Deng, has been characterized by key policy and institutional reforms that were instrumental to the development

of township and village enterprises (TVEs) and subsequently the development of the rural economy of China. He emphasises the integral role that TVEs played in the development of the agribusiness sector and how some TVEs have grown to become flagship enterprises in this sector. Indeed, TVEs are often described as the remarkable innovation of farmers in China. Taking many forms of organization, TVEs are mostly SMEs located in rural areas. They have played an important role in promoting rural employment, economic growth and rural infrastructure development, and in reducing inequality between the urban and rural economies in China. In conclusion, the author identifies three areas for further TVE policy reform: improvements in the property rights system, technical upgrading, and the promotion of the food processing sector. The author notes that there are significant lessons to be learned by other developing countries from the Chinese experience with TVEs.

In Chapter 9, Vasant Gandhi and Dinesh Jain examine several institutional models for lessons to inform future policy reforms concerning agro-industries development in India, and other countries of the developing world with similar circumstances. Agro-industry models are assessed against the following five attributes: (1) the ability to organize production and procurement from small-scale farmers; (2) the extent to which modern technologies and practices are adopted by small-scale farmers; (3) the aptitude to mobilize financial and other support services; (4) the capacity for building competitiveness in both domestic and global markets; and (5) the structure and sustainability of the models in the long term. The main message emerging from this analysis is that ownership by key stakeholders and their full commitment to the venture concerned are important to the sustainability of agro-industrial development models.

The third theme, concerning commodity and technological development in the agro-industrial sector, is covered in Chapters 10 to 13. An in-depth analysis of the role of agro-based clusters in agro-industries development is undertaken by Mysore Sudha and Froukje Kruijssen in Chapter 10, using the case of the *totapuri* mango belt in Southern India. The authors approach the subject from the perspective of cluster partnerships and supply chain management. They perform an economic analysis of value addition at different stages along the value chain, in an attempt to understand the risks at each level of the chain and the distribution of margins among the chain's actors. The study highlights the role of market information to the smooth functioning of the agro-industry cluster. The integration of mango supply chains appears to be incomplete, given that the benefits of higher price from exports do not seem to trickle down to the lowest players in the chain, the producers. To provide guidance on how the mango cluster can be improved, Sudha and Kruijssen compare successful models from other crops and suggests institutional support for setting up a suitable alternate market integration mechanism, e.g. a commodity board for export-oriented production of semi-processed mango.

Taking a commodity specific approach, Lateef O. Sanni in Chapter 11 examines the effect of the 'Presidential Initiatives' in stimulating process and product innovations

in the cassava agro-industrial sector in sub-Saharan Africa. The roles of international, regional and national institutions in fostering positive policy thrusts to mobilize new investments in the sector are discussed. The lessons that have emerged from Nigeria and Ghana are that the involvement of high-level political leadership is useful to foster agro-industrial development. The 'Presidential Initiatives on Cassava' helped create awareness about the diverse potential uses of cassava, generating growth in demand. To inform future policy-making, the author outlines strategies for further commercialization of cassava, such as the provision of basic infrastructure that is supportive to cottage industries, investment incentives, and the establishment of the Cassava Development Commission.

The commercialization of cassava in West Africa is presented in Chapter 12 by Adebayo Abass and co-authors. In contrast to the previous chapter where the focus was on Presidential Initiatives, this chapter details how numerous public and private institutions have participated in the development of the cassava market in West Africa. The authors identify three lessons from the experience in this region. The first is that partnership in technological development and testing in diverse locations hastens commercial use. The second is that continuous interaction of stakeholder partners along the continuum of research to development hastens technological adoption and development. The third is that capacity development is important for technologies to spread and impact positively on the sector.

Finally chapter 13 by Katinka Weinberger and Antonio Acedo Jr. documents the development and diffusion of vegetable post-harvest and processing technologies in the Greater Mekong subregion of Asia. One of the main contributions of the authors is to quantify the impact of post-harvest technologies developed by The World Vegetable Center (AVRDC).

Despite the broad geographic coverage and subject matter contained in all the chapters, a number of salient issues emerge. All authors acknowledge that supportive policies and institutions are critical for accelerating the development of agro-industries. They illustrate how institutional and policy interventions have evolved over time and space in response to prevailing challenges and opportunities. Most of the institutional and policy interventions discussed in the book have focused on SMEs, confirming the dominance of SMEs in the agro-industrial sector of developing countries.

A variety of business models and approaches have been in use in the development of agro-industries in developing countries. These include business networks, agro-based clusters, food parks, export processing zones, and other types of alliances or partnerships. While some of the initiatives have solely been private sector led or public sector driven, public-private partnerships emerge as a favoured mechanism for agro-industries development. Essentially, PPPs facilitate sharing of risks and costs, hasten technological development, dissemination, and adoption, and have the potential to realize greater impact where resources are limited.

PPPs have taken different forms and occur in different points of the value chain. For instance, in Malawi PPPs have been instrumental in ensuring access to inputs by small-scale producers; this in turn has impacted productivity positively and resulted in a steady flow of raw materials for agro-processing. On the other hand, PPPs have also been used in the marketing of produce, for example in dairy marketing in India. In general, cluster-based approaches seem to be especially beneficial to SMEs, as they offer economies of scale that enhance competitiveness.

The role of the public sector and government in creating an enabling policy environment for agro-industries development is recognized by many authors. Specifically noted is the importance of fiscal incentives and other promotional activities to entice private sector participation. Beyond the traditional incentives of tax cuts and tax holidays, Governments across the world have come up with innovative market incentives such as mandatory blends of cassava flour, ethanol blends with gasoline, and institutional purchases (associated with school feeding programmes, for example) to create or increase demand and guarantee markets.

As illustrated in the last chapters of the book, national or local governments have at times chosen to promote select commodities in pursuit of agro-industrial development. The choices of targeted commodities are strategic in nature either from a comparative/competitive advantage or economic development/poverty reduction perspective. For example, in Ghana and Nigeria where cassava is a staple crop, the governments have provided incentives and resources collectively known as Presidential Initiatives for the processing and utilization of the crop. Furthermore, to promote export diversification and competitiveness, some governments have established Export Processing Zones (EPZ) and agro-processing units.

Additionally, the chapters identify key elements of successful models or adoption of innovative technologies, such as designing initiatives that tackle the whole value chain, incorporation of capacity-building activities (including extension services) in initiatives, giving initiatives access to financial services, and minimizing post-harvest losses. Ultimately, many of the authors admit that numerous challenges still remain in building strong and viable agro-industries; they emphasize the importance of stakeholder ownership and commitment to initiatives if new approaches are to be sustainable and successful.

The chapters that form this book attempt to address the question posed in the introductory paragraphs of this first chapter. They have illustrated the fact that, in order to be promoted as competitive, equitable and inclusive enterprises, agro-industries require not only access to the key pre-requisites of technology, financing and markets, but also government policies that favour cost efficiencies, foster competition and promote stability of raw material supplies. Additional requirements include innovative business models, strong institutions and adequate support services in areas such as research and development, quality and safety standards and information systems, to name a few.

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CHAPTER 2

Business networks as innovative institutions to support the development of agro-industries

EDWARD MABAYA

2.1 Introduction

The central role of agriculture in the economic growth and development of poor nations has long been widely recognized. To spur rural development and food security, both the theory and practice of development economics has traditionally focused on increasing agricultural productivity on the farm. More recently, development practitioners and policy-makers have broadened their attention to include agro-industries – the post-harvest activities involved in the transformation, preservation and preparation of agricultural products for intermediary or final consumption (Wilkinson and Rocha, 2009). Because agro-industries are uniquely situated between natural sources of food supply and the dynamics of demand for food and fibre, promotion of agro-enterprise development can have numerous benefits. These include: positive impacts on employment in both rural and urban areas; offering market access to agricultural smallholders; business linkages to small- and medium-sized enterprises (SMEs); enhanced food security by reducing post-harvest losses and extending the shelf-life of foodstuffs for the rapidly-increasing population of urban poor. The combined effects of employment gains and food security through improved agro-industry competitiveness can be an important strategy for reducing the overall poverty within developing countries.

Developing strong and viable agro-industries requires a different mix of policies and institutions from the traditional type, which were mostly farmer focused. Agro-enterprises, the building blocks of agro-industries, have a different objective function – maximizing profits – and often require an enabling environment to thrive. To fill this gap, a multitude of new policies, initiatives and institutions have emerged in developing countries in the last two decades. These interventions, mostly designed to facilitate the participation of SMEs, include warehouse receipts, business clusters,

microfinance institutions, technology parks, business development services, contract farming, and public investment in transport and infrastructure. Much has been written about the theoretical basis for and empirical evidence of these interventions. However, the potential of business networks in fostering agro-industry growth in developing countries is relatively underexplored. (Business networks in this context are defined as 'alliances of SMEs with common interests and goals that operate through exchange of business information, ideas, and support.')

First, this chapter explores the use of business networks as an innovative institution that will support the development of agro-industries. First, the concept of a business network is explored within the micro and macroenvironments facing agro-industries. The chapter distinguishes, compares, and contrasts the following:

- ▶ formal networks and informal networking;
- ▶ vertical networks that span different levels of the same supply chain versus the horizontal networks of firms at the same level;
- ▶ virtual networks versus face-to-face networks.

Second, the economic rationale of a business network is explored with a focus on agro-industries. For example, companies in an agri-business network can share buyers and suppliers, leveraging strength in numbers for better deals. However, the same companies can be competing for the same resources in another sphere. Business networks often need to strike a delicate balance between minimizing intra-network rivalry and maximizing collaboration.

Third, the chapter delineates the essential conditions for successful business networks. Comparisons are made between business networks and other innovative institutions such as business clusters and technology parks.

Fourth, the chapter describes the empirical case study of the Seeds of Development Program – a network of 30 emerging seed companies in nine African countries – to illustrate how such business networks can impact industry structure, participants' conduct and overall economic performance. Among its many achievements, this network has resulted in increased trade of seed across neighbouring countries, increased sales revenues, expanded production capacities, and sustained growth for its members. Best practices and potential risks are drawn from this case study and a few other examples of agribusiness networks that can be used by government and other development practitioners are highlighted. Synthesizing all of the above, the chapter concludes with a methodology for the formulation and implementation of business network development projects to support agro-industries. Following a structure similar to the 'six steps to promote clusters' approach developed by UNIDO (the United Nations Industrial Development Organization), the chapter adapts this framework for promoting agribusiness networks.

2.2 Business clusters and networks

Despite the recent flurry of interest in development economics, the phenomenon of business networks is not new. Businesses, governments and research institutions have always networked in the collection of information, obtaining material resources, diffusing new ideas and exercising political influence (Stabler *et al.*, 1996). To define and explain business networks, it is easier to start with the closely related and more commonly understood concept of business clusters. Neoclassical economics has long recognized the economies of agglomeration, by which firms benefit from locating near each other and lower their production costs as a result of competing suppliers, greater specialization and division of labour (Marshall, 1890; Schumpeter, 1912). The resultant 'clustering effect', in which buyers and sellers of a particular good or service converge in a certain place, has a solid theoretical underpinning and numerous empirical examples are evident, e.g. computer technology companies located in Silicon Valley, California. It is arguably the industrial driving force behind urbanization.

Popularized by Michael Porter in *The competitive advantage of nations* (1990), industry clusters can be defined as geographic concentrations of competing, complementary, or interdependent firms and industries, that do business with each other and/or have common needs for talent, technology, and infrastructure. It is important to note that firms within a cluster may be, and often are, both mutually competitive and cooperative. The nomenclature of business clusters is usually framed around four groups:

1. *geographical clusters* that are identified by location
2. *sectoral clusters* of businesses operating together from within the same commercial sector
3. *horizontal clusters* between businesses at the level of shared resources (e.g. knowledge management)
4. *vertical clusters* of businesses along a supply chain.

Building on the above description of business clusters, business networks can be defined as an alliance of SMEs with common interests and goals, that operates through exchanges of business information, ideas, and support. By this definition, a business cluster is a type of business network; however, not every type of business network necessarily exists within a cluster. The feature that most aptly distinguishes business networks from business clusters is geographic specificity. Unlike clusters – which are defined within and often limited by physical location – networks are not bound by geography. Members of a business network can be located in different cities, countries and continents. As a consequence, neither face-to-face meetings nor direct transacting are necessary for members of a business network. However, the theoretical underpinnings of conglomeration economics, with the geographic restrictions relaxed, do apply equally to business networks as they do to clusters. Framed in the terminology of institutional economics, business networks are

“an efficient mechanism for coordinating strategic action across firms, without sacrificing organizational autonomy, either legally or functionally” (Stabler *et al.*, 1996). The increased efficiency results from reduced transaction costs and knowledge sharing; the potential for collective action makes business networks an invaluable tool for SMEs along the agro-industry value chain. It is this aspect and application of business networks that is the motivation and key focus of this chapter.

It is important to distinguish between a business network, which is an institutional arrangement or organizational form, and the verb form, ‘business networking’. The later refers to the process of establishing a mutually beneficial relationship with other business people, the emphasis being on the individual and not the firm. While economic benefits, be they direct or in-direct, are essential to a business network, these are not prerequisites to sustain business networks between business people. Indeed, most such networking often serves a social need for connection with peers, while leaving open the possibility of future collaboration. However, it should be noted that informal business networks, which are often based on family or ethnic connections, do fall somewhere in the middle of the spectrum – somewhere between purely social business networks and formal business networks.

Business networks can be classified into three groups: vertical networks, horizontal networks and cross-sectoral networks (Matopoulos, Vlachopoulou and Manthou, 2005). A vertical network – more commonly referred to as a supply chain – is a network of producers, retailers, distributors, transporters, storage facilities and suppliers, that participate in the sale, delivery and production of a particular product. By contrast, horizontal networks consist of firms that are on the same level of the value chain within one sector. The relationships among members of a horizontal network are often characterized by pooled and reciprocal interdependence (Matopoulos, Vlachopoulou and Manthou, 2005). Most horizontal linkages pertain to large and small agribusiness and agro-industries, while vertical linkages pertain to large agribusiness and agro-industries and farmer groups. Of the two, horizontal linkages are less common, because of the lack of incentives for large agribusiness and agro-industries to pursue such business relationships. In contrast, large agribusiness firms may subcontract to their smaller counterparts in order to satisfy a market opportunity. Such arrangements may not have direct spillover effects such as the transfer of technology and information. Alternatively, large agribusinesses may jointly bid for contracts with smaller firms and, in so doing, increase their access to markets. Lastly, cross-sectoral networks, more commonly referred to as business clusters, consist of enterprises operating in close proximity and “characterized by the existence of pooled, sequential and reciprocal type of interdependencies” (Matopoulos, Vlachopoulou and Manthou, 2005). Table 2.1 summarizes the distinguishing features and characteristics of the three types of business networks.

The evolution and history of business networks is more complex and difficult to trace. Arguably, even at the outset of the invention of private enterprises, strategic alliances have been formed mostly among family members and friends in ways

TABLE 2.1

Classification of business networks

Characteristic	Vertical network (Supply chain)	Horizontal network	Cross-sectoral network (Business cluster)
Membership	Usually needed, often with exclusivity	Usually required	Not required
Type of interdependence	Sequential	Pooled Reciprocal	Sequential Pooled Reciprocal
Major outcomes	Reducing risk and uncertainty, improving logistics performance	Switching partner capacity Shared resources	Information and knowledge sharing Increasing innovation capacity
Value base	Optimization of production and operations	Knowledge diversity and network externalities	Regional assets
Geographic character	International National	International and National	Regional

Source: Adapted with modifications from Matopoulos, Vlachopoulou and Manthou, 2005.

that meet the modern day definition of a business network. In more recent history, interest in business networks seems to have been spurred by economic globalization and the growth of multi-national cooperations (MNCs), especially in the mid 1980s. During this period, MNCs created a wide plethora of complex corporate alliances resulting in "corporate galaxies in which a large MNC is linked to a cluster of smaller MNCs and national firms via joint ventures, sub-contracts and marketing agreements" (Dunning, 1988). It is from such alliances based on common interest that modern day formal business clusters and networks were born. The growing popularity of networks *vis-à-vis* other cooperative alliances mostly hinges on how they "allow forms of international economic coordination to arise which may be less costly to administer than arms-length, market-based transactions but which do not require the formation of the managerial hierarchies of conventional internalized firm structure" (Casson and Cox, 1993).

2.3 The theoretical basis of business networks

The broad diversity and flexibility of business networks makes them difficult to analyse (Stabler *et al.*, 2006; Fafchamps *et al.*, 2006). Networks differ in their goals, memberships and *modus operandi*, such that no two networks are alike. Even the same network can vary significantly across both time and space, depending on the micro and macroenvironment in which it operate. Consequently, much of the empirical work on business networks utilizes the case study¹ approach and often has limited generalizability for development practitioners when compared with other institutional innovations for SME development. In other words, many of the conclusions and lessons from one business network cannot necessarily be extrapolated to other networks, because the context may be very different. It is no wonder, then, that no single unified theory exists that explains the basis and structure of business networks. Instead, the theories borrow from several paradigms including neo-classical theory, strategic management, transaction cost theory, and social exchange and social capital theories. A brief discussion of these theories and how they apply to networks is outlined in the following paragraphs.

2.3.1 Neo-classical economic theory

Neo-classical economic theory is based on the notion that firms seek to maximize profits and consumers seek to maximize utility. The unit of analysis is often a firm or consumer acting alone to maximize their objective function. Within this context, business networks are viewed as maximizing agglomeration economies or capturing positive externalities. For example, knowledge spillover of inventions and information (such as a production technique) are likely to be diffused more rapidly with a network of enterprises. To take a specific agricultural case, pasteurization techniques will spread faster in scenarios whereby enterprises along the dairy industry value chain are organized into a network or association. In this case, the network serves primarily as a mechanism to facilitate the free flow of information, a public good.

2.3.2 Strategic management

Strategic management literature frames business networks as a means to enhancing competitive advantages through collaboration strategies. Attributed mostly to Michael Porter's work, this theory espouses the strategic advantages of collaboration through strategic alliances or joint ventures. According to Porter and Fuller, such

¹ The case study research method is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used (Yin, 1994).

collective strategies do confer the following advantages: economies of scale, improved access to technology and expertise, reduction of risk, and improvement in the competitive structure of the firm (Porter and Fuller, 1986). Porter's frameworks view networks and collaborations as transitional forms, designed to exploit the benefits of integration while saving on the potential costs of full vertical integration (Porter, 1990). More recently, strategic management research has focused on *supply chain integration* which has further evolved into *supply networks*. Adapted from Harrison *et al.* 2003, Table 2.2 summarizes the dimensions, elements and benefits of supply chain integration that can be extended to business networks.

TABLE 2.2
Supply chain integration dimensions

Dimension	Elements	Benefits
Information integration	<ul style="list-style-type: none"> • Information sharing and transparency • Direct and real-time accessibility 	<ul style="list-style-type: none"> • Reduced bullwhip effect • Early problem-detection • Faster response • Trust building
Synchronized planning	<ul style="list-style-type: none"> • Collaborative planning, forecasting and replenishment • Joint design 	<ul style="list-style-type: none"> • Reduced bullwhip effect • Lower costs • Optimized capacity utilization • Improved service
Workflow coordination	<ul style="list-style-type: none"> • Coordinated production, planning and operations, procurement, order processing, engineering change and design. • Integrated, automated, business processes 	<ul style="list-style-type: none"> • Efficiency and accuracy gains • Fast response • Improved service • Earlier time to market • Expanded network
New business models	<ul style="list-style-type: none"> • Virtual resources • Logistics restructuring • Mass customization • New services 	<ul style="list-style-type: none"> • Better asset utilization • Higher efficiency • Penetrative new market • Create new products

Source: Adapted from Harrison *et al.*, 2003.

2.3.3 Transaction cost theory

Established by Coase in 1937 and later developed by Williamson in the last quarter of the century, transaction cost theory asserts that some institutional arrangements are more efficient than others in completing a transaction (Coase, 1937; Williamson, 1983). The objective function and effect of economic entities is centred on minimizing transaction costs (or 'friction') in the transaction resulting from search for information, negotiation, adapting to change, monitoring transactions, and controlling transactions. Williamson distinguishes between *ex ante* transaction costs (incurred before the transaction) and *ex post* transaction costs (incurred after the transaction). Examples of *ex ante* transaction costs include the costs of drafting, negotiating, and enforcing an agreement. *Ex post* transaction costs include haggling costs, dispute resolution, and economic bonding costs (Williamson, 1983). By enhancing the flow of information between memberships, business networks can contribute significantly to minimizing transaction costs.

2.3.4 Social exchange and social capital theories

The above economic and management frameworks fail to recognize the role that the human element plays in the execution of business transactions. For this, we look at two key contributions from the social sciences: social exchange theory and social capital theory. Social exchange is based on the 'configuration of interests and resources' by individuals, while economic transactions are made up of interdependent exchange transactions (Coleman, 1986). All exchange transactions are characterized by 'reciprocal stimuli and mutual reinforcements' which, when broken, can result in a termination of the relationship (Zafirovski, 2003). Social capital theory on the other hand is anchored in the value of social networks in bonding people of similar interests and connecting between diverse groups based on norms of reciprocity. In other words, the goodwill, trust, and solidarity that is created through interaction with other individuals or enterprises has both an economic and social value that can be utilized. Often as an unintended or even unanticipated consequence, business networks play a key role in creating and managing social capital among members of the network.

2.4 Agro-enterprises and business networks

The preceding section summarized the theoretical basis for business collaboration via networks from various academic fronts. This section narrows the focus by exploring ways in which the agricultural value chain, including both farming and off-farm activities, is particularly suitable to the establishment of business networks. In framing these arguments, it is important to recognize that agro-industries in developing countries operate within a broader macroenvironment that presents both

opportunities and challenges. A macroenvironmental analysis of agro-industries in developing countries is presented in Table 2.3.

The ability of business networks to promote agro-industries in developing countries depends largely on how they capture new opportunities while minimizing the risks posed by external threats. For example, the creation of business networks is a powerful tool for overcoming size constraints and limited access to information for SMEs in developing countries, where market environments are highly volatile and

TABLE 2.3

Macro-environmental factors influencing agro-industries in developing countries

Factor	Opportunities	Threats
Political Legal	<ul style="list-style-type: none"> • Political stability in most countries • Regional harmonization of policies • Preferential trade agreements 	<ul style="list-style-type: none"> • Political conflicts in some countries • Corrupt government regimes • Limited enforcement of property rights • Poor business climate
Economic	<ul style="list-style-type: none"> • Economic liberalization well underway • High economic growth rates increasing foreign direct investments • Central role of agriculture in most economies • Remittances from the diasporas 	<ul style="list-style-type: none"> • Global recession • Poor transport infrastructure • Legal barriers to trade • High interest rates • High levels of inflation and unemployment
Social Cultural Human Demographic	<ul style="list-style-type: none"> • Growing population – increasing market-rapid urbanization • Improved access to education and health • Gender – increasing role of men into farming, women's rights 	<ul style="list-style-type: none"> • HIV/AIDS • Limited adoption to new technology • Cultural preferences for specific staples
Technological	<ul style="list-style-type: none"> • Improved access to information (mobile phone and Internet) • Advances in bio-technology • Technology leap-frogging • Investment in public research (NAROs and CGIAR)* 	<ul style="list-style-type: none"> • Diverse agro-ecologic conditions limit technology diffusion • Weak national scientific and research institutions and universities • Limited enforcement of intellectual property rights

* NAROs: National Agricultural Research Organizations; CGIAR: Consultative Group on International Agricultural Research.

competitive (Matopoulos, Vlachopoulou and Manthou, 2005). Discussed below are the key factors that favour the business networks as an institutional innovation to support agriculture and agro-industry development. Following the same structure as the macroenvironmental analysis, the factors are framed into a PEST analysis, i.e. divided into four categories: Political, Economic, Social and Technological.

2.4.1 Political and legal factors

In both developed and developing nations, the government plays a key role in the agricultural sector through policies and regulations. However, in the development of agro-industries in developing countries, government intervention often acts as a double-edged sword. On the one hand, government policies and regulations can be credited for creating enabling environments through investment in infrastructure, provision of public goods, correction of market failures, and protection from foreign competition. On the other hand, the distortionary effect of government inventions has led to increased risk of doing business, crowding out of the private sector consumers, and increased transaction costs. If enterprises along the agricultural value chain are organized into business networks, they are better able to express their wants and lobby government to support their needs. As an example, small millers in Botswana have recently created an association that, among other objectives, represents its members' interests to government representatives (Seleka *et al.*, 2008). Furthermore, horizontal networks or associations, especially at producer level, make it easier and more effective to deliver development assistance that is in line with the interests of the primary stakeholders. Farmer groups and cooperatives are a typical example of such networks through which assistance can be targeted.

2.4.2 Economic factors

At the core of the economic factors that favour networks for agriculture and agro-industries are the unique physical attributes of agricultural goods. Agricultural products, including food, fibre and biofuels, are perishable, bulky, seasonal in production, and highly susceptible to weather conditions. Perishability often results in very high post harvest losses, estimated to be between 10 and 40 percent in most developing countries (FAO, 1997). The high volume, low value nature of most agricultural commodities implies that reduction in intermarket transfer costs – consisting of loading and off-loading charges, trading fees and transportation costs – will result in increased spatial market integration and lower prices for the consumer. Well coordinated vertical networks such as supply chains and cold chains are widely acclaimed for reducing post-harvest losses and significantly lowering the cost of transportation. Furthermore, the seasonality of agricultural production often results in harvesting and processing bottlenecks. Horizontal networks could be used

to facilitate the leasing of underutilized capacities in similar enterprises. Lastly, the high production risks in agriculture that emanate from weather conditions, pests and diseases can be mitigated through business networks. For example, if farmers are organized into associations or networks, pests and diseases that threaten the viability of the entire industry can be detected earlier and preventative measures can be implemented more easily.

Increased consumer awareness coupled with food contamination scares has resulted in tighter food safety laws. In response, agri-food companies “developed collaboration strategies between entities at different levels of the value chain to achieve undistorted information exchanges and track and trace efficiency” (Matopoulos, Vlachopoulou and Manthou, 2005). New labelling standards, such as those for organic foods and Fair Trade, will also require more stringent product traceability that is best achieved through vertical integration or networks.

For smallholder farmers and SMEs in agro-industries, business networks offer unique opportunities to enjoy some economies of scale, and to penetrate lucrative markets that would otherwise be inaccessible. For example, increased farm mechanization in India since the 1970s has largely been attributed to farmers organizing themselves into groups and sharing the costs of large-scale biased technologies such as tractors (Singh, 1995). Similarly, farmers and small processors in East and Southern Africa are starting to use networks as a means to aggregate their products and penetrate lucrative markets such as supermarket chains. Examples of such networks include the Kenya Organic Agricultural Network (KOAN), the Tanzanian Farmers Network, and the Mountain Gorilla Organic Coffee Farmer’s Association in Uganda. Lastly, the hourglass-shaped market structure of most agro-industry supply chains in developing countries implies that power is often concentrated at processor, wholesaler and retailer levels. Establishing horizontal networks at both ends of the supply chain can be a highly effective way to balance power relations along the value chain.

2.4.3 Social factors

As a consequence of rural to urban migration in pursuit of higher living standards, rapid urbanization is a key trend in most developing countries. More food now needs to be transported to urban centres from farming areas that are often in remote rural zones. The increased separation of production from consumption – both physically and as measured by number of intermediaries – requires vertical networks by which information on prices and consumer preferences can be conveyed along the entire value chain. As noted by Reardon *et al.*, supermarket chains in developing countries have been shifting their models over the past few years – away from the old wholesale procurement model toward a new model that aims to close the gap between their supplies and their needs (Reardon, Timmer and Berdegue, 2004).

2.4.4 Technological factors

Both productivity and efficiency in agriculture rely heavily on the use and application of cutting-edge technology. For agro-industries, technological innovation has long been a major contributor to progress and will continue to influence agricultural inputs, production, processing, distribution and marketing (Weick, 2001). Four key areas of technological innovation will play a key role in shaping the future of agro-industries: global positioning systems, geographic information systems, biotechnology, and the Internet (Weick, 2001). In developing countries, the diffusion and adoption of such new technologies is slow especially among smallholder farmers and SME working in agro-industries. Numerous studies have shown that technological innovation is more likely in enterprises that are connected to others through business networks that can help them to learn about the existence of new technologies and how to adapt these technologies within their firms (Newell and Clark 1990; Abernathy, Clark, and Kantrow 1983; Porter 1990). In the past, technology and innovation parks have played this role for agro-industries. However, due to the rapid growth of information and communication technologies over the last two decades, distance between enterprises is much less of a constraint for collaboration and information sharing.

2.5 Business networks *vis-à-vis* innovative institutions

Several other institutional innovations have been tried for supporting agro-enterprise development in both Western and developing countries (Table 2.4). Business development services, incubators, agribusiness parks, warehouse receipts, and contract farming are being utilized to assist in agro-enterprise creation and growth. The effectiveness, merits and the appropriateness of each of these interventions or institutional arrangements in developing agro-enterprises depends largely on the context and the desired goals.

Two key features distinguish business networks from all the other innovative institutions – business development services, research and technology parks, warehouse receipt systems, contract farming, out-grower schemes, commodity exchanges, certification agencies – all outlined in Table 2.4. The first distinguishing feature of networks, *vis-à-vis* other institutional innovations, is their relatively low costs of establishment and maintenance. Huge capital investments are required to establish the requisite infrastructure such as buildings and human resources, especially for research and technology parks, warehouse receipt systems and certification agencies. In contrast, business networks require neither physical infrastructure nor highly skilled management staff to function. The low maintenance cost of business networks makes them more sustainable and allows for short term exit strategies for donors.

TABLE 2.4
Innovative institutions for agro-industry development

Innovative institution / Intervention	Outputs	Outcomes
A. Business development services	<ul style="list-style-type: none"> • Management training workshops that are specific to the needs of agribusiness and agro-industries • Modules, case studies and other training materials that are specific to agro-industries 	<ul style="list-style-type: none"> • Improved performance of agro-enterprises as measured by: increased sales revenue, increased profitability, increased market share, wider range of products and services offered
B. Business incubators for agro-enterprises	<ul style="list-style-type: none"> • Programmes designed to accelerate the successful development of start-up and early-stage agro-enterprises 	<ul style="list-style-type: none"> • Increased likelihood that a start-up agro-enterprise will stay in business for the long term
C. Agro-industry research and technology parks	<ul style="list-style-type: none"> • Investment in research and technology parks that house established agro-enterprises and government or university labs 	<ul style="list-style-type: none"> • Increased production efficiency and improved technology transfer • More agro-industries located closer to source of raw materials
D. Warehouse receipts systems for agricultural commodities	<ul style="list-style-type: none"> • Facilities that guarantee the quantity and quality of a particular agricultural commodity being stored within an approved facility 	<ul style="list-style-type: none"> • High income for farmers as they capitalize on higher off-season prices • Decrease in seasonality of agricultural prices
E. Contract farming and out-grower schemes that integrate farmers into the agricultural value chain	<ul style="list-style-type: none"> • Increased use of contract farming to coordinate linkages between farmers and agribusiness firms • Agro-enterprises providing services to smallholder farmers 	<ul style="list-style-type: none"> • Tighter coordination of supply chains • Higher income for smallholder farmers
F. Commodity exchanges for agricultural commodities	<ul style="list-style-type: none"> • Exchange where various agricultural commodities and derivatives products are traded 	<ul style="list-style-type: none"> • Efficient trade of agricultural commodities • Linkages between domestic, regional and international markets
G. Certification agencies for agricultural products	<ul style="list-style-type: none"> • Institutional mechanisms to ensure traceability and certification of agricultural products 	<ul style="list-style-type: none"> • Increased premiums for high quality products • Increased consumer confidence in value-added agricultural products

The second distinguishing feature of networks is that they can be very effective in supplementing investments in other institutional innovations. Indeed, it can be argued that all the other institutional arrangements outlined in Table 2.4 bear some aspects of business networks, whether by design or as a by-product. It is therefore prudent for development practitioners and policy-makers working on any aspect of agro-industry development to understand how business networks function, and how their existing interventions can benefit by integrating and formalizing key stakeholders into networks. Described in the next section, the case study of the Seeds of Development Program illustrates how business development services can be paired with a business network to enhance the competitive advantage of SME seed companies in East and Southern Africa.

2.6 Case study of the Seeds of Development Program

This section illustrates the concept of a business network through the Seeds of Development Program (SODP), an innovative programme designed to improve access to appropriate and affordable seeds for low-income smallholder farmers through management training for small- to medium-sized local seed companies in East and Southern Africa². Established in 2003, SODP is an award winning project that has created a business network of 30 locally owned, emerging seed companies operating in eight African countries (Kenya, Tanzania, Uganda, Zambia, Zimbabwe, Malawi, Mali and Mozambique). SODP operates through a business network for selected seed companies that serve smallholder farmers in Africa. The list of currently active members of the SODP Network, showing the broad geographical coverage of the network, is given in Table 2.5.

SODP seeks to alleviate rural poverty through improved access to appropriate seed varieties. This goal is accomplished through a business development service and networking programme for small to medium-sized seed companies, complemented by market analysis of domestic seed industries. The specific objectives of the SODP are to:

- ▶ build the management capacity of small- to medium-sized local seed companies in order to improve their market delivery systems for low-income farmers;
- ▶ create platforms for networking among African seed companies, research institutions and other seed industry stakeholders, to improve the former's effectiveness in meeting the needs of smallholder farmers;

2 The author of this chapter is also the founder and coordinator of the Seeds of Development Program. As such, data and information relating to the programme is presented herein without citation because it is primary data gathered by the author in managing the network. Annual monitoring and evaluation (M&E) reports of the programme are available upon request. More information about the programme is available online at <http://sodp.marketmattersinc.org/>

- ▶ conduct research on the seed industry that will guide the strategies of locally-owned seed companies serving resource-poor farmers, and also inform public policy.

The programme is coordinated by a not-for-profit organization, Market Matters Inc., (with offices in the USA and South Africa) and works in collaboration with the Emerging Markets Program at Cornell University and other seed industry stakeholders.

Small- and medium-sized seed companies that serve smallholder farmers in Africa are carefully selected to become members of a Fellows Program. The Fellows Program consists of five major capacity building and networking activities described briefly below: workshop training, distance learning, field visits, seed trading forum, and student attachments. SODP fully sponsors the participation of one person from each Fellow company at these events; the costs of any additional participants are covered by the company.

Workshop training: Each year, selected managers from the participating seed companies attend the 'Making Markets Matter' workshop in Stellenbosch, South Africa. In addition to the general agribusiness management training received by all workshop participants, seed industry fellows participate in specialized activities and sessions designed exclusively for the seed industry. Starting in 2006, an additional workshop exclusive to seed companies has been added.

Distance learning: Management modules suitable for the seed industry are provided to Fellows based on identified needs. Fellows are kept up-to-date with new developments in the global, regional and domestic seed industry through an e-mail list service.

Field visits: Fellows are awarded travel grants to allow them to visit successful seed companies in a country of their choice to learn about relevant aspects of seed production and marketing and to explore business opportunities.

Seed trading forum: Every year between harvest and the next planting season, SODP brings together managers from participating companies to network and explore opportunities for seed trading and other collaborative initiatives.

Student attachments: As part of its capacity building effort, SODP, in collaboration with the Emerging Market Program at Cornell University, facilitates attachments for university students to address specific management and marketing challenges facing Fellow companies.

TABLE 2.5
List of current SODP Network members

	Company	Location
1	Agri Seeds and Services	Harare, Zimbabwe
2	Drylands Seeds Limited	Nairobi, Kenya
3	FICA Seeds	Kampala, Uganda
4	Freshco Seeds Ltd	Nairobi, Kenya
5	Funwe Farm Ltd	Blantyre, Malawi
6	Fuso Kaba	Bamako, Mali
7	Harvest Farm Seeds	Kampala, Uganda
8	Hygrotech	Lusaka, Zambia
9	Kamano Seeds	Lusaka, Zambia
10	Leldet Ltd	Nairobi, Kenya
11	MRI Seeds	Lusaka, Zambia
12	NASECO, Ltd	Kampala, Uganda
13	Oil Crop Development	Nairobi, Kenya
14	Pristine Seeds	Harare, Zimbabwe
15	Progene Seeds	Harare, Zimbabwe
16	Seed-Tech	Blantyre, Malawi
17	Qualita Seeds	Chimoio, Mozambique
18	Semente Perfeita	Chimoio, Mozambique
19	Suba Agro Trading	Arusha, Tanzania
20	Tanseed International	Dar es Salaam, Tanzania
21	Tropical Seeds (Nhimbe Seeds)	Harare, Zimbabwe
22	Victoria Seeds	Kampala, Uganda
23	Western Seeds	Nairobi, Kenya
24	Zanobia Seeds	Arusha, Tanzania

2.6.1 Background to the SODP: Agriculture and seed systems in Africa

About 70 percent of sub-Saharan Africa's population live in rural areas, where the main source of livelihoods is agriculture. Agriculture is the mainstay of most economies in sub-Saharan Africa as it contributes to 70 percent of employment, 33 percent of Gross Domestic Product (GDP), and 40 percent of export earnings. Agriculture's central economic role makes its development and growth a key component for overall economic growth and the eradication of food insecurity.

African agriculture is characterized by low productivity. While in West Asia cereal yields grew by about 2.3 percent per year in the past two decades, cereal yields in sub-Saharan Africa were practically stagnant (FAOSTAT, 2009). Furthermore, in the last four decades less than 40 percent of the gains in cereal production in Africa came from increased yields (FAOSTAT, 2009). The majority of the increased production was a result of the expansion of cultivated land.

This low agricultural productivity has been attributed to a host of factors, including: the range and intensity of biophysical constraints to plant growth, large agro-ecological variation, the absence of policies that encourage crop improvement, very low and declining soil fertility, and the underdeveloped state of seed sectors in most countries (DeVries and Toenniessen, 2001; Nkonya *et al.*, 2005). Increased productivity in these agrarian systems, complemented by improved access to both input and output markets, is key to reducing poverty and improving food security. Pioneering Africa's 'Green Revolution' requires increased use of high-yielding crop varieties that can survive harsh terrains and recurrent droughts.

The seed sector in sub-Saharan Africa is dominated by informal supply systems with farm-saved seeds accounting for approximately 80 percent of planted seeds, compared with a worldwide average of 35 percent (Bay, 1998; Scowcroft and Scowcroft, 1999). This informal seed supply system is characterized by on-farm production of self-pollinated non-hybrid crops and a distribution system limited to barter trade and sales in local markets. Improving smallholder farmers' access to new high-yielding varieties and hybrid crops requires better coordinated marketing efforts and expanded distribution systems.

Since the mid-1970s, sub-Saharan Africa governments and the donor community have "recognized the critical role of seed in agricultural transformation and begun to provide substantial support for seed system development" (Maredia and Howard, 1998). Many of those investments were in experiment research stations, public certification boards and parastatals with an exclusive mandate to produce and market seeds. Initially, the research and extension system was geared to address the needs of the commercial sector and was later broadened to cover the smallholder sector. Like most other government parastatals, these institutions were bureaucratic, inefficient, and subject to volatile government budget restrictions

(Bay, 1998). Consequently, they offered a limited range of seed varieties and inconsistent seed quality to smallholder farmers (Maredia and Howard, 1998). With the possible exception of hybrid maize in Southern Africa, “sustained adoption of improved varieties” by smallholder farmers has been limited. (Rusike, Howard and Maredia, 1997; Christou and Twyman, 2004).

The deregulation of seed markets in the early 1990s, under the Economic Structural Adjustment Programs initiated by the International Monetary Fund/World Bank, ended state-owned monopolies in seed production, marketing, and distribution. As a result, multinational companies and domestic SMEs entered these newly accessible markets, each serving different segments. Because of the highly heterogeneous nature of smallholder farmers and the diverse agro-ecological conditions typical of sub-Saharan Africa, the large multinational companies target the most attractive market segments, such as large-scale commercial farmers who purchase seed in bulk. SME seed companies primarily target niche markets mostly made up of smallholder farmers. Recent research indicates that smallholder access to improved varieties has worsened in a number of countries following the reform (Maredia and Howard, 1998; Mtolera, 2001).

2.6.2 The rationale for intervention

Because of their size and market orientation, small- to medium-sized emerging seed companies have a ‘potential competitive advantage’ in meeting the needs of smallholder farmers in Africa. The reasons for this premise are as follows:

- ▶ First, most SME seed companies’ primary market is smallholder farmers, who account for 60–80 percent of their seed sales.
- ▶ Second, most SME seed companies are located in close proximity to their market to minimize transportation costs. Consequently, the companies are in close contact with smallholder farmers and thus best positioned to understand local agro-ecological and socio-economic conditions affecting the farmer. During the rainy season, when road infrastructure is further compromised by the wet conditions, proximity to markets is critical to ensuring timely availability of agricultural inputs.
- ▶ Third, the diverse agro-ecological and social conditions in African countries minimize any economies of scale that favour large companies in Europe, Asia, and the Americas. The highly fragmented market favours niche marketing.
- ▶ Fourth, because of relatively low overheads, SME seed companies are able to produce and sell seed at a lower per-unit cost than larger companies. In Uganda, the entry of SME seed companies into the industry has lowered the average price of hybrid maize seed from about US\$2 per kilogram to about US\$1.2 per kilogram.
- ▶ Lastly, the macroeconomic environment in Africa is highly dynamic and changes drastically across countries. These conditions favour smaller companies with local orientation that can change more quickly than large MNCs.

Despite these advantages, emerging domestic SMEs face some competition from (a) formerly subsidized government parastatals that have been privatized and (b) large MNCs that have entered the market. Additionally, they have limited financial and managerial resources and are often obstructed by complex and bureaucratic legal frameworks. As infants in the industry, small- to medium-sized domestic seed companies need assistance in establishing a solid financial base and developing management capacity. Table 2.6 presents a Change to: SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) of a typical SME seed company operating in East and Southern Africa.

TABLE 2.6
SWOT analysis of a typical emerging seed company

Internal strengths	Internal weaknesses
<ol style="list-style-type: none"> 1. Good working capital from the 'Alliance for a Green Revolution in Africa' (AGRA) 2. Well-established distribution system 3. Intimate knowledge of local market dynamics 4. Low overhead costs 5. Locally adapted seed varieties 6. Good working relationship with government and development institutions 7. Flexible and adaptive to dynamic environment 	<ol style="list-style-type: none"> 1. Over-reliance on out-growers for seed production 2. Limited business management capabilities in operations (production, processing) marketing, financial and strategic management 3. Limited or no product research and development (lack of in-house breeding programmes) 4. Highly centralized management systems (one-man shows)
External opportunities	External threats
<ol style="list-style-type: none"> 1. Untapped 80 percent market potential of farmers not using improved seed 2. Opportunities for public-private partnerships 3. Progressive new pro-market governments 4. Stronger ties between seed companies and the government 5. Harmonization of regional seed policies (market expansion) 6. New development initiatives supporting agricultural and seed enterprises 	<ol style="list-style-type: none"> 1. Very low adoption rate of improved seeds 2. Regulatory influences and government policy changes 3. Proliferation of fake seeds 4. Absence of well-defined intellectual property rights 5. Entry of large multi-national companies 6. Natural disasters such as droughts, pests and diseases 7. Heavy reliance on non-governmental organization (NGO) market 8. Harmonization of regional seed policies (increased competition) 9. HIV/AIDS 10. Unstable economic and political environments

2.6.3 The SODP programme model

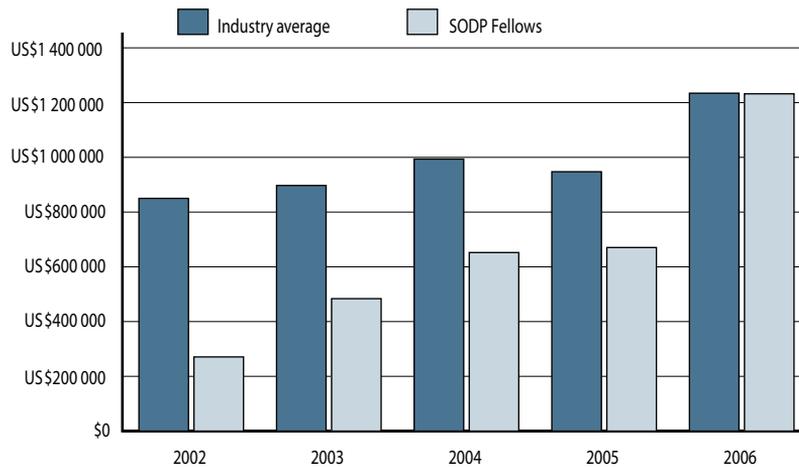
The guiding *theory of change* behind SODP is that initiatives aimed at boosting the performance of small- to medium-sized seed companies will ultimately improve the socio-economic conditions of the rural poor they serve. This model of intervention has become the hallmark of a new approach to promoting the development of small enterprises in developing countries (Oldsman and Hallberg, 2002).

Strengthening small- to medium-sized indigenous seed companies can promote food security and poverty reduction within economically disadvantaged rural communities. Given that 80 percent of smallholder farmers in Africa use farmer-saved seeds, the size and growth potential of these markets is great. Since small- to medium-sized seed companies primarily target smallholder farmers, support programmes that improve performance within these companies will result in timely availability of affordable, quality, and appropriate agricultural biotechnologies to Africa's rural poor.

2.6.4 Performance indicators

The outcomes and successes of the Seeds of Development Program are most visible in the programme's direct impact on participating companies. Monitoring and evaluation reports indicate that SODP Fellows have experienced statistically significant gains in the following areas: sales revenue, maize seed production, other seed production, number of varieties offered and total volume of seed sales. Based on a baseline survey conducted in 2006, a comparison of growth (as measured by annual sales revenue) between SODP companies and the industry averages for East and Southern Africa (excluding South Africa) is given in Figure 2.1. In 2006, the programme was awarded the L.A. Potts award³ for an innovative programme showing significant impacts on economically disadvantaged communities. A key element of the companies' success lies in the capacity building and networking provided by SODP. Fellows consistently report that they value and make use of opportunities to exchange information and experiences with other seed companies from the continent. Further, SODP Fellows have created numerous successful business deals. These collaborations not only include seed sales but also other products, such as chemicals/fertilizers, equipment, and germ-plasm processes that are essential to increased profitability of the seed companies and productivity by rural farmers. In short, the SODP network allows Fellows to expand their contacts, participate in business deals they would not otherwise have access to, and gain experience in providing seed products/services in domestic and/or regional markets.

³ In December 2006, SODP was awarded the L.A. Potts award for "an innovative programme showing significant impacts on economically disadvantaged communities" at the Professional Agricultural Workers' Conference (PAWC) at Tuskegee University, Alabama, USA.

FIGURE 2.1 Average annual sales of SODP Fellows *vis-à-vis* industry average

Through its successful work with African seed companies, SODP's broader impact in smallholder farming communities has become visible. First, Fellow companies create additional employment, as virtually all companies have experienced growth and the concurrent need for additional labour, the earnings of which in turn support immediate and extended families. Company sales data also show that the bulk of sales (more than 80 percent) are from smallholder farmers. By offering a wider variety of seeds, including higher-yielding, disease- and drought-resistant varieties, as well as other inputs such as fertilizers, SODP companies help smallholder farmers increase food security for their families and communities. Other performance indicators for SODP Fellows are given in Table 2.7.

TABLE 2.7

Performance indicators for members of the SODP Network

Performance indicator (averages)	2003	2006	Increase
Sales revenue	US\$450 370	US\$1 232 112	174%
Area under maize seed production	198 000 (ha)	448 000 (ha)	126%
Area under other seed production	146 000 (ha)	312 000 (ha)	113%
Number of maize seed varieties offered	4.2	7	166%
Volume of total seeds sold	229 (M tons)	682 (M tons)	299%

2.6.5 Impacts of SODP Networking

The opportunities available to Fellow companies through the SODP training and networking activities have enabled these small start-up companies to improve competitiveness compared with established multinational companies. Companies in the SODP network have benefited from economies of scale, and have taken advantage of their linkages to share information and develop joint market entry strategies. From 2009 they have also been preparing for the planned harmonization of regional seed trading regulations in East and Southern Africa. Below are some examples of this collaboration in the following categories: formation of new enterprises, cross registration of varieties, purchase and sale of seeds and equipment, sharing of information.

- ▶ At the seed trading forum in 2005, Qualita Seeds (Mozambique) negotiated for an export deal from its vegetable seeds with Kamano Seeds (Zambia), Tanseeds International (Tanzania) FICA Seeds (Uganda), Freshco Seeds (Kenya) and MRI (Zambia). Qualita also agreed to do seed production for Zanobia Seeds, and set up a Macadamia nursery for Freshco. Finally, Qualita partnered with Victoria seeds to import vegetables in bulk from India.
- ▶ Following a field trip to India in 2006, five SODP Fellow companies, represented by John Makoni of Pristine Seeds (Zimbabwe), negotiated a deal with an Indian agrochemical company – United Phosphorus Ltd – to source seed treating chemicals jointly, at lower prices than domestic suppliers. Buying in bulk also lowered the per unit costs of shipping and handling.
- ▶ FICA Seeds Ltd (Uganda) has partnered with Pristine Seeds (Zimbabwe) to supply seeds to an underserved market in Malawi. In 2005, they registered a company called ZUM Seeds (ZUM being 'Zimbabwe, Uganda, Malawi') which now sells maize seed in Malawi.
- ▶ Pristine Seeds is currently marketing many of its products through another fellow company in Zimbabwe (National Tested Seeds).
- ▶ In 2005, Suba Agro-Trading (Tanzania), a relatively small start-up company, won a tender to supply the Food and Agriculture Organization of the United Nations (FAO) with one million US dollars' worth of seeds. Unable to supply such volume from its own stocks, Suba relied on SODP Fellows in neighbouring countries to meet this demand. They received seeds from Western Seeds in Kenya (worth more than US\$60 000), FICA Seeds in Uganda (US\$85 000) and Victoria Seeds in Uganda (US\$65 000). "In fact, without the relations we built during our SODP course things could have been very difficult for us," acknowledges Mr Muya, the managing director of Suba.
- ▶ FICA Ltd (Uganda) is expanding into highly lucrative regional markets through Freshco. Ltd (Kenya) and Pristine Seeds (Zimbabwe). Having a partner in these countries will reduce costs and legal barriers to entry by registering three varieties through local partners.

- ◉ In 2006, Western Seed Company (Kenya) exported 250 tonnes of sorghum to Tanzania through another SODP Fellow, Suba Agro-Trading. They are also exploring opportunities to export some of their Open Pollinated Variety (OPV) maize varieties to Zimbabwe through Pristine Seeds.
- ◉ Zenobia Seeds (Tanzania) is taking advantage of its large and well isolated farm to produce maize seed for another local SODP Fellow, Suba Agro-Trading. The two companies enjoy some economies of conglomeration by sharing seed processing and storage facilities.
- ◉ Pristine Seeds (Zimbabwe) has sourced seed processing equipment from a Zimbabwean supplier for Western Seed Company (Kenya). Pristine also facilitated registration of Western Seed Company varieties in Zimbabwe.

2.6.6 Sustainability and exit strategy

The organization and structure of the African seed industry are important factors, if not determinate ones, that influence the sustainability and exit strategy of SODP. In the long term, two likely scenarios will ensure that the network survives after the withdrawal of donor support – active Seed Traders’ Associations and strategic alliances among Fellow companies.

First scenario: Active Seed Traders’ Associations

One of the salient functions of the SODP is to provide a networking platform for small- to medium-sized seed companies in East and South Africa. The emergence of local and regional seed traders’ associations in most of sub-Saharan Africa in the last decade is seen as a positive development. While most of these associations have focused largely on lobbying local governments to develop desirable seed trade policies and regulations, they have the potential to develop into a networking platform for various seed industry stakeholders. As they become more active, Seed Traders’ Associations could replace the networking functions of SODP. For this reason, SODP encourages its Fellows to be active members of these associations and not to view SODP as a substitute but rather as a complement to these. Where possible, SODP activities are planned to coincide with regional Seed Traders’ Association meetings to help build institutions in this sector. However, it should be noted that the existing associations do not distinguish between the small- to medium-sized seed companies and the much larger multinationals. This ‘one size fits all’ approach could potentially limit the effectiveness of these associations, because the interests of the large multinationals may differ and at times conflict with those of their smaller local competitors.

Second scenario: Strategic alliances among Fellow companies

The training and networking activities of SODP have enabled these small start-up companies to collaborate on variety registration, market research, staff recruitment, equipment procurement, influencing government regulations, and the facilitation of exports. While SODP can take credit for creating the network, the collaborations

have been initiated, funded and executed entirely by the Fellows. It is reasonable to expect that such collaboration will continue to expand and last beyond the lifespan of the SODP initiative. For example, six SODP Fellows have proposed the formation of the United African Seed Companies Pvt. Ltd (UASC) in preparation for the harmonization of seed industry regulations in East and Southern Africa. Under this arrangement, each participating company would continue to operate as an independent entity while investing in a joint company that will offer economies of scale plus the benefits of multiple production, processing and marketing facilities to small- and medium-sized seed companies. Such strategic alliances among Fellow companies will guarantee sustainability of the SODP initiative in delivering appropriate seed varieties at affordable prices to smallholder farmers.

2.7 Developing business networks for SMEs

This section gives guidance to development practitioners seeking to establish and maintain business networks with the goal of supporting agro-industries in developing countries. The section is divided into three parts. First are some key lessons for SME business networking drawn largely from the SODP case study discussed above. Second is a summary of key steps involved in the development of SME networks based mostly on guidelines from the United Nations Industrial Development Organization (UNIDO). Last is an examination of the role of governments in fostering business networks.

2.7.1 Lessons for SME business networking

Based on the case study of SODP, observing other networks and following the literature on the subject, this section shares some of the valuable lessons that are critical to establishing and maintaining successful SME business networks. Recognizing that every business network differs in its objectives, membership, *modus operandi*, and the macroenvironment in which it functions, the lessons are to be taken only as guiding principles and not golden rules. Box 2.1 outlines the top ten lessons of business networking (listed in no particular order).

2.7.2 Steps to developing SME networks

Despite their numerous advantages, business networks are difficult to establish and maintain, especially for SMEs. This section outlines a step-by-step process of developing SME networks. The process is mostly based on guidelines from UNIDO entitled 'Development of Clusters and Networks of SMEs' (UNIDO, 2001). To provide context, an explanation of the UNIDO terminology is appropriate. UNIDO defines clusters as "sectoral and geographical concentrations of enterprises that produce

Box 2.1 Top ten lessons for SME business networking

1. *The network belongs to its members:* From the start, it is important for members of a business network to feel a sense of ownership of the institution. Every major decision about the structure and direction of the network should be made in full consultation with members. Whenever possible, conflicts should be resolved through a democratic voting process.
2. *The enterprise, not the owner or manager, is the member of the network:* Due to high employee turnovers for enterprises in developing countries, it is important to extend membership to the entire firm and not to individuals. This also allows various managers and staff within the enterprise to participate in the network. Staff turnovers are less likely to affect the functioning of the network.
3. *Make use of information and communication technologies:* Regular communication is vital for the functioning of a business network. Network coordinators can facilitate communication among members through modern information and communication technologies such as: network web sites, e-mail list servers, online working groups or group-hubs, Twitter, newsletters, and short messaging systems (SMS).
4. *Face-to-face meetings among members are important:* Despite the widespread use of information and communication technologies, face-to-face meetings are still important to establish trust among members. There is no substitute for a handshake.
5. *Membership should be exclusive:* One value to being a member of a business network is its exclusivity. If anyone can join the network, this value is eroded. Every business network should have clearly-defined eligibility criteria and/or a selection process for membership.
6. *Pay attention to group size:* The network should be big enough to create opportunities for its members. However, there may be some diminishing returns to size (e.g. coordination problems, reduced exclusivity).
7. *All members of a network are equal:* Given heterogeneity among network members, it is often tempting to create subgroups or division within the network. However, this can result in some stratification or ranking of members which can hinder networking.
8. *Coordinators should remain neutral arbiters:* Network coordinators will often be called upon by its members to intervene in conflicts or moderate transaction between members. In such cases, they should remain as neutral mediators and not take any sides.
9. *Business networks are dynamic:* Networks should evolve to meet the ever changing needs of their members and adapt to the macroenvironments within which they operate.
10. *Develop a code of ethics:* A code of ethics, agreed upon by all members, should set the minimal standard of expected behaviour among network members. This minimizes transaction costs and reduces internetwork conflicts resulting from opportunistic behaviour by some members.

and sell a range of related or complementary products and, thus, face common challenges and opportunities". It defines networks as "groups of firms that cooperate on a joint development project complementing each other and specializing in order to overcome common problems, achieve collective efficiency and penetrate markets beyond their individual reach" (UNIDO, 2001).

Based on a solid track record of developing and maintaining clusters, UNIDO designed a methodology for the formulation and implementation of cluster development projects. As published on their web site, the clusters and business linkages unit of UNIDO follows a five step approach to promote clusters (UNIDO, 2009). Below, the same five steps are adapted for the development of SME network projects:

1. *Network selection*: This first step involves the careful selection of a business network based on the primary objectives of the development practitioner. It should be clear at this stage whether the network will be vertical (along a supply chain), horizontal (similar level players), or cross sectoral (within a business cluster).
2. *Diagnostic study*: The second step involves conducting a rigorous diagnostic study of the business network. Several frameworks can be used to structure this analysis. The key factors affecting the industry can be identified using a 'PEST' analysis (Political/Legal, Economics, Social/Demographic, and Technological factors). Porter's five forces model – entry of competitors, threat of substitute, bargaining power of buyers, bargaining power of suppliers, and rivalry among the existing players – can be used to evaluate the attractiveness of the industry. A SWOT analysis can be used to evaluate the internal Strengths and Weaknesses and External Opportunities and threats of the network.
3. *Vision building and action planning*: This third step entails the formulation of a vision and a corresponding development strategy shared by the entire network. Eligibility or selection criteria for the network are set at this stage.
4. *Implementation*: This fourth step refers to the management and coordination of the activities outlined in the action plan. It can be broken down into five steps as follows:
 - a. Promotional and motivational activities of potential network partners
 - b. Assistance in strategic planning of network activities
 - c. Pilot projects (usually short-term activities to promote trust)
 - d. Strategic projects (longer-term and of a more strategic nature)
 - e. Self-management of the network
5. *Monitoring and evaluation*: This final step refers to the ongoing task of monitoring and evaluating both qualitative and quantitative outcomes of the business network.

2.7.3 Role of the state in fostering business networks

Literature on the state's role in network development, both theoretical and empirical, is rather scant. What exists instead is a wide plethora of studies examining the broader

question of how government policy and action affects the performance of an industry. Based on this literature, the consensus is that government is critical in providing suitable macroeconomic conditions, improving microeconomic capacity, and establishing a supportive and progressive regulatory environment. For brevity, this literature is not reviewed here. Instead this section limits the discussion to measures that are specifically designed by government to promote business networks.

Recognizing that the social benefits of a business network may be substantial while the private costs for some participants may exceed private benefits, it follows that governments and development agencies should play a role in the formation and maintenance of networks. According to the United Nations Economic Commission for Europe's (UNECE) recent report, *Enhancing the innovative performance of firms: policy options and practical instruments*, public intervention can help in addressing issues that emerge at various stages of the networking process, in particular regarding:

- ▶ awareness of a networking possibility;
- ▶ search for partners;
- ▶ building trust and a shared knowledge base;
- ▶ organizing the network;
- ▶ ensuring complementary resources; and
- ▶ active cooperation in the activities of the network (UNECE, 2009).

The same report concludes that there are four key lessons from recent practice in public programmes supporting networks:

- ▶ *Presence of a formal organizational structure*: This is meant to encourage the formation of a long-term sustained relationship that supports mutual trust. Informational resources can be provided by the public sector to promote these structures, but concrete arrangements should be left to the participants.
- ▶ *Bottom-up support*: Programmes that support existing or emerging self-organizing networks (a bottom-up approach) tend to give better results than those that reflect 'top-down' technological priorities.
- ▶ *Long-term*: Building trust takes time; long periods of support and institutional stability are essential. Insufficient coordination of initiatives and a volatile funding and institutional setting are particularly damaging for network-oriented policies.
- ▶ *Tailor-made*: Programmes need to take into account the different needs, incentives and capabilities of participants. This implies, for example, paying particular attention to the needs of SMEs (UNECE, 2009).

For a different perspective on the government's role in fostering business networks, one can adapt a framework designed by Porter (1998) on how governments can facilitate and upgrade cluster development and create opportunities for business networking. Replacing the word 'clusters' with 'networks' in Porter's recommendations, the five key government functions in fostering business network are to:

- ▶ play a role as 'broker', 'facilitator', 'initiator', 'participant' and 'listener' to engage partners in a productive dialogue and create a sense of urgency to cause action;
- ▶ conduct ongoing network assessments to determine their viability and relative strength to ensure global competitiveness;
- ▶ institutionalize network upgrading, e.g. restructuring government programmes and services, diffusing new knowledge, and collecting and disseminating data/information by clusters;
- ▶ directly invest in and provide investment incentives for technical, physical and knowledge infrastructure;
- ▶ sponsor business network conferences and fora to promote 'social capital' opportunities for participants (Porter, 1998).

Again, it is important to emphasize that the diversity of networks in their memberships, goals, structure, socio-cultural context, and the micro and macroenvironments in which they operate, make every business network unique. As such, any lesson learned from other networks must be carefully adapted to fit local conditions and agenda. To this end, governments must be flexible in adapting their interventions according to the different needs of each network and be willing to change across space and time as conditions change.

2.8 Conclusions

This chapter explored the use of business networks as an innovative institution to support the development of agro-industries. The concept of a business network was explored within the micro and macroenvironments facing agro-industries. This was followed by an analysis of the theoretical basis of a business networks and why they are especially important for agro-industries. Comparisons were made between business networks and other innovative institutions, showing how networks are much cheaper to develop and can be used to supplement other institutions. To illustrate the concept of an agro-industry network in developing countries, the case study of the Seeds of Development Program, a network of thirty emerging seed companies in nine African countries, was summarized. The case of the SODP illustrates that business networks have an enormous potential to develop agro-industries for SMEs in developing countries. More importantly, when used in conjunction with other tools – such as business development services, incubators, agribusiness parks, warehouse receipts and contract farming – the effectiveness and contribution of business networks to the development of successful SMEs may be even greater.

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CHAPTER 3

Public–private partnerships for agribusiness development in Thailand and India: Experiences, issues, and strategies

SUKHPAL SINGH

3.1 Introduction

Agricultural development is key to economic development in many developing countries, especially India, where a large proportion of its population still relies on agriculture, directly or indirectly, for its livelihood. A strong agricultural sector is essential to poverty reduction and social progress. Agriculture is important not only for food security: it is also important because of the employment opportunities it offers, and also for other sectors of the economy because of demand-side impacts. Additionally, its role in environmental sustainability is paramount. Yet the conditions under which agricultural development needs to be achieved have changed in the last decade in India, due to the opening up of domestic markets, liberalization of domestic policies under its Structural Adjustment Program (SAP), and the inclusion of agricultural trade under the World Trade Organization (WTO) remit.

Given the change in trade structures as a result of global value chains and outsourcing (and Asia has been affected perhaps more than any other region in this regard), there has been a corollary double shift, first in the composition of trade and second in the poles of world trade. In the composition of commodity trade, there has been a move away from agricultural products (food and agricultural raw materials). These used to account for nearly 50 percent of exports in 1960; in 2001 that figure had dropped to just 7 percent. There has also been a corresponding increase in exports of manufactured goods – from less than 20 percent in 1960 to almost 70 percent in 2001 (The United Nations Conference on Trade and Development, UNCTAD, 2002; UNCTAD, 2004). Exports of food and agricultural raw materials have, therefore, steadily become less and less important in the exports of developing Asian countries. A large part of agricultural trade is between

similarly-developed countries (e.g. 70 percent of developed country trade is within the developed world), yet intra-developing country trade has also grown, from around 23 percent in 1965 to around 40 percent in 1995. In 2001, 41.5 percent of exports in developing Asia were to developing Asia itself (UNCTAD, 2004). In middle- to low-income countries, growth of income leads to a growth in demand for agricultural commodities, more than in developed nations. This has benefited economies that mainly export agricultural commodities.

However, the competitiveness of cereal and livestock production in India has been low. Furthermore, trade in processed and high-value food products is expanding rapidly (80 percent of total) at the cost of raw materials and commodities. Trade in processed food products is concentrated in a few countries, with 30 developed nations accounting for 84 percent of processed food imports. This trading is also increasingly 'intra-industry', i.e. a country simultaneously imports and exports close substitute products. Market concentration in food processing industries and retailing is also increasing: for example, 80 percent of meat and soyabean processing in the USA is dominated by only four firms in each industry. Overall, it is clear that international agritrade is increasingly oligopolistic.

There is also increasing concentration within global value chains accompanied by increasingly tough public and private (collective and company) product, process, and social standards, such as Sanitary and Phyto-Sanitary measures (SPS), GlobalGAP ('Good Agricultural Practices' – formerly known as EUREPGAP, referring to standards of food production laid down by the Association of European Retailers), organic farming and fair trade. These trends lead to higher costs of compliance to standards in exporting countries, both for exporters and primary producers.

Finally, the context of agricultural development has changed at the national level, with demand for high value products growing nationally and globally, growing technological and institutional innovations in the face of increasing pressure to be competitive, redefinition of the role of the state in agriculture providing greater scope for private sector involvement, and the rising scope and power of civil society organizations given the background of state and market failures. As a result, the new agriculture is market driven, state assisted, influenced by civil society and grounded in technological and institutional innovations (World Bank, 2007).

Major problems of small and marginal farmers in India include spurious input supply, inadequate and costly institutional credit, lack of irrigation water and costly access to it, lack of extension services for commercial crops, exploitation in marketing of their produce, high health expenditure, and lack of alternative (non-farm) sources of income (Dev, 2005). Employment, which is the only way to raise these farmers' incomes, is low in these fields because of the limited employment elasticity of output resulting from increasing mechanization and the kind of crops being grown (Muller and Patel, 2004).

The policy and development regime characterized by the diminishing role of the state as an agent of development, and the expanding role of the market (private entities) and civil society organizations, makes leveraging the strengths of private and civil society actors more relevant. It also helps avoid the state in terms of its overwhelming presence, which at times has been counterproductive to development and poverty reduction.

There is an increasing corporate interest in agriculture in India. This has largely resulted from the policy focus on the role of the private sector in agricultural development, in the guise of free markets combined with Public-Private Partnerships (hereafter PPPs). This chapter examines the extent and nature of PPPs in India. Section two focuses on the concept and dimensions of PPPs; section three discusses the international experience, mainly Thai, of PPPs; section four focuses on the Indian experience; section five outlines the main constraints on the expansion of PPPs in agribusiness and its potential in India; section six suggests mechanisms for promoting meaningful PPPs. Section seven concludes the chapter.

3.2 PPPs in agribusiness

PPPs refer to a “working arrangement based on mutual commitment (over and above that implied in any contract) between/among public sector organization/s and any organization/s outside the public sector” (Bovaird, 2004). The partnerships can come in different sizes and shapes (Hihorst *et al.*, 2007). The nature of partnership can be sectoral in terms of public sector agencies partnering with the private sector, civil society, Non-Governmental Organizations (NGOs) or a combination of these. Further, it can be relational, ranging from a loose network to collaborative, power-sharing, consultative or contractual arrangements. In terms of the economic aspect it can be supply-side oriented, demand-side oriented, or mixed. The scope of partnership could be vertical, horizontal, or a combination of both.

The reasoning behind this paradigm of agricultural development comes from the following:

- ① Financial constraints in the public sector/state, resulting in a ‘marriage for money’ by the state or public agencies.
- ② Management expertise in the private sector – the private sector offers ‘value added’ contributions, such as technological development and dissemination, farming system innovations (e.g. intensification, diversification) and marketing expertise.
- ③ In agricultural economies, especially where smallholders dominate, farmer organizations may also drive the formation of PPPs for their mutual benefit.
- ④ Similarly, natural resource management, and sustainability and safety issues in soil, water and food, can bring partners together to minimize loss of resources or

to conserve or regenerate them for better productivity and quality produce. Food quality improvement for export and domestic markets – which has become a prerequisite for participation in global and national markets post-WTO – is another important impulse for such partnerships. These require not only large financial resources, but also scientific and managerial expertise to fully understand the markets they wish to succeed in. Growth of supermarket value chains as a result of Foreign Direct Investment (FDI) in the retail sectors of many developing countries – both for domestic consumption and for export – is also driving such partnerships.

- ▶ The emergence of biotechnology as a means of pro-poor growth has also driven many PPPs, especially in agriculture and food processing.
- ▶ Linking up smallholders with modern markets, which requires competitive marketing skills and effective extension, is another reason for many partnerships.
- ▶ More importantly, innovations in value chains are the most significant logical reason for the adoption of PPPs by many development projects, because these innovations require diverse resources and capabilities to transform themselves into successful enterprises.
- ▶ The push for rural penetration from the banking and agricultural input industries, as seen in rural retail chains and contract farming (CF) projects in India and neighbouring countries, is also bringing various players in the banking and agri-input sectors together to their mutual benefit, given that these markets require bundles of services and products which individual firms cannot deliver. This is made more complex by the agricultural slowdown and agrarian distress in many parts of the developing world, where the viability of smallholders is at stake.

The policy objectives of PPPs could be:

- ▶ improvement of productivity and efficiency;
- ▶ empowering clients and the disadvantaged; tackling social exclusion;
- ▶ cost cutting and quality improvements via economies of scale, of scope, and mutual exchanges of knowledge in terms of best practices, the factors required to succeed, and the obstacles to overcome;
- ▶ provision of multi-actor integrated solutions suggested by the scope and nature of the problem being addressed;
- ▶ movement away from a 'no win' situation among multiple actors to a compromise and potential 'win-win' situation;
- ▶ promotion of a broader operationalization of the public good (Brinkerhoff and Brinkerhoff, 2004).

Mutuality achieved through PPPs can help partners to come up with new ideas and propose new and more effective approaches; this enables partners to contribute with fewer constraints and greater legitimacy. Partners can gain access to new skills, resources and information, and expand and enhance the relevance of their projects and programmes (Brinkerhoff and Brinkerhoff, 2004). The partners in such arrangements, besides public agencies such as state ministries and para-statal agencies, can be:

- ⦿ agribusiness enterprises including agri-input companies;
- ⦿ extension agencies such as agriclincs and input dealers;
- ⦿ individuals such as contract farmers, master farmers, contact farmers, link farmers, farmer friends;
- ⦿ farmer cooperatives, associations, and groups, water users' associations (WUAs), self-help groups (SHGs), farmer interest groups (FIGs), producer companies;
- ⦿ NGOs;
- ⦿ Panchayati Raj Institutions (PRIs) under Public–Private–Panchayat partnerships.

3.3 International experiences of PPPs

There have been many experiments with PPPs in agricultural extension in Latin American countries such as Chile, Mexico, Colombia, Venezuela and Nicaragua. These ranged from pure subcontracting to a private agency, to wider involvement of the agencies as partners (Umali-Deininger, 1997). The Asian experience of PPPs includes non-timber forest products in Nepal, in which Dabur Nepal collaborated with the Ministry of Local Development and ICIMOD (International Centre for Integrated Mountain Development) to cultivate ayurvedic plants within communities. This led to commercialization of seven high-value medicinal plants that Dabur agreed to buy back (Shakya, 2005). In Thailand, fruits and vegetables have been cultivated via PPPs involving the Tops retail chain. In India, cases include that of Hindustan Unilever Ltd (HUL), Mahagrapes, agricultural extension in Madhya Pradesh, and CF in the state of Punjab. In Thailand too, CF has been promoted through PPP, and is the focus of the analysis below.

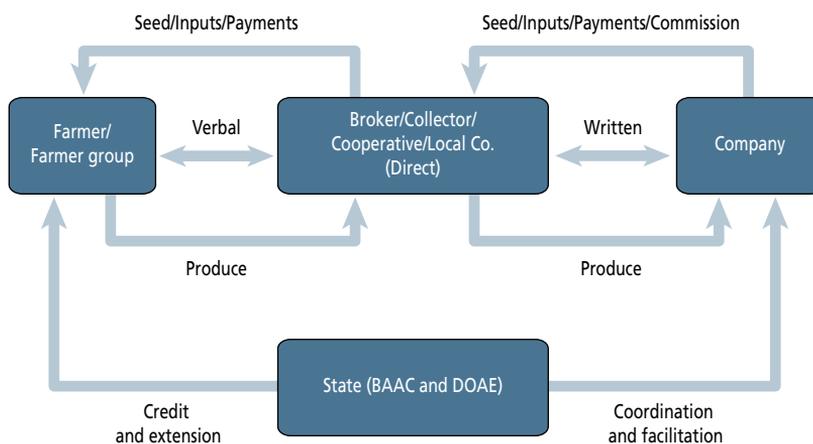
3.3.1 Contract farming in Thailand

Thailand has the most extensive and the longest experience of CF in Asia. It emerged more than three decades ago, initially in poultry, sugar cane, tobacco, pineapple and vegetable production. By the early 1990s, CF was established in the production of the following crops/commodities in Thailand: poultry, dairying, palm oil, pineapple, tobacco, sugar cane, kenaf, asparagus, maize, maize seed, castor oil, eucalyptus, baby corn, cashew nuts, sunflower, bamboo, barley, sea shrimp, cotton, tomato, tomato seed, rubber, gherkins, peas, string beans, silk worms, swine, asparagus, bamboo shoots, ginger, mushroom and fragrant rice (Kusakabe and Higuchi, 1992; Goss and Burch, 2001). By the early 1990s, production of canned bay corn, bamboo shoots, tomatoes and various fruits was largely under contracts (Burch, 1994). By the late 1990s, almost 100 percent of commercial production of poultry in the country, especially for frozen chicken exports, was under some form of contract (Burch, 1994). Later, CF expanded to vegetable seeds and crops such as tomato (Saenjan, 1998).

The state and contract farming in Thailand

Though CF was initiated in most cases by the private sector, the state soon came to play a major role in its development, both in terms of setting broad policy directions for diversification and underwriting private sector activity, through various institutions like the Board of Investment (BOI), National Economic and Social Development Board (NESDB), and Agricultural Land Reform Office (ALRO). Though BOI, set up in 1954 and in its present form since 1977, had no particular brief to promote CF, this has been an inevitable by-product of its activities given its involvement in sectors which use CF (Burch, 1994). Besides, there are two other wings of the state – the Ministry of Agriculture and Cooperatives (MOAC) and the Ministry of Finance (MOF) – which promote CF through their own agencies, i.e. the Department of Agricultural Extension (DOAE) and the Bank for Agriculture and Agricultural Cooperatives (BAAC), respectively (Figure 3.1).

FIGURE 3.1 CF system in Thailand as PPPs



It was in its fifth plan that the NESDB accorded high priority to agribusiness for the first time, but only in the sixth plan was a lead role given to private agribusiness, including CF system (Goss and Burch, 2001). Analysing the production and sale of agricultural products, the sixth plan notes and recommends, “Contract farming has proved viable and should be further promoted, on condition that the provisions of such agreements are amended to be more effective and beneficial to all parties concerned” (NESDB, The Sixth National Economic and Social Development Plan, 1987–91; 218). This plan focused on four-sector cooperation (agribusiness firms, farmers, state (MOAC) and financial institutions, popularly known as the ‘four-sector

cooperation plan”) for the promotion of CF and agribusiness. The rationale behind the plan was the need to harness the resources and skills of large agribusiness firms, and the more efficient ways these firms have in reaching small farmers and helping them to link profitably with markets (Christensen, 1992).

The seventh plan carried this policy on CF further by making an explicit mention of it and seeking its promotion. It stated under the guidelines for agricultural development:

“Expand scope of agricultural credit and encourage contract farming business by using the following measures:

- ◉ Encourage agribusinesses, with the government as co-ordinator among various agricultural groups to co-operate with entrepreneurs in agriculture-related businesses to have opportunities for contract farming arrangements, and to have joint investment to expand and increase the types of products of agro-industries.
- ◉ Supervise contract arrangements between agricultural institutions and business entrepreneurs to ensure fairness to all parties” (NESDB, The Seventh Economic and Social Development Plan, 1992–1996; 36).

The only departure of the seventh plan from the sixth plan seemed to be its emphasis on ‘group’ contracting as opposed to individual farmer contracts. There is no explicit mention of CF in the eighth and the ninth plans. Nonetheless, individual departments were still implementing it on the ground. For example, a 1999 order of the Department of Internal Trade (DIT), which issued a standard CF agreement for companies and farmers, not only said that that agreement should be used, but also specified that it (DIT) would regulate contract compliance. It is a different matter that the standard agreement designed by the DIT was used only by a couple of companies, even in 2002, and it was also poorly designed. Surprisingly, it had no clauses on input supply and payment for inputs, or other conditions regarding these, which were so crucial in some types of CF arrangements. As such, the standard contract was more of an agreement about the buying and selling of produce between two parties.

Though permission was no longer required to start CF in any province, to build farmer confidence companies often accepted the help of the provincial agricultural office when contacting farmers for the first time. Some companies, such as River Kwai International (RKI), acknowledged the support given by the Ministry of Agriculture and Cooperatives through its Department of Agricultural Extension, and that offered by the Bank for Agriculture and Agricultural Cooperatives of the Ministry of Finance (it mentions this on its web site as well). In fact, this company was the only one that recognized the role of state agencies in its operations, as follows:

1. The extension department sometimes promotes the production of sweet corn by buying seed from a company and selling it to farmers at a subsidized price. About 10 percent of the company’s farmers receive this seed supply.

2. BAAC provides concessional credit to groups of farmers who work with a company. The company gives a commitment to BAAC to buy these groups' produce and this works as a guarantee for loan. About 10 percent of the company's growers make use of this credit facility. In fact, under the four-sector plan, companies can request special extension and credit assistance from government for specific crops and areas of operation when budgeting is done for such programmes every year.

The MOAC through its DOAE still carried out training in CF for farmers and local officials that included aspects such as: guidelines for implementation of CF (i.e. types of products suitable for certain kinds of contracting arrangement); familiarity with the CF system; supervision of contract arrangements; special financial assistance to companies undertaking CF; guidance on implementation of the CF project in terms of coordination between public–private sectors and choosing farmers and the produce to be contracted. Its guidelines even specified requirements before a CF project was undertaken, namely: farmer willingness and exposure to the concept of CF, feasible standards of quality of produce, price flexibility, and production and marketing plans. These guidelines assigned specific roles and responsibilities to farmers, farmer groups, companies and government agencies in terms of dealing with each other during the project. Finally, the DOAC recommended suitable types of CF system for different types of commodities, and advocated CF via farmer organizations instead of through individual farmers. It even went on to advise in terms of having multiple outlets for produce – both contract and non-contract – for different grades of produce from the same group of farmers (MOAC, 2002).

3.3.2 The Bank for Agriculture and Agricultural Cooperatives and contract farming

The BAAC started operating CF in the early 1980s with the Choroen Pokphand (CP) group, in which other commercial banks also participated. Joining a private firm to make market contract with farmers helped BAAC reduce its business risk, because the firm deducted the loan and interest from farmers' sales receipts. At the same time, the firm did not have to extend input credit itself and farmers were able to obtain the credit they needed. All three parties were made more secure in this way. The BAAC provided credit, both in cash and in kind, to farmers participating in CF with the firm, but farmers who actually joined the project received special privileges, such as being eligible to borrow double the amount available ordinarily (60 000 baht in 1991 compared with 30 000 baht), and without collateral (Manarungsan and Suwanjidar, 1992). Since 1993, BAAC has no CF projects as part of the four-sector cooperation plan; contract farmers take loans from the bank as individuals or group guarantee loans. The CF project was in operation for five years only. According to a BAAC official interviewed, the bank later abolished its agribusiness section, and instead had a social and environment section.

There is no doubt that even small and marginal or even landless farmers were participating in CF, thus making the process all-inclusive. The farmers were, by and large, happy with the system as it prevailed then. Though state policy helped contracting to take root in the country, it later worked between farmers and companies more by way of a market mechanism, and there were all kinds of arrangements in place in the name of CF. The companies relied on brokers (middlemen) to work with farmers. State intervention helped the farm sector and its farmers because it promoted competition that was beneficial to growers, such as potato cultivators in northern Thailand, and also led to capital injection into the farm sector through the BAAC loans for contract growers.

3.3.3 The Indian experience of PPPs

In India under the new agricultural policy regime, PPPs are the main route being taken to bring about transformation in agriculture. The state is providing incentives to corporate entities to enter the agribusiness sector, including through CF. CF is a risk reduction intervention/institution or policy strategy and one of the many instruments of farmer risk management. CF has also been used in many situations as a policy step by the state to bring about crop diversification to improve farm incomes and employment (Benziger 1996; Singh, 2000). CF is also seen as a way to reduce costs of cultivation because it can provide access to better inputs and more efficient production methods. The increasing cost of cultivation was the reason for the emergence of CF in Japan and Spain in the 1950s (Asano-Tamanoi, 1988) and in the Indian Punjab in the early 1990s (Singh, 2002).

CF as public-private partnership

The government of the Punjab through its Punjab Agro Foodgrains Corporation (PAFC) reimbursed extension cost to the CF agencies/facilitators at the rate of 150 rupees (Rs.) per acre for three years, in order to facilitate CF with the aim of achieving crop diversification. This was a case of PPP. But, it provided this reimbursement without due regard for the size of holding of the contract growers. To a large extent, this defeated the purpose of the PPP as it did not ensure the inclusion of small and marginal farmers who could not afford to pay for extension and who needed to be brought into the contract system. Similarly, the Ministry of Food Processing Industries (MFPI) was providing an incentive during the 9th Five-Year Plan in the form of a reimbursement of 5 percent of the value of raw materials procured through CF, with a maximum ceiling of Rs. 1 million per year for a maximum of three years. The condition for this incentive was that any organization (whether private, public, cooperative, NGO, joint venture, assisted) should work with at least 25 farmers under contract for at least three years (MFPI, 1998).

Basix, an NGO involved in livelihood promotion through microfinance schemes, entered into a collaboration with Frito Lay India (a subsidiary of Pepsico) for potato CF, whereby it facilitated the production of chip grade potatoes at the farmer level in Jharkhand. In 2005–2006 the company agreed to buy at pre-agreed prices and specifications, as part of the CF arrangement facilitated by Basix in terms of contract coordination and provision of credit for 424 small contract farmers with 83 acres. This increased to 1 442 contract growers with 585 acres in 2007–2008. The partnership led to higher yields, better prices and higher net returns for contract chip potato growers compared with those achieved from conventional potatoes, though the cost of production was somewhat higher under contracts. The agency (Basix) also made a surplus in 2005–2006 and a small loss in 2006–2007 (Mishra, 2009).

Creating producer bodies through PPPs

Another outstanding case of PPPs is the creation of Mahagrapes by the Maharashtra State Agricultural Marketing Board (MSAMB), the Department of Cooperation, Government of Maharashtra, the National Horticulture Board (NHB), the National Cooperative Development Corporation (NCDC), the Agricultural Products Export Development Authority (APEDA), and the grape growers themselves for the benefit of grape growers.

The project has been extremely successful. Mahagrapes was set up in 1991 as a marketing arm of the grape growers' cooperatives in Maharashtra by MSAMB, and supported financially by NCDC and APEDA, to promote the marketing of grapes globally and to attend to the problems of quality and rejection in the global market faced by the growers' produce. It has features of both a cooperative and a company in terms of its organizational structure and functioning. It is a unique organization in India, born in 1984 as a result of the special provision of the (amended) cooperative law at the provincial level, whereby cooperatives were allowed to associate with other agencies, including marketing partners.

Mahagrapes was registered as a partner to the producer cooperatives under a clause following the amendment to the cooperative Act. Two executive partners head the organization, which has an executive council comprising seven elected cooperative heads, followed by a board of directors composed of the heads of 16 member grape growers' cooperatives. Mahagrapes is a 'for profit' organization and its primary source of funding is membership equity. Mahagrapes has now assumed a much bigger role in managing and facilitating the entire value chain of grapes, including extension and market information, as well as negotiating prices for growers with national and global buyers. It only charges a facilitation fee from growers for its services and does not retain the profits it earns. It is wholly owned and governed by farmers and their cooperatives. It has been able to deliver better net returns to its member growers than those earned by non-members. Noteworthy in this effort is the role of

the state agencies in helping the apex organization of growers to establish itself and stabilize. The MSAMB paid the salaries of the first governing officers of Mahagrapes for three years, who were seconded from other state government departments. NCDC provided loans to grape cooperatives for creating local value addition and value preservation facilities (Roy and Thorat, 2006).

Agricultural extension as PPPs

In Madhya Pradesh (MP), there was a PPP in agricultural extension involving the National Institute of Agricultural Extension Management (MANAGE) based in Hyderabad, the Department of Agriculture (DoA), the Government of MP and the Dhanuka Agritech Group, which markets plant protection chemicals including eco-friendly products. The partnership was intended to foster increased productivity on farms and improve the standards of living, of farmers, providing services like soil testing, training programmes, farmers' visits for exposure to new technology, demonstrations, promotion of organic farming, cyber *dhabas* (countryside/highway eateries in India serving local ethnic food), exhibitions and market linkages for agricultural produce. Outstanding farmers received awards, and films were shown on success stories in farming. Moreover, encouragement was given to self-help groups and cooperatives, at the same time as infrastructure development was promoted. The services also included agro-climatic research and extension planning, production of seeds of high quality, and conduction of participatory processes in all these activities.

Under the PPP Memorandum of Understanding (MoU), the DoA handed over the soil testing laboratory to the Dhanuka Group for a period of two years and supplied all the chemicals needed for analysis of soil samples, free of charge. It withdrew its entire staff from the lab which was later managed and maintained by the private sector partner (Dhanuka) at its own expense. The soil samples from various stakeholders were sent to this lab for analysis and reports were sent back to the farmers by respective channels, i.e. DoA's Senior Agricultural Development Officers (SADOs), and Dhanuka doctors. This was the most successful component of the PPP among all the 18 activities under the MoU remit. The other activities carried out included farmer training, farmer study tours, field demonstrations, exhibitions and farmer fortnights. Yet, other activities such as cyber *dhabas*, supply of inputs, joint accounts, linkages for marketing of agricultural produce, facilitating access to institutional credit, awards for successful farmers, infrastructure development, strategic research and extension plans, and promotion of organic farming, did not really take off under the PPP arrangement. Some of the reasons identified were: lack of orientation for PPP among employees of various agencies involved, lack of clarity of roles, excessive commercial orientation of private companies and lack of their regulation by the state agency, frequent transfers of private and public agency employees, lack of focus on the subject of PPP by the DoA, and lack of participatory monitoring and evaluation (Chandra Shekara, Balasubramani and Charyulu, 2006).

Organic production as PPP

In another PPP project, organic cultivation of a medicinal plant, *Picrorhiza kurrooa* (Kutki), was attempted at Ghees village in Chamoli district, Uttarakhand, in collaboration with the High Altitude Plant Physiology Research Centre (HAPPRC) and Dhawan International, Delhi (an exporter). HAPPRC has been working on various aspects of high altitude medicinal plant species for the past two decades. The main objective of HAPPRC in initiating the scheme was to transfer useful technologies for commercial purposes. HAPPRC provided technology and training to farmers in combination with a buy-back agreement with Dhawan International, an exporter. This collaboration is of mutual advantage to the three parties involved because:

- ▶ Dhawan International benefits from assured access to a large quantity of high quality material;
- ▶ the farmers have an assured market for their product, receiving a good price;
- ▶ HAPPRC has seen its technology being used for the benefit of the farmers, which is the main objective of the Institute (Nautiyal and Nautiyal, 2004).

In Uttarakhand again, Kohinoor Food Ltd (KFL), formerly known as Satnam Overseas Limited – one of India's leading companies in the organized marketing of rice including Basmati rice – attempted a PPP in organic basmati rice. It holds a leading position in the branded Basmati rice business in India with about 38 percent market share. To increase its supplies, KFL tried to identify farmers for the organic programme and to this end approached various state agencies such as the State Agricultural University, the Rice Research Station and the Seed Development Corporation. They also approached some farmers' groups and, in 2004, after some false starts, KFL made contact with a Basmati farmers' federation in Dehradun district. This federation was organized by the Uttarakhand Organic Commodity Board (UOCB), a state government agency that had been set up in 2003 to promote organic farming and allied sectors throughout the state. UOCB took responsibility for the internal control system and organic certification which enabled KFL to avoid the pre-operational work of motivating the farmers to adopt organic cultivation. Since the majority of the farmers in Uttarakhand have small holdings, one federation was not sufficient for KFL's requirements. KFL and the first farmer federation therefore identified seven other UOCB promoted farmer federations; a total of eight federations – four each in Dehradun and Udham Singh Nagar districts – were organized to participate in the programmes. Formal contracts between each federation and KFL were signed with UOCB as organic certification service provider and mediator. The technical support to farmers was provided by KFL. The farmer federations procure paddy from farmers and pay individual farmers, because they have a *mandi* (agricultural wholesale market) license, pay *mandi* charges and receive payments and service charges (2.5 percent) from KFL (Singh, 2009).

Compared with the *mandi* system, the KFL farmer realized approximately Rs. 235 per metric tonne more (one US\$ is equal to 50 Indian rupees). The organic yield was higher, the cost of production was lower and the price was higher than that of conventional Basmati rice. KFL also saved Rs. 245 per metric tonne from this, a quarter of which was spent on extension support to farmers. A subsidy of Rs. 250 per farmer or about Rs. 10 per kg is provided by UOCB as part of its support for organic certification. The farmers are also able to make some more money by weighing and bagging their produce themselves. They are paid for the work, whereas previously they had to do this for nothing in the *mandi* during peak times. Moreover, the 1.5 percent commission paid to the federation not only covers its operation costs but also serves as a cash reserve which can be used to make emergency cash loans to members. Starting with only 190 farmers and 119 acres under the organic project in 2005, the project had expanded to cover 864 farmers and 748 acres by 2007. Because the Organic Basmati Export Program of the UOCB is a government supported project, it has placed great emphasis on the inclusion of small and marginal farmers. This meant that a large number of farmers had to be covered to produce sufficient quantities of paddy.

However, it was very difficult to ensure that all small farmers adhered to organic practices. Every year, UOCB had to expel about 5 percent of the farmers from the programmes because they deviated from organic practices. KFL was training the farmers in paddy grading and it was hoped that within a year or two it would be possible to start grade-based pricing. Over time, the confidence of the farmers in KFL, and in organic farming in general, had increased. (Singh, 2009).

Linking farmers with retail chains in PPPs

A more recent experience of tomato CF in Uttarakhand highlights the role of an NGO – the Himalayan Action Research Centre (HARC) – and farmers' organizations in helping farmers to overcome the marketing problems associated with perishable produce by building a successful supply chain: linking small-scale farmers producing tomatoes with Metro Market place (Delhi). In 2001, the farmers were organized into six federations across 80 villages, which supply off-season vegetables (mainly tomatoes) to Mother Dairy through a purchase agreement with the federations. Mother Dairy, an enterprise of the National Dairy Development Board – an autonomous body of the Government of India established in 1965 to promote dairy development – was set up to distribute liquid milk in major cities of India. It has run hundreds of fruit and vegetable retail outlets in Delhi since the early 1990s with a fruit and vegetable project based in Delhi.

Tomatoes were brought by farmers to designated collection centres, which were managed by an employee/volunteer of the federation. The farmers graded tomatoes at the collection centre according to the quality parameters provided by Mother Dairy, which were monitored by a federation representative.

After grading, tomatoes were packed in plastic crates provided by Mother Dairy; this reduced losses during transportation and the cost of packaging by 70 percent. Although the farmers' federations and Mother Dairy had a legal relationship, the individual farmers were not contractually obliged to sell to Mother Dairy. The farmers were selling only about 30 percent of their tomatoes to Mother Dairy in 2006; the rest were sold to private dealers. Similarly, Mother Dairy was not obliged to buy a fixed quantity of tomatoes from the farmers. The quantity to be purchased was determined every year through negotiations between the federations and Mother Dairy.

In order to supply to Mother Dairy a farmer must be a member of a farmers' federation. The farmers had no difficulty in forming farmers' federations, but were not compliant to the grading standards. Many farmers (especially in the large federations) tried to cheat the system by including poor quality tomatoes. Because Mother Dairy itself was conducting a sample-based quality check at its facility, this sometimes led to the rejection of a whole truckload on account of the actions of just a few farmers.

The federations provided the following services to their member farmers:

1. Preparation of an annual production plan and negotiation of supply targets with Mother Dairy.
2. Organization of the procurement of vegetables at their collection centres.
3. Monitoring the grading of produce before it is packed at the collection centres.
4. Acting as a mediator between farmers and Mother Dairy.
5. Providing packaging crates on rent.
6. Selling agri-inputs to members.
7. Receiving payment from Mother Dairy and distributing the same to farmers.
8. Arranging for farmers' training.
9. Arranging to sell farmers' surplus vegetable production to private dealers when Mother Dairy was unable to purchase farmers' produce during the peak season.
10. Charging Rs. 2 for every 10 kilograms of produce sold through them for the relief fund to assist growers during natural calamities.

The federations received income from the following activities:

1. A one-time membership fee of Rs. 250.
2. A 1.75 percent transaction fee from Mother Dairy.
3. A service fee (5 percent of transaction) charged to members for bulk purchases of seeds, fertilizers, pesticides and other inputs from agri-input companies.
4. Renting of plastic crates at Re. 1 per crate per day to members and Rs. 2 for non-members.

The farmers supplying to Mother Dairy had larger landholdings (3.25 acres) than the non-Mother Dairy farmers (2.8 acres). The farmers supplying to Mother Dairy

also had higher yields (2.5 times higher), higher costs of cultivation (resulting from increased use of pesticides – almost double – to meet quality standards), but also enjoyed much lower marketing costs and lower prices for the produce, resulting in higher net returns per kilogram and per acre compared with those in private channels. The difference in profitability was not due to a difference in the price given to farmers by Mother Dairy and private dealers: it was primarily due to the lower costs of marketing (Rs. 0.14/kg) incurred by farmers supplying to Mother Dairy, compared with those of non-Mother Dairy farmers (Rs. 1.83/kg). The difference in the marketing costs was largely due to high transportation costs and commissions paid by the non-Mother Dairy farmers.

Following Mother Dairy, private dealers also started to provide farmers with plastic crates. But, rejection rates for some federations were as high as 50–60 percent in 2006 because of the small sizes of the fruits harvested, pest infection, and the excessive distance of transporting produce to Delhi, where final quality checks took place. Besides, deliberately poor grading by farmers and lack of supervision led to high rejections, although it was also noted that rejections were sometimes deliberate by the Mother Dairy, to avoid oversupply (Alam and Verma, 2007).

PPPs in the non-farm sector

In the non-crop sector or allied sector category, Hindustan Unilever Ltd (HUL) launched the Vindhya Valley project in partnership with the Madhya Pradesh government-owned Khadi Gram Udyog Board (Handspun Cotton Rural Industry Board). The idea was to help increase the income of farmers and small-town entrepreneurs engaged in agro-processing and cottage industries in the state, by providing support infrastructure for marketing and distribution of their products. HUL together with 'Vindhya Valley' – an umbrella brand for food and other products made by the Development of Women and Children in Rural Areas (DWCRA) groups – has support software for their marketing, manufacturing and distribution through their own outlets. Marketing of the products is effected entirely through individuals and private firms. The products include spices, pickles, papads, honey, *agarbattis* (incense sticks), herbal tea and shampoo, *murabbas* (sweetened fruit pulps), *masalas* (cooking powders) and *kasoori methi* (fenugreek). The product upgrading was expected to generate higher sales and higher returns for rural artisan communities, many of whom were women. To impact even larger groups, HUL was helping the government set up permanent handicraft fairs across top cities and towns in the state. The government already operated about 15 000 'fair price' shops, although there were still villages which did not have access to such shops. Those villages had been identified and fair price shops were to be established, each with a cluster of villages as a catchment area. They were to be run by self-help groups and cooperatives.

3.4 The potential of and issues with PPPs

PPPs can be used in situations of partial or complete market failure. At a broader level of rural livelihood improvement, it can be applied in cases of:

- ▶ diversification of livelihoods/income sources;
- ▶ information provision about new opportunities and networking;
- ▶ savings and reasonably-priced production and consumption credit/loans (Krishna, 2003).

This can be made possible through the combined strengths of different partners who bring different resources together – such as technology, marketing, finance or organizational efficiency – in the local production and market system. The HUL–MP case just described falls into this category.

In agriculture *per se*, arrangements designed to reduce or share production and market risk (including insurance) can be designed under PPPs involving technology and extension, CF, value addition, and market development. The CF in Thailand and in the Indian Punjab are examples of this kind of arrangement.

In infrastructure creation, bridge financing for irrigation development and agri-infrastructure development, development of drylands, agricultural research capability, farm machinery centres, and provision and access of Information and Communication Technology (ICT) are potential areas for PPPs (Birner *et al.*, 2005). Even organic farming and organic inputs such as biofertilisers and biopesticides, the promotion of organic produce markets and certification systems, and setting up new value addition facilities (especially secondary products), can be achieved through PPPs. Product quality improvements, which are key to national and global marketing, need such partnerships. Promotion of farmers' groups and associations, or even producer companies for better market orientation and viability, is in the domain of organizational and institutional PPPs. Farming systems innovations, natural resource conservation, augmentation and management, and market linkages for growers and their groups, are other high potential areas for PPPs (Sharma, 2002).

3.4.1 Major issues in managing PPPs

PPPs are easy to get into but difficult to manage successfully. Accountability and transparency – mainly of private agencies and NGOs – in the actual operations of the PPP projects and activities is a must; if these are not ensured to begin with in the initial design of projects and partnerships, sub-optimal results may be the consequence. Generally there is a fear of lost remit, or autonomy, or control over resources, in the minds of mainly state or NGO personnel involved in PPPs. This can be hard to deal with if partnerships are not open and shared widely. Sustainability of partnership and management of conflicts is key to successful PPPs (Bovaird, 2004).

Excessive commercialization and profit orientation – which can be against the public interest – is another major issue when there is a private commercial entity involved in such partnerships. This may undermine the larger goals of the project and the very sustainability of the activity. Conflict over the extension and types of technologies used, especially when NGOs with ideologies and values are involved, is another complex issue to resolve (Hilhorst *et al.*, 2007). There may be strong and differing opinions between different partners as regards a specific technology or resource, resulting from the different orientations of the agencies. Lack of trust and/or the involvement of various partners in terms of intentions, goals and credibility of achievements in the context of missing social capital can be quite problematic for the sustainability of the arrangement (Hilhorst *et al.*, 2007). Therefore, it is important to choose like-minded partners. Differing incentives structures between public and private systems are also problematic, because they may drive their personnel to perform or not to perform. If these are not aligned, work cultures are not synchronized and efficiency suffers. Furthermore, the inability to overcome negative perceptions of each other can be a permanent stumbling block.

Hidden costs of partnership that are not accounted for and power imbalances between and across partners, as well as procedural complications, may undermine the spirit of partnership (Brinkerhoff and Brinkerhoff, 2004). Lack of appropriate mapping of proprietary assets and responsibilities between or across sectors or partners for effective functioning can be troublesome for the partnership (Mruthyunjaya, 2007). Limited use of innovative and creative organizations and mechanisms by different partners is another problem that restricts creativity, which is key to partnerships and their successful functioning (Shakya, 2005). Above all, it is social capital – the foundation for successful partnerships – that is found lacking or weak in many partnership contexts.

3.5 Strategies and enabling environments for PPPs

The facilitating environment for PPPs includes: changes in legal structures and mechanisms, setting up of a robust legal and regulatory mechanism, and overall macroeconomic and macro-political stability (Phansalkar, 2005). A sound policy environment for agricultural development is basic to any effective partnership. The role of public policy in PPPs includes: policy framework design and analysis; policy redirection towards creating the enabling environment; quality control; regulation of actors; encouraging/facilitating institutional innovations. However, for successful PPPs it is important to have commonality in goals, complementarity in strengths, and sharing of responsibility and costs, in addition to appropriate mechanisms for conflict resolution (Katyal, 2005).

The major success factors that act as preconditions are: political will to promote PPPs, clarity in institutional roles, adequate capacity of partners for the specified

role, and an effective market for products of PPPs. The operational requirements of successful PPPs include selection of partners, their monitoring, evaluation and certification, and sharing of the costs and benefits of the services among them, in addition to the content and target of the service (Rivera *et al.*, 2000).

Furthermore, for the partnership to result in tangible benefits right up to the farmer level, it is important to address the entire value chain of a product and not just specific bottlenecks. There is also a need to frame broad guidelines for the public sector to facilitate engagement with the private sector, facilitate the secondment of staff across sectors of the partnership, and devolve powers in national research and policy systems, for efficient initiation and disposal of various projects and interventions under PPP mode (Mruthyunjaya, 2007).

3.6 Conclusions

The above analysis and discussion of the PPP experiences in Thailand and India shows that it is important for the state and its agencies to facilitate the entry and operations of private players in agricultural markets, and protect the farmer interest, so that the projects are both efficient and fair for both parties. The state need not directly intervene in such situations, but rather set the framework within which public agencies and private entities work together with other players, performing their respective roles. State agencies can be useful to introduce private players to project areas in the rural setting, given that generally there is a lack of trust among farmers concerning agribusiness firms. The state should set the policy agenda and governance mechanisms to ensure that the interests of the primary producer are not compromised.

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CHAPTER 4

Export support for El Salvador's SMEs: Fusing technical capabilities with collective efficiency

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4.1 Introduction

El Salvador is a developing country with a population of 6.8 million people in an area of 21 040 km², the most densely populated of Central America. According to the Ministry of Economy (MINEC, 2009), El Salvador has a Gross Domestic Product (GDP) of US\$22 114 million and a *per capita* GDP of US\$3 916. It is therefore considered among the 10 poorest countries of Latin America. The largest component of GDP is the service sector at 61 percent, followed by the industrial sector at 30 percent. Unlike the rest of the Central American countries, the agricultural sector represents only 12.5 percent of GDP. El Salvador's main export markets are the USA (54 percent in 1997 and 48 percent in 2008) and Central America (22 percent in 1997 and 36 percent in 2008) (MINEC, 2009).

Inflation has been low compared with other Central American countries during the past five years, staying below 5 percent until 2007 and increasing to 5.5 percent in 2008 (MINEC, 2009). For the period 2008–2009, El Salvador ranks at position 79 among 134 countries in the Global Competitiveness Index. El Salvador ranks lower on innovation (118), higher education and work force training (95) and technology (90); at the same time it ranks higher on infrastructure (56) efficiency of its job market (57) and market efficiency (59).

Since the end of the civil war in 1992, El Salvador has been taking steps to diversify its economy and reduce dependence on coffee exports. Integration with the global economy has accelerated since 2001, when the US dollar was adopted as the legal tender alongside the Colon. In 2004, El Salvador and four other Central American countries signed the Central American Free Trade Agreement with the United States

(CAFTA). Free trade agreements have also followed with Mexico, Chile, Panama and the Dominican Republic (MINEC, 2009).

Governments have designed export promotion programmes to help small and medium-sized enterprises (SMEs) overcome obstacles when the opportunity to expand internationally presents itself (Spence, 2001). The USA has adopted the Aid for Trade (AFT) initiative promoted by the World Trade Organization (WTO) to help Central American countries take advantage of CAFTA. The programme involves providing seed money to strengthen productive supply capacity, institutions and trade infrastructure (De Lombaerde and Puri, 2009). The WTO mandate also includes provisions to assess the effectiveness of such programmes.

In 2003 the United States Agency for International Development (USAID) established a programme for promoting internationalization of Salvadorian SMEs, with emphasis on helping them overcome non-tariff barriers. This way, SMEs would take full advantage of CAFTA to export to the USA – where approximately 2.3 million Salvadorian immigrants live – and the rest of Central America.

The USAID Export Promotion Program (hereafter referred to as the Program) designed a strategy based on the experience of similar programmes established around the world during the past 20 years. The Program combined the approach of strengthening technical capabilities (Fischer and Reuber, 2003; Ruzzier and Antoncic, 2007; Owusu-Frimpong and Mmieh, 2007) with the collective efficiency approach proposed by Caniëls and Romijn (2003) among others.

The objective of this study was to evaluate empirically the effectiveness of the Program for SMEs in El Salvador, which ran in two phases: phase I from July 2003 to March 2006, and phase II from April 2006 to June 2009.

4.2 A review of the literature and hypotheses on SME behaviour

4.2.1 Characterization of SMEs

Enterprises have been classified according to their main business activities – manufacturing or services – because these activities may impact upon the response obtained from the market (Erramili, 1991).

Erramili and Rao (1990) have differentiated between 'hard' service firms – such as car rental firms, restaurants and health care – where consumption and production need to happen almost simultaneously, and 'soft' services firms – e.g. consultants and software – where consumption and production can be decoupled.

Whereas the internationalization behaviour of hard service firms is similar to that of manufacturers, soft service firms cannot use export as an internationalization strategy and need to rely more on market entry modes, such as contractual entry, licensing, franchising or foreign direct investment (Spence, 2001).

The size of enterprises (micro, small, intermediate and large) has been defined loosely around the world depending on the country and the size of its economy. The most popular descriptors used to categorize enterprises by size have been the number of employees and total annual sales (Aaby and Slater, 1989; Miesenbock, 1990; Kim *et al.*, 1997; Spence, 2001; Calderón *et al.*, 2005; Fischer and Reuber, 2003; Owusu-Frimpong and Mmieh, 2007). In Europe (Calderón *et al.* 2005, Spence, 2001; Ruzzier and Antoncic, 2007), Africa (Owusu-Frimpong and Mmieh, 2007) and Latin America (De Lombaerde, 2009), microenterprises have been defined as having less than 10 employees, small enterprises as having between 11 and 50, medium-sized as having between 50 and 100 (Calderón *et al.* 2005, Spence, 2001) or up to 250 (Ruzzier and Antoncic, 2007), and large enterprises as having more than 250 employees. By contrast, in Korea and the USA a small enterprise is defined as having less than 100 employees, while a medium-sized enterprise has less than 500 employees (Kim *et al.* 1997).

Classification of enterprises by total annual sales is even more varied between countries. Spence (2001) defines a small enterprise in the United Kingdom as having total annual sales of less than US\$1.6 million (about £1 000 000), while Owusu-Frimpong and Mmieh (2007) define Ghana's small enterprises as those earning less than US\$0.1 million per year.

Czinkota and Johnson (1985), Reid (1987), and Wolff and Pett (2000) suggest that the size of a firm does not make any difference in terms of its exporting activities, needs or attitudes. By contrast, Calderón *et al.* (2005) suggest firms assign importance to obstacles for internationalization depending on their size, defined by their number of employees.

4.2.2 Obstacles to SMEs' internationalization

A firm can encounter impediments to exporting at any stage, from the pre-export stages to the more advanced level of international involvement (Owusu-Frimpong and Mmieh, 2007). SMEs seeking to penetrate foreign markets often encounter obstacles that hinder their international expansion, such as lack of market knowledge, non-tariff barriers, competition and instability in the region (Calderón *et al.*, 2005).

On the supply side, rigidities in the product process, lack of technology, research and development, and lack of know-how have been cited by SMEs in the Dominican Republic as critical constraints (Kaplinsky, 1993). Other impediments to exporting commonly cited by Latin American SMEs include finance (shortage of working

capital), operational/logistical problems (excessive documentation requirements), communication problems, and difficult foreign market regulations (da Silva and Da Rocha, 2001).

In 2006, 58 percent of refusals of Salvadorian products by the USA's Food and Drug Administration (FDA) were due to labelling errors (MINEC, 2009). Refusals cause losses to exporters and increase the frequency of inspections on Salvadorian products at USA ports. Typical labelling errors included lack of a nutrition facts panel or a format not conforming to the Nutrition Labeling and Education Act (NLEA) 2006 (which made mandatory the reporting of trans fats), and the detection of ingredients that were not listed on label. In 2006, the Program joined the Ministry of Economy (MINEC), the Economic and Social Development Foundation of El Salvador (FUSADES), the Foundation for the Promotion of Competitiveness for Micro and Small Enterprises (CENTROPYME), the National Council on Science and Technology (CONACYT), and the Export Promotion Agency of El Salvador (EXPORTA), to form a Salvadorian Food Labelling Committee. The objective was to significantly reduce FDA refusals of Salvadorian products through information and training.

Calderón *et al.* (2005) affirm that companies with less than 50 employees give more importance to logistics and transport problems, market knowledge, sales promotion and financial problems, whereas businesses with more than 50 employees give more importance to problems involving human and technological resources, and difficulties arising from foreign investment.

This suggests that, to be successful, export promotion programmes for SMEs must address all these problems at once. However, allocation of resources should be done considering the size and degree of internationalization of the firm.

SMEs are frequently incapable of solving these problems on their own. In such cases, public (Calderón *et al.* 2005) and private (Kim *et al.*, 1997) organisms generate export promotion policies – such as provision of market knowledge, assistance via trade fairs (Spence, 2001), searching for distributors, export insurances and training – with the aim of collaborating in the process of SMEs' internationalization.

4.2.3 Strengthening collective efficiency vs. technological capabilities

The technological capability (TC) literature puts SME intra-firm knowledge accumulation at centre stage. The term TC was coined in the early 1980s by researchers probing intra-firm technological dynamics in developing countries, where firms typically operate far from the world's technological frontier (Caniëls and Romijn, 2003).

The learning process causes firms to accumulate so-called 'capabilities', bundles of related routines governing the exploitation of their resources. Capabilities are resident in a particular function (Javidan, 1998). Examples are marketing, production, and human resource management capabilities. Capabilities that are cross-functionally integrated and coordinated are denoted as 'competencies', which express what a firm is able to do well (Prahalad and Hamel, 1990). A subset of such competencies is the basis for a firm's unique competitive advantage at any given point in time. These distinctive competencies are called 'core competencies' (Caniëls and Romijn, 2003).

'How to' skills are the necessary starting point for the ultimate development of dynamic organizational–managerial capabilities. The TC literature in less developed countries sees the individual firm as the prime actor in the generation of knowledge (Caniëls and Romijn, 2003). However, collective support is useful when complex technologies are involved or when private mechanisms are weak. The promotion of healthy clusters of SMEs, and SMEs clustered with large firms, is likely to be very helpful in building marketing and technological capabilities (Lall, 2000).

Morgan (1997) used the notion of the 'learning region', in which institutional actors are seen to play a central role in promoting and facilitating regional innovative behaviour. Isaksen (2001), a proponent of the Region Innovation System (RIS), observes that the innovation performance of a region depends to a large extent on how firms utilize the experience and knowledge of other firms, research organizations and government sector agencies in innovation processes, and how in turn they blend this with the firm's internal capabilities.

Again, an effective national export promotion programme would have to combine both approaches: developing SMEs' internal technical capabilities through training and 'learning by doing', and their external collective efficiency through clustering.

4.2.4 Human capital and the internationalization of SMEs

Human capital represents an investment in education and skills and is created when a person's skills and capabilities are improved (Ruzzier and Antoncic, 2007). Once engaged in the internationalization process, such individuals should have a superior ability to exploit opportunities (Davidsson and Honig, 2003). Ruzzier and Antoncic (2007) identify four dimensions in the human capital of an SME's entrepreneur(s) that will help them to relate positively to internationalization: international business skills, international orientation, perception of environmental risk and management know-how. By travelling abroad, entrepreneurs are more likely to learn about foreign business practices, meet prospective clients, and identify market opportunities (Leonidou *et al.*, 1998).

Among the range of export promotion programmes offered, those most favoured by exporters are programmes which provide experiential knowledge about

foreign countries (Reid, 1980). Trade missions are one such type, with the aim of encouraging SMEs to enter or expand into foreign countries when their experience with the market is still limited. A second popular programme is trade shows or fairs. The objective of trade shows is to further SMEs' expansion into foreign markets once the firm is already established in targeted markets (Seringhaus and Rosson, 1990). Both the acquisition of market knowledge and the building of networks are important activities in SMEs' overseas expansion (Coviello and Munro, 1997). Kedia and Chhokar (1986) have demonstrated that lack of market knowledge was the most significant inhibitor to export expansion among SMEs.

4.2.5 The role of e-business in SMEs' internationalization

While over 60 percent of SMEs in the USA and Canada have adopted some form of business through a computer mediated network such as the Internet, other countries have significantly lower adoption rates. In Asia and Latin America, where as many as 99 percent of all firms are classified as SMEs, low adoption rates may be an impediment to increased international trade (Johnston and Wright, 2004).

Web sites, e-mail contact and low cost telephone calls with customers can all contribute to improved customer service and an expanded customer base (Matthews, 2007). Web sites are an excellent communications tool which can reach new international audiences (Raymond *et al.*, 2005).

Looking at the individual enterprise, there is some empirical evidence to suggest that SMEs employing Information and Communication Technologies (ICT) enjoy enhanced profitability and outreach and thus can better position themselves for more wholesale expansion (Matthews, 2007). Firms using e-mail for customer communication, for instance, can grow 3.4 percent faster in terms of sales than those that do not (Qiang *et al.*, 2006).

Matthews (2007) reports Venezuelan SMEs' greatest priority after Internet access was to build a web presence, with 58 percent of SMEs citing a web site as a key requirement. E-commerce, marketing and networking were cited as motivating factors.

Mexican SMEs cited online ordering/quoting, order fulfillment and tracking, and customer service and support, as the most frequently adopted networked processes. The least adopted process was online payment (Johnston and Wright, 2004).

4.2.6 Evaluation of export promotion programmes

Export promotion policies are government financed. Consequently, in order to assess the economic efficiency of these programmes, a periodic evaluation of their results is necessary (Calderón *et al.* 2005). The International Trade Centre (ITC, 2002)

points out that the performance of promotion organisms should be measured quantitatively and evaluated to ensure their effectiveness and efficiency as part of a constant process of self-improvement.

Export performance evaluation includes qualitative and quantitative measures in order to address the shortcomings of both approaches (Spence, 2001). Research on evaluation of export promotion covers two areas: first, a global evaluation with quantitative results, and second, evaluation at a business level using quantitative and qualitative indicators.

The most common measures of export performance at the global level used in academic studies have been exports as a proportion of sales, export profitability and growth in export sales (Spence, 2001). Qualitative studies at the business level rely on surveying export programme beneficiaries periodically (Kim *et al.*, 1997; Spence, 2001; Calderón *et al.*, 2005; Lu and Beamish, 2006).

For the USAID El Salvador Export Promotion Program evaluation, both quantitative and qualitative measures were gathered at the national and business level. The objective of this study was to document the effectiveness of the Program in promoting Salvadorian SMEs' exports along with its collateral benefits (job creation, cluster organization, etc). A follow-up academic study on relationships between SME descriptors (size, age, and degree of internationalization) and their achievements (export sales, markets reached, etc) is recommended.

The following hypotheses were formulated for this study:

- H1: The Programme is able to promote a significant increase in Salvadorian SMEs' exports to the USA and Central America during the period 2003–2009 through a combination of technical competence and collective efficiency.
- H2: The Programme is able to collaborate with other national labelling committee members to promote a significant reduction in FDA product refusals due to bad labelling of Salvadorian SMEs in the period 2003–2009.

4.3 The Program's methods of promoting SME internationalization

4.3.1 Structure of the Program

The USAID Program for Promotion of Exports in El Salvador ran in two phases: phase I (officially named USAID/EXPRO) from July 2003 to March 2006 and phase II (officially named USAID Export Promotion Program) from April 2006 to June 2009.

Phase I had a US\$10 million budget while phase II was implemented with US\$9 million, totalling US\$19 million for the whole Program.

Both phases of the Program contained the following components: SME strengthening, external collaborations and promotions, and technical and commercial assistance. However, phase I technical assistance emphasized strengthening internal aspects of enterprises while phase II put more emphasis on export logistics.

All the support awarded to SMEs was in the guise of cofinancing. Either the SME itself or public and private institutions provided 50 percent of funds. In addition, SMEs had access to discounts negotiated by the Program on product design, improvement and analytical services.

The Web site <http://www.usaidexpro.org> was established to help promote and explain the services the Program offered to Salvadorian SMEs. The information and documentation necessary for an SME to apply for Program services could be downloaded from the web site.

4.3.2 SMEs' access to the Program

The Program used a mixture of the USA and European definitions of 'SME' (Calderón *et al.*, 2005; De Lombaerde and Puri, 2009). In order to access the Program an SME had to meet the following three requirements:

- ▶ less than 100 permanent employees;
- ▶ total annual sales between US\$70 000 and US\$3 000 000;
- ▶ has a product with export potential.

For reporting results, the programme categorized SMEs according to the number of employees: less than 5, 6–25, 26–50 and 51–100.

An SME aspiring to access the Program was asked to submit annual audited financial statements, a copy of its business registration payment, and an application form. The application form asked for SME information on: years of operation, current product description (number, types, markets, price, annual sales, exported or not), description of facilities and administrative system, and a survey on export training and experience.

A 0–100 point scale was used to determine the type of assistance an SME was eligible for through the Program (Table 4.1). A maximum of 20 points was assigned for financial stability, 30 for market and product potential, 30 for production capabilities and 20 for export attitude and experience. An SME was then assigned a track allowing it to access all approved components during one or both phases of the Program.

TABLE 4.1

Categorization of SMEs for access to the Program's export promotion services

SME Level	Grade	Qualifying assistance
Entry	Less than 50	Training only
Basic	50–65	Technical assistance and commercial promotion as a guided visit
Intermediate	66–80	Technical assistance and commercial promotion
Advanced	More than 80	Access to all services

4.3.3 Training component

During the second semester of 2004 the Program partnered with Zamorano University (EAP – Escuela Agrícola Panamericana), located in Honduras, to implement the training component during the rest of phase I and all of phase II. EAP's Food Science and Agribusiness departments defined training courses based on the University's philosophy of learning by doing. A portfolio including a training workshop (40 hours), short course (24 hours) and a conference (8 hours) was designed and imparted by the EAP faculty according to needs identified by SMEs, The Ministry of Economy (MINEC), the Salvadorian Institute of Professional Formation (INSAFORP) and the Salvadorian Foundation for Development (FUSADES). These institutions surveyed SMEs in different instances to assess training needs.

Training courses and short conferences were imparted in San Salvador to between 20 and 40 attendees per session, while product innovation workshops were given at the EAP campus in Zamorano, Honduras, to an average of 25 attendees. It was encouraged that half of the training beneficiaries should be women.

Counterpart financing for attendees from qualifying SMEs was provided by INSAFORP (US\$125 per attendee). Attendees did not pay for access to training courses.

In addition to SMEs' employees, government officials and private consulting agents were given access to training courses. This was part of the strategy to transfer Program capabilities both to the public and private sectors by the end of its run.

In phase I, 37 courses were imparted, 14 of which were given by EAP starting in 2004. Courses on Food Safety (ISO 22000 and prerequisite programmes) and workshops on food product innovation comprised the training programme. Emphasis was made on training organic and specialty coffee SME clusters with a potential to export.

TABLE 4.2
Training calendar for the phase II of Export Promotion Programme

Period	Courses	Workshops	Conferences
April 2006 – March 2007	13 (40)	2 (25)	5 (50)
April 2007 – March 2008	18 (40)	2 (25)	9 (50)
April 2008 – June 2009	16 (40)	2 (25)	6 (50)

() Scheduled number of attendee

Table 4.2 describes the training component of phase II. The EAP Food Science faculty covered training on food safety systems, product innovation, USA labelling legislation, packaging, statistical production control and quality control. The Agribusiness faculty covered market surveys, entrepreneurship, export logistics, accounting, development of business plans, export management, new market tendencies, free trade agreements and operations administration.

4.3.4 Financial assistance component

Financial assistance was awarded to SMEs through two methods: fast-track small grants of up to US\$5 000, and US\$25 000 FONDEPRO grants (Productive Development Fund). Small grants could also be accessed to finance attendance at trade missions and fairs (Table 4.3), obtain technical assistance (e.g. consulting and analytical services) and product improvement. FONDEPRO grants were processed by MINEC and required an investment plan. In both cases, SMEs had to match funds awarded by the Program. Funds were not to be used for covering operational expenses.

EAP offered 20–40 percent discounts on product development and improvement, shelf stability and nutritional labelling analyses.

4.3.5 Cluster export support

The collective efficiency approach (Caniels and Romijn, 2003) was applied to develop clusters of SMEs and help them export. Eight clusters were organized by the Program. They received assistance in becoming legally constituted. Three clusters of gourmet food processors were organized to export their products under two brands (Cocina Maya and Latin Foods) through wholesalers in the USA (Whole Foods, Bestway, etc). An e-commerce cluster (Suprema LLC), a handcrafts cluster (Deco Mayan) and three art and culture clusters (Export Arte, Expocultura and Visual Arts TC) were also organized. These clusters benefited from supporting providers, who gave

TABLE 4.3
Promotion activities financially supported by the Program during phase II

Promotion activity	Region	2006	2007	2008
Trade fairs	Asia	0	1	5
	Central America	8	18	26
	USA	9	28	51
	Europe	3	6	8
Commercial missions	Central America	8	13	25
	USA	7	20	22
	South America	0	0	11
	Europe	1	3	4
Inbound buyer missions	El Salvador	2	11	3

services for product and package design, marketing, food safety and export logistics. The clusters are fully owned by their participant SMEs.

Additionally, seven existing clusters were financially and logistically supported by the Program to increase exports: ADIES furniture, Exportsalud Healthcare, Paax Muul acoustic guitar artisans, Maki footwear, TI Hub translation services, Cy-Soft, and Exsource software. In addition, the Program provided support for e-commerce to these and other clusters by creating the <http://www.cuscatrading.com> Web site and by linking it with the <http://www.amazon.com> Web site. The <http://www.paaxmuul.com> web site for the guitar artisan cluster is under construction.

4.3.6 Assessment of export performance

Phase I objectives included training 1 000 SME employees and promoting sales of US\$40 million. Phase II objectives included training 1 500 SME employees, government officials and private consultants, promoting domestic and export sales increases of US\$35 million from 350 SMEs and creating 7 100 new jobs.

The Program significantly improved monitoring and information acquisition from phase I to phase II, starting on 2006.

Annual surveys were conducted on SMEs starting in 2006 to assess phase I and phase II domestic and export performance. All 847 SMEs trained in phase I and 1 112 SMEs trained on phase II were contacted and an average of 87 percent responded to the

surveys. Domestic and export sales, number of jobs created and number of people trained were reported up to December 2008. Data for the last semester of the project were not ready for publication at the moment of writing this chapter.

Official exports and FDA refusals data were obtained from MINEC for the period 2004–2009. Total export sales by food sector and FDA refusals due to labelling errors were reported.

4.4 Results and discussion

Official statistics (MINEC, 2009) and the Program's statistics coincide in reporting that from 2004 to 2008, El Salvador has been able to take advantage of CAFTA, and other free trade agreements signed afterwards.

Collateral benefits of export promotion programmes (MINEC's EXPORTA and USAID EXPRO) included increased exports to Europe and other markets (especially organic foods), increased domestic sales, development of clusters in food, furniture, software, and guitar manufacturing, and strengthening of institutions and consumer education on nutrition, arts, etc. An effective transfer of capabilities from temporal export promotion programmes to permanent public and private programmes and institutions is key to making internationalization sustainable (Caniëls and Romijn, 2003).

4.4.1 Training

By December 2008, the Program was able to fulfil its goal of training 2 500 people (1 000 in phase I and 1 500 in phase II) from SMEs, government institutions, non-governmental organizations (NGOs) and private consulting agencies (Table 4.4). Training courses and workshops were still imparted during the final semester of the Program (January–June 2009).

In phase I of the programme, 1 241 people from SMEs and from government and consulting agencies – 50 percent of them women – received theory and practical training on food safety (ISO 2200 and pre-requisite programmes) and product innovation (Table 4.3). Businesspersons from 847 SMEs comprised 80 percent of attendees.

In phase II, 1 904 people – 49 percent of them women – had been trained by December 2008. The emphasis of training in this phase was on export logistics – procedures, legislation and international quality standards. However, training on operations strengthening – administration, food safety standards and food product innovation – continued to be imparted. Businesspersons from 1 112 SMEs comprised 87 percent of attendees. The rest were government officials and consulting agents (Table 4.4).

TABLE 4.4
People trained during phases I and II

Phase	Businesspersons		Government officials		Consulting agents	
	Male	Female	Male	Female	Male	Female
July 2003 – March 2006	523	487	21	38	85	87
April 2006 – June 2006*	862	799	21	39	88	95
Total	1 385	1 286	42	77	173	182

*Data collected in December 2008

4.4.2 SMEs sales and exports

Agro-industrial total exports to the World and to the USA have more than doubled in the period 2003 to 2008 (Table 4.5). This suggests Salvadoran exporters have been able to take advantage of CAFTA, which took effect in 2004. It also suggests that new export capabilities helped exporters to expand to other markets besides the USA. Total exports continued to be driven by the textile industry, which has also experienced significant growth increase during this period.

Traditional products such as coffee and sugar continued to make up the majority of agro-industrial exports. However, exports of ethanol and glucose syrups significantly increased from 2003 to 2008, reaching US\$171 million in 2008 (MINEC, 2009). Exports to the USA of other non-traditional food products – organic foods, dairy, cocoa, chocolates and pickled foods – also significantly increased, especially after 2008 (Table 4.6). Organic coffee exports comprised 95 percent of organic food exports. The main market for organic coffee was Europe, but exports to the USA also significantly increased and are expected to continue growing in the coming years. Roasted organic sesame seeds also drove the increase of organic food exports to Europe and the USA.

TABLE 4.5
Value of El Salvador's total agro-industry exports, 2003–2008 (US\$ millions)

Market	2003	2004	2005	2006	2007	2008
World	271	308	403	440	522	628
USA	89	96	114	121	150	193

Source: MINEC, 2009.

TABLE 4.6

El Salvador exports of selected non-traditional foods to the USA, 2004–2008 (US\$ millions)

Product	2004	2005	2006	2007	2008
Organic foods	1.03	1.18	1.64	2.32	3.80
Dairy foods	0.24	0.23	0.72	0.98	0.93
Cocoa and chocolates	0.26	0.32	0.35	0.37	0.61
Pickled foods	0	0.38	0.24	0.50	0.40

Source: MINEC, 2009.

Dairy food exports to the USA quadrupled from 2004 to 2008 (Table 4.6). This suggests that Salvadoran processors benefited from the lifting of USA tariffs on imports of dairy foods in 2004, when CAFTA took effect. This is also a direct indication that Salvadoran dairy processors – 99 percent of them SMEs – were able to meet the FDA's food safety, labelling and nutritional requirements. Furthermore, between 2004 and 2008 El Salvador displaced Costa Rica as the second largest Central American dairy foods exporter to the USA, behind Nicaragua. Salvadoran exports of dairy foods to the USA decreased 7 percent from 2007 to 2008, possibly resulting from the economic crisis that deepened during the last semester of 2008.

The impact of the Program on the increase in SME total sales and total exports from 2004 to 2008 is presented in Tables 4.7 through 4.11. Trained and financially-assisted SMEs reported exports in phases I and II that surpassed the goals set by the Program (Table 4.7).

In phase I, all 400 financially-supported SMEs reported increases in total export sales. In phase II, 373 of 1 112 (34 percent) supported SMEs reported increased exports that met the goals of the Program six months before the end of its run. The proportion of SMEs that have translated training and financial support into exports is similar to other internationalization programmes (Kim *et al.*, 1997; Spence, 2001; Calderón *et al.*, 2005).

However, Czinkota and Johnson (1985) and Lu and Beamish (2006) warn that increases in total domestic and export sales do not always translate to increases in profits for SMEs. It is therefore recommended that the Program continues to monitor supported SMEs, and place more emphasis on documenting profitability indicators, than simply assessing total increases.

Spence (2001) reported that the international experience of SMEs' chief entrepreneurs is directly related to their success in the internationalization process. Of 1 112 supported SMEs in phase II of the Program, 68 percent had never exported at all, and 81 percent had never exported to the USA or Europe (Table 4.8).

TABLE 4.7
Export performance of SMEs on phases I and II

Phase	Total SMEs	Financed	Trained	Exports (US\$ millions)
July 2003 – March 2006	847	400	447	42.1
April 2006 – June 2006*	373	179	194	41.4
Total	1 220	579	641	83.5

*Data collected until December 2008

The Program implemented a strategy that combined activities to develop both internal technical capabilities and clusters of SMEs with enhanced collective efficiency. The majority of SMEs that qualified for support had little or no export experience in highly competitive markets (Table 4.8). SMEs face higher constraints in terms of finance, information and management capacity, as well as external barriers such as market imperfections and regulations (Hollenstein, 2005). Official data (Tables 4.6) and Program data (Tables 4.7 through 4.11) suggest the Program's combined approach was effective in promoting exports in SMEs with little international experience, especially in the case of micro SMEs (less than 5 employees).

From April 2006 to December 2008, micro SMEs showed the highest proportional increase (six times) in export sales compared with the rest of SMEs (four times, on average) (Table 4.9). However, average increases in total sales was directly related to SME size, confirming the findings of Hollenstein (2005). The effectiveness of the Program's efforts to transfer its capabilities to the public and private sectors by June 2009 remains to be seen.

TABLE 4.8
Previous export experience of SMEs participating in phase II

Export experience	SMEs	
Never exported	760	(68%)*
Central America	142	(13%)
Other	210	(19%)
Total	1 112	(100%)

*() Percentage of SMEs.

TABLE 4.9
Increase in SME sales from April 2006 to December 2008

Employees	2007			2008		
	Jun	Sep	Dec	Jun	Sep	Dec
< 5	1.4 (45)*	2.0 (60)	5.1 (86)	6.0 (104)	7.6 (112)	8.6 (116)
5–25	4.8 (78)	7.0 (94)	12.9 (139)	16.2 (164)	19.4 (174)	22.0 (184)
26–50	3.5 (18)	4.7 (25)	7.9 (32)	9.6 (33)	11.2 (35)	13.4 (38)
51–100	6.3 (16)	9.6 (22)	14.2 (27)	19.0 (30)	21.2 (33)	25.6 (35)
Total	16.0 (157)	23.3 (201)	40.1 (284)	50.8 (331)	59.4 (354)	69.7 (373)

*() Number of SMEs with increased sales.

Table 4.10 shows that 85 percent of SMEs supported by the Program fell in the micro enterprise (43 percent) and small enterprise (42 percent) categories. Intermediate enterprises comprised 15 percent of supported SMEs. Only 34 percent of supported SMEs in phase II were able to translate training, financial and export logistics support into increased domestic and international sales by December 2008. Smaller enterprises were the smallest percentage (24 percent) of supported SMEs that were able to increase total sales, while almost half of supported larger SMEs were able to increase sales. The smallest SMEs provided only 8 percent of total sales increase while the largest SMEs provided 37 percent of increased sales. This confirms the findings of Hollenstein (2005) regarding a direct correlation between firm size, total sales and export sales increase, and contradicts Czinkota and Johnson (1985), Reid (1987), and Wolff and Pett (2000).

TABLE 4.10
Total sales performance of SMEs in phase II

Employees	Supported SMEs	SMEs with increased sales	2006–2008 Increase in total sales (US\$ millions)
< 5	481	116 (24%)*	8.6 (12%)^
5–25	469	184 (39%)	22 (32%)
26–50	81	38 (47%)	13.4 (19%)
51–100	81	35 (42%)	25.6 (37%)
Total	1 112	373 (34%)	69.7 (100%)

*() Percentage of supported SMEs ^() Percentage of total sales.

A total of 29 percent of SMEs that increased sales during phase II belonged to the agro-industrial sector (25 percent food processing and 4 percent agriculture), while SMEs dedicated to services represented 44 percent, and 23 percent belonged to the crafts manufacturing sector (Table 4.11). Only 4 percent of SMEs that increased total sales and exports were in the pharmaceutical business. Food processors and SMEs producing natural and organic products had the highest average increase in total sales, while SMEs from the agricultural sector had the lowest. This data coincides with the traditional importance and profitability of productive sectors in El Salvador (MINEC, 2009). It also suggests processed foods, gourmet coffee, natural and organic foods and dietary supplements are the products with the greatest potential for internationalization at this moment.

TABLE 4.11
Total sales by sector of SMEs supported in phase II

Sector	SMEs	Sales (US\$ millions)
Food products	83 (22%)*	20.6 (30%)^
Manufacturing	85 (23%)	18.4 (26%)
Services	163 (44%)	18.1 (26%)
Pharmaceuticals	15 (4%)	5.6 (8%)
Agricultural products	19 (5%)	3.6 (5%)
Natural and organic products	3 (1%)	2.8 (4%)
Speciality coffee	5 (1%)	0.6 (1%)
Total	373 (100%)	69.7 (100%)

*() Percentage of supported SME ^() Percentage of total sales.

SMEs in craft manufacturing (guitars, furniture, etc) and services (healthcare and software) were responsible for 52 percent of increased sales. These SMEs along with food processors were the best performers, suggesting that the cluster approach was effective. Supporting these clusters in attending trade fairs, linking them to wholesalers and enabling e-commerce through Amazon and Cuscatrading, appeared to be effective. SMEs tend to export through intermediaries during the early stages of internationalization (Hollenstein, 2005).

The apparent success of the Program in promoting increased sales and exports by SMEs still needs to be reflected in an improvement of El Salvador's competitiveness indicators. From 2004 to 2008 El Salvador's ranking in the Global Competitiveness Index fell from position 50 to 79 (MINEC, 2009). Reversing this trend will only be possible if the Program is able to transfer its capabilities to the public and private sector.

4.4.3 Employment

In phase II, the Program was not able to fulfil its goal of creating 7 100 jobs by June 2009 (Table 4.12). This suggests that increases in sales and exports from SMEs at this early stage of internationalization have yet to translate into growth for firms. Czinkota and Johnson (1985) and Lu and Beamish (2006) have reported similar behaviour of SMEs in the early stages of internationalization.

The fact that more than half of jobs created are temporary, and that 95 percent of them are for production, suggests SMEs are being conservative at this stage, given the consequences of the economic crisis that deepened in late 2008 and is still with us.

TABLE 4.12

Permanent and temporary jobs created in phase II

Position	Permanent jobs		Temporary jobs	
Production	1 164	(73%)*	1 737	(95%)*
Administration	242	(15%)	57	(3%)
Middle management	128	(8%)	22	(1%)
Upper management	61	(4%)	13	(1%)
Total	1 595	(100%)	1 829	(100%)

*() Percent of permanent or temporary jobs.

4.4.4 FDA product refusals

Participation of the Program in the effort initiated by MINEC in 2006 to reduce the refusal of Salvadoran products by the FDA because of labelling errors has yet to produce a permanent effect. Significant reductions in refusals were observed in 2007 as compared with 2006 (Table 4.13). In 2008, however, the FDA refused the

TABLE 4.13
Refusals of Salvadoran products by the FDA, 2003–2009

Reason for refusal	2003	2004	2005	2006	2007	2008	2009
Wrong ingredient list	3	5	5	2	4	10	1
Missing nutrition facts panel	5	13	11	9	1	9	6
Missing weight information	3	8	3	6	2	8	2
Missing product name	2	1	0	7	1	9	0
Missing manufacturer information	2	6	3	0	3	10	0
Label not in English	1	6	20	12	0	29	12
False label	0	0	0	0	3	1	2
Missing instructions	0	0	0	1	0	2	0
Non-authorized health claim	0	0	0	0	0	8	1
Wrong product name	0	0	0	0	0	2	0
Total	16	39	42	37	14	88	24

Source: MINEC, 2009.

highest number of shipments in six years. A total of 26 corresponded to the same pharmaceutical company. In general, the majority of refusals based on labelling were from pharmaceutical products. None of the refusals involved SMEs trained by the Program. The most common errors were a lack of labelling in English, lack of a nutrition facts panel and incorrect ingredients lists. It is now up to MINEC and private institutions to continue the effort of informing and training SMEs in complying with FDA labelling regulations.

4.5 Conclusions

The Program strategy of combining the strengthening of SMEs' internal technical capabilities through training based on 'learning by doing', and enhancing national and regional collective efficiency through clusters, has had early success in increasing total sales and exports. Efforts to create jobs and help reduce FDA refusals resulting from issues such as labelling errors have so far fallen below expectations. Success in those areas will depend on the effectiveness of the Program to transfer its know-how to public and private institutions.

Continued monitoring of the Program beyond June 2009 is necessary to document fully its impact on promotion of exports. This should include determining profits earned by supported SMEs. Another study with a more academic emphasis is recommended. The study should relate the characteristics of SMEs and the support they received to their degree of success in the internationalization process.

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CHAPTER 5

The emergence of SME agro-industry networks in the shadow of agribusiness contract farming: A case study from the south of Brazil

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5.1 Introduction

This chapter proposes to review two decades of interventions in the western region of the State of Santa Catarina, Brazil, to promote small and medium-sized agro-industries, either individual or managed on a group basis, as a strategy for the sustainable renewal of the family farm sector together with its food processing traditions. The region was occupied in the early years of the 20th century by Italian and German farmer immigrants with their mixed arable and livestock practices, from which emerged the largest poultry and pig agro-industrial complex in South America. Initially a large proportion of the family farm sector was integrated into this complex; however, by the 1980s concentration in both industrial and farming activities led to large-scale exclusion. Since then there have been a series of efforts to preserve rural incomes and employment and revitalize local economies through the promotion of small-scale agro-industries based on local food traditions, known as 'colonial' products, which have persisted and are appreciated both in the region and outside. Local governments and Santa Catarina State organizations – particularly rural extension groups, rural trade unions, social movements and federal government programmes – have all contributed in different forms to the creation of a viable institutional and political environment favouring strategies of regional development, anchored in the promotion of networks of small-scale agro-industries. Equally important have been pre-existing traditional food consumption and processing practices, which have guaranteed a high level of autonomous initiative on the part of farmers and local communities.

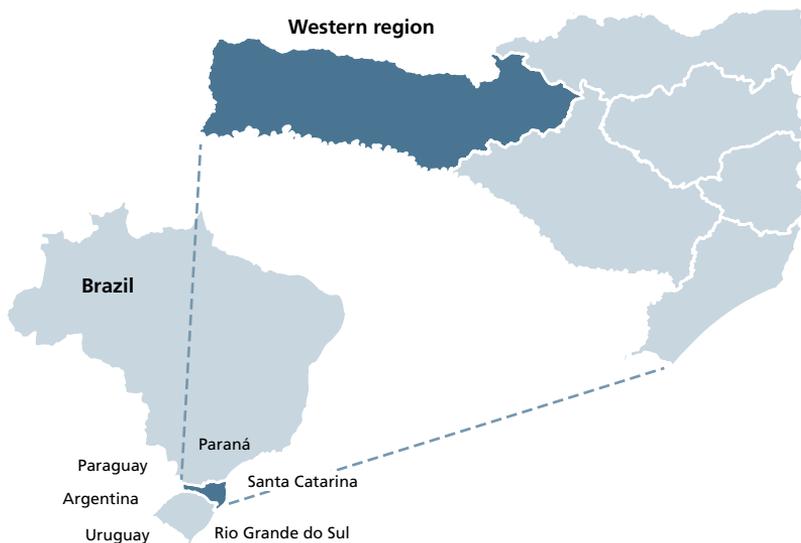
This chapter will review the different instruments and policies directed at forms of organization, financing, technological models, management, and marketing.

At the same time, we will explore the importance of social networks in sustaining these emerging organizations and markets. The authors will argue that a key explanation for the emergence and persistence of these new models of agro-industrial development in the region has been the diversity of actors involved and the experiments undertaken, and the synergies – often unintended and even conflicting – between public and private interventions.

5.2 Peculiarities of the region

The western region of the State of Santa Catarina in the South of Brazil has some 1.15 million inhabitants with 360 000 of these – around 30 percent – living in rural areas (Brazilian Institute of Geography and Statistics, IBGE, 2007). Occupying only 25 percent of the State's territory, this region is responsible for 50 percent of the State's agricultural production, and 51 percent of the economically-active population in the region work in the primary sector. Ninety-five percent of rural properties are family farms with less than 50 hectares, 70 percent having less than 20 hectares. A typical family farm in the 1980s would produce chickens or pigs in a contract relationship with large agro-industries or cooperatives. It would grow corn for feed, beans and manioc for family consumption and sale on local markets, and would generally have an orchard. It might also produce

FIGURE 5.1 Maps of Brazil and Santa Catarina with the western region highlighted



tobacco, contracted in the same way by the agro-industry. The farm would have some cows for domestic consumption with surplus produce being transformed into 'colonial' cheese that would be sold in the local community. This dairy base explains the later rapid expansion of milk production in the region, and was also the origin of a vibrant informal artisan agro-industry sector. The fact that under 3 percent of total pig production and only 17 percent of milk are consumed in the region itself gives some idea of the size of its agro-industrial base (Silvestro *et al.*, 2001).

This agro-industrial base was built up in the 1920s and 1930s, producing pork fat for the São Paulo market. The shift to margarine inaugurated a new phase, with the adoption of genetic stock designed for greater meat production and the organizational innovation of contract integration with the family farmers of the region. Brazil's leading white meats firms and cooperatives emerged in this region and are still located there, even though they have since expanded throughout Brazil and into neighbouring countries. They are now global leaders in exports with an increasing presence in key international markets. Perdigão and Sadia (now Brazilian Foods, BRF) were established here, as also were Seara (now Cargill) and Aurora, the largest white meats cooperative. Dairy and tobacco agro-industries also have an important presence in the region.

In the 1980s some 67 000 out of a total of 80 000 farmers produced pigs for agro-industries, declining drastically to 20 000 by 1995 (Testa *et al.*, 1996) and to 10 000 by 2008. Rural exodus from the 1980s onwards led to a decline in the region's population growth relative to the total for the State, and to a sharp shift in the rural–urban population ratio within the region. In 1980, the rural population numbered 576 051 as opposed to 327 137 in urban areas. By 2007 this had inverted sharply, with only 361 000 people remaining in the countryside and 791 712 people now in the region's towns.

From the beginning of colonization, the region was marked by its associative dynamic. It had been settled at the turn of the twentieth century with an equal distribution of lots and access to resources (water and roads), and was organized on a community basis. The Italian and German origins of the colonists accounted for the traditions of mixed farming, and the importance of pork, wine and corn products. Sugar cane was also important to the communities of German origin. This background also explains the strong presence of the Catholic Church in the organization of the rural population, particularly in the form of the Pastoral Land Commission (CPT). Cooperativism was equally important, and with the return of democracy in Brazil in the 1980s, social movements and civil society organizations emerged in force.

In the following sections we explore the different initiatives which have emerged in response to the crisis in the traditional forms of family farm integration in the region. Table 5.1 presents a synthetic overview of the evolution of these initiatives, focusing on types of agro-industry, the nature of social actors and the characteristics of public policies.

TABLE 5.1

Evolution in types of agro-industrialization, social actors and public policies in the western region of Santa Catarina

	1970s	1980s	1990s	2000 onwards
Types of agro-industrialization	Conventional large-scale industrial model with increasing integration of pig and poultry farmers	Process of concentration and exclusion in pig production Increasing value attached to artisan food production	Growing exclusion of pig farmers Rapid growth of dairy production Entry of large dairy firms into the region Emergence of family-based agro-industries	Numerical expansion of family-based agro-industries Emergence of networks of family-based agro-industries side by side with the conventional pig and poultry agro-industries
Social actors	Rural Trade Unions still subordinate to the State Creation of State Agricultural Research Organization (EMPASC) with unit in Chapecó Establishment of National Research Unit of EMBRAPA for poultry and pigs in the western region	Association of Condominiums The Pastoral Land Commission Beginning of the Landless Movement (MST) Alternative Trade Unionism	Constitution of APACO Solidary Credit Movement CEPAGRO Emergence of the Association of the Municipalities of Western Santa Catarina (AMOSC) Growth in rural unions and social movements: FETRAF-SUL, Movement Against the Dams (MASB), Movement of Women Peasants (MMC) Establishment of the intermunicipal entities AMOSC and the SAGA Institute	Networks of agro-industries The UCAF network. Quality seal 'Sabor Colonial' (Colonial Flavour) adopted by APACO associates New networks of small-scale cooperatives

5.3 First responses to the crisis

By the early 1980s the white meats agro-industry situated in the western region of Santa Catarina had already consolidated its leadership position, both within the domestic Brazilian market and in exports. Poultry led the way in terms of production and turnover, but the very high levels of productivity per farmer meant that one farmer could produce 100 tonnes in one year. Typically, a farmer only needed to fatten the day old chicks received from the agro-industry. This involved a mere 42-day turnover, allowing for five to six lots a year, with twelve thousand chickens at a time being raised in a 100 × 12 metre aviary. As a result, relatively few contract farmers were needed compared with pig production.

TABLE 5.1 (continued)

Evolution in types of agro-industrialization, social actors and public policies in the western region of Santa Catarina

	1970s	1980s	1990s	2000 onwards
Public policy	Modernization of agriculture Subsidized credit and tax exemption for conventional agro-industry Consolidation of large-scale slaughter plants Rural extension oriented to large-scale agro-industry Work with rural youth	Continuation of support for conventional large-scale agro-industries Training in food production carried out in the farmers' kitchens (ACARESC and its social extension workers) Cooking courses for women farmers (baking, cheeses, cold meats, pickling) Preoccupation with family subsistence and the improvement of nutrition Constitution of pig rearing condominiums and storage associations Establishment of first agrarian reform settlements in Santa Catarina State research unit in Chapecó with 50 researchers becomes exclusively dedicated to small-scale production	Continuation of support for conventional large-scale agro-industries Professionalization of farmers in Epagri's Training Centres Microbacias (Watershed) 1 Project Pilot Project – PRONAF agro-industry Legislation for artisan agro-industry in Santa Catarina EPAGRI project for the promotion of value added activities Recognition of the region as 'in crisis' (Testa <i>et al.</i> , 1996 publication) Beginning of the implementation of PRONAF Municipal support for local food markets Beginning of municipal inspection service (SIM)	Continuation of support for conventional large-scale agro-industries DESENVOLVER Project National Family Agro-industry Program MDA Microbacias (Watershed) 2, Project The Large Mesoregion Frontier of the MERCOSUL programme of the Ministry of National Integration

Until the 1980s it was common also for farmers to be involved in what was called the 'full cycle' of pig production – farrowing, weaning and fattening – also a much longer process than for poultry. A typical pig farmer would have 7–15 sows and would hand over 80–150 pigs to the agro-industry each year. The number of sows depended on the area cultivated with corn, on the basis of one hectare for one sow. In return, each sow produced enough manure to fertilize half a hectare. Given this production system, a high proportion of the region's farmers were involved. When the leading firms introduced a new integration model separating out the rearing and the fattening phases into specialized activities, economies of scale kicked in and a process of concentration ensued, sharply reducing the number of farmers contracted by agro-industry.

The State of Santa Catarina at this time had a highly-effective rural extension service (ACARESC) and high levels of organization in the family farming sector in the western region. In addition, cooperation programmes with Europe meant that the leading cadre in ACARESC could draw on a wide range of family farming models and organizational systems. To confront the sharp changes being put into place by the agro-industry, collective models of farmer organization were introduced – known as ‘condominiums’ – particularly for pig production but also for storage and farm purchases. In the case of pigs, groups of around 10 farmers would collectively assume the responsibility for the rearing phase. When the pigs were weaned each farmer would fatten his share and would market his own produce, whether to the agro-industries or to the cooperatives. Initially this model was extremely successful and by 1990 there were over 150 condominiums in operation involving around a thousand family farmers, many financed by the Brazilian Development Bank (BNDES).

Success led to efforts to extend the model in the direction of an integrated agro-industrial complex. The municipality of Coronel Freitas would be a good example here, where 23 condominiums involving 180 farmers accounted for some 40 percent of its total production. A unified organization was created (OCELCOSUL) and plans were put in place for the collective purchase of inputs and marketing, the centralization of rearing, construction of a feed plant, and construction of another plant for the industrialization of meat products. A similar initiative was promoted in the case of storage for grain – a crucial component of the pig production cycle – and by 1990 there were some 170 groups involving 1 500 farmers. In that year a State level Association of Condominiums (AECOS) was also created.

This first reaction to the shift in the dominant agro-industrial model, however, did not succeed in consolidating an alternative and many of the initiatives were assimilated within the new model. Official support for the initiative by the rural extension service was also withdrawn. Nevertheless, this initial reaction was to mark a new stage in the organization of family farming in the State and especially in the western regions. New organizational forms had been experimented with and the challenges of collective action tested. Above all, the goal of creating alternatives to the dominant agro-industrial model had begun to take root.

5.4 New levels of association

A key expression of these new levels of organization was the creation in 1989 of the Association of Small Farmers of Western Santa Catarina (APACO) a non-profit civil society organization which represents its affiliated small farming cooperation groups. Among its stated objectives are:

- ▶ to be a forum for political discussion of problems relating to small farmers;
- ▶ to provide political, administrative and technical support to its affiliated groups;

- ◉ to coordinate joint marketing activities of the affiliated groups (without substituting individual activities).

The founders of this organization have their roots in the Pastoral Land Commission (CPT), but the APACO is premised on the self organization of small farmers, first in community groups for agricultural cooperation (CGAs), then in municipal support centres (CEMAs) and finally in the regional organization. Within two years, 144 CGAs were in operation in 24 municipalities, with 10 CEMAs incorporating 1 968 small farming families. Together with two other regional organizations of this nature, a State level organization, CEPAGRO – a Studies and Promotion Centre for group-based agriculture – was created, to which the State's rural agricultural union (FETAESC) also subscribed.

Parallel civil society organizations therefore emerged, working closely with social movements, local governments, and the public sector. This development coincided with a decline in the role of rural public extension services, and cadres moved easily between the public sector, non-governmental organizations (NGOs), social movements and local government. As we will see, APACO came to play a central role in the development of alternative agro-industrial strategies. At the beginning of the 1990s ACARESC was annexed to the Santa Catarina State's research organization, EMPASC, to become EPAGRI, which then terminates its work with the condominiums to concentrate on a strategy of farmer professionalization. Rural extension in its turn became the responsibility not of the State but of the municipalities.

The agrarian reform movement also became particularly important in the western region with the consolidation of a significant number of settlements. These provided ideal terrain for the exploration of alternative strategies for family farming, among which agro-industry was to become a central concern. It also dramatically increased the importance of social movements in the region, particularly in the form of the Landless Workers Movement (MST), as well as the presence of the Federal State in the financing of the land settlements. At the same time, it should be noted that the farming sector in the region was traditionally highly organized into cooperatives. Data for 1997 indicate 10 cooperatives in the region with some 35 000 members (FECOAGRO, 2000).

In the early 1990s the State launched its first 'microbacias' (small watersheds) project, in partnership with municipal governments and implemented by EPAGRI, to counter the environmental problems of modern farming and agribusiness. This was concluded in 1998 and was followed by a second programme begun in 2003, now focusing on the social problems of agribusiness where concentration was accelerating rural exodus, a phenomenon which affected Santa Catarina later than the other southern States. Both projects were financed by the World Bank. The first included a component of support for group-based farming and the second provided more explicit support for small-scale agro-industries.

The western region also played an important role in the consolidation of the Cre\$ol system, a rotating credit fund for family farming. Founded in the neighbouring State of Paraná with support from international organizations (Miserior), APACO was important in the consolidation of a cooperative base for this initiative. Its central office, the Cre\$ol Central, is located in the city of Chapecó, capital of the western region. This body is recognized by Brazil's central bank and now implements the PRONAF¹ credit lines. The system has 50 000 associates in 56 cooperatives and operates in some 300 municipalities.

5.5 'Added value'

If one idea were to be identified as embodying an alternative perspective for family farming at this time, it was the notion of 'added value'. This was primarily promoted by the new 'civil society' organizations, which emerged alongside the public sector, the unions and the cooperatives. In 1994 CEPAGRO articulated a network including regional NGOs such as APACO, local governments and different public sector bodies, and launched the Small-Scale Agro-industry Program. A range of agro-industries emerged from this initiative, particularly small dairy plants, which were a harbinger of the important shift to dairy production in the light of the increasing crisis in pig farming. A second component of this programme was equally important and involved work at the legislative level to develop a separate regulatory structure, without which artisan-style agro-industry was not viable.

Studies were undertaken to map this new world of small-scale agro-industry, which until then had remained invisible: squeezed out as the rural sector was seen only in terms of agriculture on the one hand and modern agro-industry on the other. The first such study was carried out by Oliveira, Schmidt and Turnes (1999) and identified 1 116 'Small-scale Rural Industries' as they were then called. Of these 345 were located in the western region. Some 79 percent of these were informal with no juridical status, and more than a third were essentially run 'from the kitchen' with no specialized facilities. Table 5.2 gives an idea of the diversity of products being processed.

Studies revealed that in Santa Catarina the informal sector produced as much cheese as the formal sector (Wilkinson and Mior, 1999). Official census data on agricultural products processed in some way on the farm for sale in the State of Santa Catarina identified 33 211 producers selling 33 105 tonnes of products in the early 1990s (IBGE, 1996). Pride of place here went to cheese, followed by meat products, animal fat, butter, and sugar-cane syrup/treacle, as can be seen in the following Table.

1 PRONAF is the acronym of the Brazilian National Family Farm Program, spearheaded by the Ministry of Agrarian Development.

TABLE 5.2

Number of rural industries by raw material processed by region and for the whole state

Raw material	Number of units which process raw material							Total
	West	Southern Highland	Northern Highland	High Valley	Northern Coast	Metropolitan Area	Southern Coast	
Milk	112	58	11	56	87	9	30	363
Sugar cane	75	1	–	7	18	65	78	244
Fruits and horticulture	47	5	10	6	83	8	21	180
Pork	88	8	6	8	6	8	26	150
Manioc	2	1	–	7	10	31	68	119
Wheat flour*	19	4	2	2	23	3	11	64
Beef	27	4	3	7	5	7	8	60
Honey	9	14	3	9	3	2	14	54
Grapes	21	–	–	–	2	4	9	36
Poultry	10	1	2	9	3	–	1	26
Quail eggs	7	–	1	–	11	1	2	22
Corn	15	–	2	–	–	–	4	21
Fish and seafood	2	1	–	–	6	–	6	15
Rice	6	–	–	–	–	–	3	9
Wheat	3	–	1	–	1	–	2	7
Hen eggs	1	–	–	–	2	–	3	6
Green tea	4	–	1	–	–	–	–	5
Manioc flour	–	–	–	–	–	2	3	5

*The authors assume that wheat flour is the raw material for bakeries.

Source: Oliveira *et al.* (1999), adapted by the authors.

TABLE 5.3
Products processed on the farm in the State of Santa Catarina, 1995

Product processed	Producer's number	Quantity produced (tonnes)	Producers with sales number	Quantity sold (tonnes)	Value of production (R\$ 000)	% in total production value
Beef	80 802	21 743	2 579	4 412	32 037	27.5
Pork	108 451	22 233	1 815	3 204	26 175	22.5
Sausages/Cold meats	20 398	2 002	483	659	5 996	5.1
Animal fat	94 760	9 119	2 176	578	6 144	5.3
Cheese/Cottage cheese	59 741	13 837	21 376	8 918	33 021	28.4
Butter	15 864	557	2 049	201	1 040	0.9
Manioc flour	3 918	11 115	786	8 978	3 660	3.1
Syrup/Treacle	12 172	4 076	891	2 714	2 745	2.4
Rice grain	32 946	9 046	170	1 334	3 095	2.7
Tobacco	821	718	585	588	1 507	1.3
Corn flour	17 058	3 183	81	228	1 034	0.9
Grape wine	2 672	2 591	220	1 291	1 535	1.3
Total	-	100 220	33 211	33 105	116 454	100.0

Source: Agricultural Census, IBGE 1995/6.

The added value strategy was also applied in the newly-formed land settlements. The settlements were assisted by the same NGOs and public sector professionals as the family farming sector, and shared in the experience and eventual collapse of the condominium movement. In its wake a number of dairies were created and cheese production was undertaken. Other settlements opted to establish plants for the slaughter of chickens and yet others for the processing of fruit. The separation between the agrarian reform sector and the family farm sector therefore became less marked, as both groups began to involve themselves in the same initiatives.

The importance of the western region of Santa Catarina in rural agro-industry production can be gauged in the comparative Table 5.4. More recent census data are still not available for the crucial period which marks the intensification of policies and strategies to promote rural agro-industries.

TABLE 5.4
Comparative evolution in the rural processing of dairy, pork and sugar cane (State of Santa Catarina and the western region)

Year	1975		1985		1995/96						
	West Region	Santa Catarina	West Region	Santa Catarina	West Region	Santa Catarina					
Product	Quantity (tonnes)	Product number	Quantity (tonnes)	Product number	Quantity (tonnes)	Product number					
Cheese/ Cream/ Cottage cheese	4 171	36 615	5 804	41 404	7 381	63 428	11 674	33 730	6 149	59 741	13 837
Cold meats (salami, sausage)	2 472	46 624	3 023	41 339	2 439	53 816	2 985	17 298	1 433	20 398	2 002
Treacle/Syrup	1 544	10 332	5 714	18 727	5 101	20 004	8 632	11 431	1 719	12 172	4 076

Source: Agricultural Census, IBGE, 1995.

5.6 A new municipal and state institutional framework

It was understood from the outset that without an appropriate regulatory system this agro-industrial strategy was doomed to failure. Existing sanitary legislation, inspection criteria, tax regulations and marketing requirements all conspired to make the transition from informal to formal operations unviable. The possibility of separate municipal inspection services provided the first loophole enabling these agro-industries to operate openly in the local market and benefit from local government support in the form of public markets and procurement policies for school meals. Very often, however, the municipality proved too small a market which inhibited growth; this in turn led to the adoption of policies of mutual recognition or 'free trade' regimes between adjacent municipalities.

A major advance was the passing of State sanitary legislation in 1997, specifically geared to the production and marketing of artisan food and drink products, including exemptions for costs relating to inspection and the need to register the products to be marketed. This legislation followed an earlier initiative exempting microfirms from taxes on the circulation of goods, which had proved ineffective in rural areas, where for a variety of reasons the juridical form of the microenterprise has not been adopted. In an effort to overcome this problem the individual farmer was given the status of a microenterprise for the purposes of taxation, but here again the terms under which a microenterprise could operate – only individually and only for sales directly to the final consumer – were not appropriate for the new organizational forms which the move to agro-industrialization was taking.

The State of Santa Catarina also benefited from a rural research and extension service (EPAGRI, previously ACARESC and EMPASC) which gave great importance to the professionalization of the family farming sector and was to prove decisive in disseminating knowledge on agro-industrial processes. Initially the objective of this training programme was to improve the nourishment of rural families; classes were conducted in the farmer's kitchen. Later these were moved to the organization's training centres of which there were some 14 in the State as a whole, an exceptional situation when compared with other states.

From improving family nourishment the orientation of the courses shifted to that of promoting artisan industries. In 1990 two courses were given, one for processing milk and the second for processing pork. By the year 2000, 18 courses were given, increasing to 25 by 2007. In the first year some 270 farmers were trained, but by 2000 this number had reached 2 340. When analysed in terms of number of courses and participants the figures are even more remarkable. In dairy processing, 503 courses were offered and 6 676 farmers were trained; in meat processing the figures were 528 and 6 802, respectively. More recently, baking (249 courses and 4 061 farmers trained) and fruit processing (218 courses and 2 978 farmers trained) have become the most popular. There is, however, a downside to this training. While these courses provide crucial inputs in terms of hygiene and technical knowledge, they often

uphold industrial norms and downplay the value of artisan products and techniques. This may lead to a loss of local variation and practices. On the other hand there is field evidence that farmers adopt practices they consider important without eliminating 'the traditional way of doing things'.

5.7 A region officially in crisis

The perception of a region in crisis was consolidated through the publication of research carried out by the State's rural extension research centre on small-scale farming (CPPP) located in the region (Testa *et al.*, 1996). This study provided a detailed map of the crisis in the dominant agro-industrial model from the point of view of the family farmer. It focused not only on the exclusionary effects of concentration but also on the environmental impact of intensive pig production, together with the results of increasing soil erosion on agricultural productivity. In the new system of integration, corn and pig production was increasingly disassociated and the region more dependent on imports for the former. It was also felt that the next stage in the growth strategies of agro-industries would involve a shift in new investments to the centre-west frontier in Brazil, the new centre for grains production. The research also pointed to the opportunities opened up through the rapid conversion to dairy production underway in the region, largely a spontaneous response to the crisis of perspectives in the white meats sector. At the same time, it made clear that organizational innovations would be necessary if this was to become a viable option for large sections of family farmers (primarily logistics and milk collection). The publication and diffusion of this study consolidated the perception of a regional crisis, calling into question the existing development model, and helped consolidate a regional consensus on the need for new solutions.

All the region's actors were drawn into this debate. The major firms in poultry, pigs and tobacco presented their 'year 2000' models for a sustainable future for family farming in articulation with the dominant agro-industry model (Wilkinson, 1996). The Association of Local Governments in the region (AMOSC) contracted international consultants whose inputs in the debate were largely influenced by the 'Third Italy' model, favouring development strategies based on clusters of small and medium-sized firms. AMOSC led initiatives to create the Saga Institute, which was responsible in turn for creating the 'Greater Frontier Meso-Region of the Mercosul', which supported the promotion of small-scale agro-industries. A proactive response to the perceived shift to dairy farming was seen to be key to ensuring broad social inclusion in this next wave of agro-industrial integration. Above all, however, hopes were increasingly placed in the potential for the development of an alternative agro-industrial model based on small farmer groups and the promotion of the qualities of traditional 'colonial' products – dairy produce, cheeses, salami, rustic chicken, cold meats and sausages, fruit products, sugar-based products and confectionary.

Box 5.1 The Santa Catarina Program for Small-Scale Rural Industry (PROIND)

The Program was created in 1996 to give technical and financial support to small farmer reconversion initiatives for activities which generate income and employment in the countryside. Initially the Program was oriented to the provision of credit, but later it developed into an integrated support programme for the development of small-scale agro-industry. Although the Program was short-lived, it provided the seeds for the subsequent development of support programmes for family farm based agro-industry.

In 1997 the project 'Adding Value to the Products and Services of Small-Farming and Artisan Fishing' was established as one of eleven priority programmes for EPAGRI. In partnership with CEPAGRO*, the Federal University of Santa Catarina (UFSC) and EMBRAPA, the project evaluated the potential for small-scale industry in Santa Catarina. 1 116 small-scale agro-industries were identified, but the study concluded that this figure considerably underestimated the total number of these activities in the State.

* In collaboration with other NGOs and farmers organizations, CEPAGRO has been active since 1994 in supporting small-scale agro-industries, particularly mini-dairies, in the State of Santa Catarina. In the western region of the state, this partnership was made with APACO.

In parallel with this, the State Government created the Santa Catarina Program for Small-Scale Rural Industry (PROIND) in 1996, although this was quickly overshadowed by the scope and more favourable conditions provided by the Federal family farming programme (PRONAF).

Two years later the State legislature approved a programme for the Promotion and Development of Small-Scale Fishing and Family Agro-industry (PROPAGRO) which included the creation of a special quality label: 'Sabor Colonial' (Colonial Taste). This label was subsequently taken over by APACO and registered with the National Institute for Industrial Property (INPI) for use by its associated groups in the western region. As we will see, APACO was also to play a key role in the articulation between the region and the Federal programme in support of family farming and small-scale agro-industry.

A further important development for the adoption and diffusion of small-scale agro-industry initiatives was the approval of the programme for the Development of Santa Catarina Family Farming through the Verticalization of Production ('Desenvolver').

This programme was inspired by a small-scale agro-industry programme – PROVE – developed in the Federal District of Brasilia and initiated a few years earlier. CEPAGRO and APACO were the principal proponents of the programme

Box 5.2 Programme for the Promotion and Development of Small-Scale Agro-industry for Family Farming and Fisheries (PROPAGRO)

On the initiative of the Santa Catarina State Legislature, a State Law was passed and subsequently regulated by Decree establishing the PROPAGRO programme, which among other provisions included the allocation of financial incentives for the creation of small-scale agro-industries.* The Law obliges the Agriculture and Rural Development Secretary to provide support for all aspects of value-added projects, from production to marketing. For this purpose the Rural Development Fund (FDR) was transformed into a financing body and the organizations associated with it assumed the execution of projects in conjunction with NGOs and local governments. In addition to providing credit for family-based agro-industries, the FDR also made possible the implementation of the Great Meso Region Mercosul Frontier project, which supported the purchase of machines and equipment by some 50 family agribusinesses for the consolidation of processing facilities. Another important aspect of the law was the creation of the quality seal ‘Sabor Colonial’ (Colonial Taste), to be used by firms that complied with legal, tax, environmental and sanitary criteria. Such firms were also to be exempted from Santa Catarina State taxes. To access these benefits, the farmer owners of the agro-industry had to comply with the criteria established for inclusion within the definition of family farming given by the Federal PRONAF programme. The quality seal was adopted by the family-based agro-industries that participated in the APACO/UCAF network in the western region of Santa Catarina.

* Parallel to this programme the State Government also launched the PRODEC AGROINDUSTRIAL for large-scale conventional agro-industry: testimony to the continued political force of this sector.

and of the 32 municipalities included, 20 of these were in the western region. From 1997 the programme was financed by the National Research Council (CNPq), and enabled the contracting of a technical team to provide assistance for the implementation of small-scale agro-industries in a range of activities, ranging from the elaboration of the project to the marketing of products. In the programme’s 2001 Report, a total of 130 small-scale agro-industries had been accompanied in the western region, involving 721 families. Direct and indirect employment generated by these agro-industries was calculated at 3 640 full-time positions, with a further 356 temporary posts being created for construction activities. As for the number of units attended by the programme (discriminated by agricultural raw materials used), Table 5.5 captures the diversity in the three poles of the programme in the western region.

Box 5.3 'Desenvolver' programme

The Programme for the Development of Family Farming through the Verticalization of Production – 'Desenvolver' – supports the creation or consolidation of agricultural production processing in all its stages, from production of raw materials to the marketing of the processed products, by providing technical assistance and producing and diffusing appropriate technologies. It began in 1998 as the result of a convergence of interests between State bodies, local governments and NGOs, with the support of the National Research Council (CNPq) through the provision of grants to contract professionals for technical assistance in family-based agro-industries.

The Programme made it possible to contract 30 professionals to promote this value-added strategy: engineers (agronomic, food chemistry, civil and sanitary), management, veterinarians, pharmacists and publicists. These professionals were responsible for organizing the farmers, designing the processing plants, selecting the equipment, obtaining credit, improving the quality of the producers, and assisting in management and marketing.

The Programme was made possible through partnerships with EPAGRI, local governments, NGOs and producer organizations in 41 municipalities, organized in three poles in the western region and three along the Santa Catarina coast.

In the report prepared to evaluate the socio-economic impacts of the programme, 61 percent of those interviewed said that their economic situation had improved with the installation of their agro-industry (see Table 5.6). For 10.2 percent of those interviewed the agro-industry was their only source of income; for 33.9 percent it had become the major source of income and for 54.2 percent it represented a complementary income. Legalization was seen to be the principal problem both for the plant itself and when marketing products. Eighty-five percent of those interviewed declared that they had received technical assistance services, but more worryingly, 71 percent stated that without such support they would be unable to continue in the activity (Carlos, 2001; Schmidt and Turnes, 2002)

5.8 The national family farm programme (PRONAF)

With the end of the military dictatorship, a range of social and economic issues that had been suppressed re-emerged, among them the demand for agrarian reform. Perhaps more important than this was a renewed questioning of agricultural modernization policies and an insistence on the continued role of family farming

TABLE 5.5

Number of units attended by the 'Desenvolver' programme according to type

Raw material	Western region			Total
	Pole I	Pole II	Pole III	
Sugar cane	05	07	06	18
Cereals	02	02	02	05
Tea	–	01	01	02
Poultry	02	01	02	05
Rabbits	–	–1	–	01
Fruit jams	04	04	01	09
Horticulture (minimally processed)	–	–	02	02
Horticulture (pickled)	03	03	02	08
Orange juice	01	–	–	01
Milk	10	05	13	28
Honey	–	01	01	02
Eggs	02	01	02	05
Quail eggs	–	–	–	–
Bakery	–	–	02	02
Fish	02	02	02	06
Pork/Beef	10	11	06	27
Brushes	01	02	01	04
Rural tourism	02	–	02	04
Ice cream	–	–	01	01
Total	43	41	46	130

Source: Schmidt and Turnes, 2002.

even in a developed agricultural setting. This argument – promoted by increasingly well-organized social movements and backed by significant academic research efforts – led to the creation of a separate Ministry of Agrarian Development (MDA) whose centrepiece was the Secretary for Family Farming (SAF). At the same time, the category of family farming was enshrined in Brazilian legislation. In the mid-1990s a National Programme for the Strengthening of

TABLE 5.6

Monthly income of farmers assisted by 'Desenvolver'

Income	% before implementation	% after implementation
Above 3 minimum salaries	30.5	49.1
Between 1 and 3 minimum salaries	25.4	44.1
Below 1 minimum salary	35.6	1.7
Total	100	100

Family Farming (PRONAF) was launched. Initially this programme was focused fundamentally on agriculture, but included a line of credit for infrastructure to be implemented by local governments. In the western region of Santa Catarina these resources were applied to the consolidation of small-scale agro-industries. The rural family farm trade-union *FetraF-Sul*, which was created in the western region in 1997, was to play an important role in the implementation of the PRONAF.

The issue of 'value added' was central to the concerns of the PRONAF programme and 'verticalization' was expected to provide a strategic way forward. A new component of the PRONAF was therefore created in 1998 – PRONAF-Agro-industry. The viability of agro-industries in the family farm setting was seen to depend on a number of key factors. In the first place, it was thought necessary to support groups of agro-industries rather than individual activities if the necessary scale for operating in the market was to be achieved. Scale was also necessary to pay for the technical services thought to be a pre-condition to ensuring competitiveness in the market. Such services would involve marketing, management and technical support. The model proposed, therefore, required a minimum number of agro-industries in operation in the same location, all serviced from a central unit. Such a set-up was not easy to identify in the Brazilian family farm sector and the first stage of the programme's implementation involved a search for candidates for pilot projects, to test the model. *Viçosa University* and later *APACO* were contracted to produce technical specifications for different types of agro-industries adapted to the programme.

At this time, the 'Testa *et al.*, 1996' publication had been discussed by the Ministry's policy staff in Brasilia and served to change the prevailing idea of Santa Catarina's western region as a paradigm of dynamic growth based on family farm integration with agro-industry. As a result, the region was now included among those seen as priorities for the PRONAF Agro-industry programme and the CPPP; the EPAGRI unit in Chapecó, now CEPAF (Research Centre for Family Farming), was invited to implement a pilot project in the western region.

5.9 The PRONAF agro-industry pilot project in Santa Catarina's western region

The project elaborated by the CPPP team built on the individual and group initiatives already underway in the region and focused on those agro-industries that already showed a minimal level of consolidation and organization. The central issue was seen to be that of bringing these agro-industries out of their informality and clandestinity through the financing of projects, which would allow for an adaptation of the agro-industries to the various sanitary and fiscal requirements. The market dynamic of these agro-industries was understood to comprise three levels in which, ideally, the agro-industry would transit from informality to formality, and from there to the development of special quality artisan products.

Given the number of initiatives and their geographical dispersion, the project was divided into two, one being coordinated by the NGO, APACO, and the other by a unit of the public sector research and extension service, EPAGRI. This mixing of public and private was not without its tensions and EPAGRI was initially reluctant to work on the basis of equality with an NGO. However, the situation was finally accepted and this 'hybridity' of public and private partnerships was in fact a typical feature of the networks built around the promotion of artisan agro-industries in the western region of Santa Catarina.

With differing juridical adaptations the broad conception of the PRONAF Agro-industry programme was adopted. It involved an articulation between the different agro-industry groups and units providing the necessary technical services identified by the programme, all under the umbrella of a Central Support structure. The project represented a major challenge for the public sector organization EPAGRI, given that it had traditionally defended the view that farmers should limit themselves to primary production, leaving 'value added' production to large-scale agro-industries. For many, the idea of promoting a verticalization of family farming in the heartland of the largest agro-industrial complex in Latin America, if not the world, was difficult to stomach.

Some 52 agro-industries committed themselves to the project, covering 23 municipalities and involving 481 families. In terms of activities the agro-industries included: 12 dairies, 12 sugar-cane products, 11 pork meats and sausages, three pickled cucumbers, three fruit jams and confectionary, two cereal products, two chicken slaughter houses, two egg packaging plants, one orange juice, one bakery, one brush factory, one jeans factory and one undertaking dedicated to rural tourism. All of these were located in rural areas and run by family farmers as defined by the national family farm programme. It was expected that 620 employment opportunities would be created by the project.

Although the project was promoted by the Federal Government, the necessary funds were not made available by the PRONAF. Nevertheless, the project went ahead and funds were raised for the majority of the agro-industries through a similar

Box 5.4 The PRONAF agro-industry programme includes the lines of action summarized below.
A pilot project was begun in 1997 but the national programme only got off the ground in 2003.

1. Rural credit

The programme provides both operational and investment credit for family farmers involved in agro-industries.

2. Training and publications

Activities include: organization and management of networks; finance and accounts management; guidance on environmental management and compliance with legislation; assistance on working conditions and insurance; participation in representative associations; elaboration of agro-industry projects either individually or in the form of networks; organization of courses on good industrial practices and processing techniques.

3. Science and technology

Acts in support of: small-scale technology development; the development of agro-industrial project profiles; new products and natural food preservatives; technology capacity building; provision of technical assistance.

4. Promotion, publicity and marketing

Promotion and publicity:

- International, National and State fairs.

Identification of markets:

- Macro market studies;
- Studies of institutional markets;
- Logistics of network creation;
- Technological and market forecasting.

Institutional market promotion:

- School dinners, provision of food baskets, acquisition /donations, etc.

5. Other sources of support for agro-industries

- Partnership with other Ministry Secretaries;
- Conducting of surveys and elaboration of strategies for individual States;
- Consultancy and technical assistance;
- Teaching and demonstration models.

line of credit (Agregar) from the Bank of Brazil. This line of credit, however, had the drawback of only financing individual proposals based on the productive capacity of each property. Projects where the viability of the agro-industry depended on the combined efforts of various families suffered discrimination; poorer farmers therefore tended to be excluded. Changes in orientation at Federal level also led to the discontinuation of the PRONAF Agro-industry programme.

In spite of these problems the model promoted by the pilot project – which involved not only a group logic but also a recognition of the need for a system of technical services covering management and marketing – became the reference for future initiatives in the region. In addition, the idea that the objective of promoting these agro-industries was not exhausted in their adaptation to the fiscal and sanitary requirements of legality, but rather involved their consolidation as superior quality, 'colonial' products, also became firmly entrenched. An indication of the importance this project acquired for the region can be gauged from the presence of the State Governor and two Federal Ministers at its launch, in addition to deputies, prefects, trade union leaders and more than a thousand farmers. Given its size, the project was divided into two: under the responsibility of APACO in Chapecó and EPAGRI in Concordia.

5.10 Apaco's vision for the region

The end of the PRONAF Agro-industry programme and the opportunity for innovative forms of financing which it entailed highlighted the importance of NGOs and social movements for the continuity of actions in support of development strategies based on the promotion and consolidation of small-scale rural agro-industries. The strategy of the PRONAF Agro-industry programme was in many ways convergent with that of APACO, which consolidated the organizational model it had proposed. A recent presentation by Gomes and Marchioro (2008) provides a succinct view of APACOs activities.

In 2000, APACO coordinated some 50 agricultural community groups (GCAs). By 2004–2005 these had doubled, and at the last count in 2008 there were 130 such groups. In APACO's experience, individual agro-industries are in general unviable, with 50 percent folding in the first year and 80 percent by the second year, fundamentally because of the cost of services (technical and marketing) which can be more easily borne when diluted within a number of agro-industries. Initial efforts had focused on the promotion of large projects involving many families with the objective of creating economies of scale. These first efforts proved unsuccessful, both as a result of the complexity of collective action problems and the lack of sufficient technical know-how. The emerging 'cooperation model' was based on four to six families, often with family ties or mutual experience in social movements and trade unions. It was important that such families had organizational experience and technical control over the production chain. APACO built on the earlier experiences of condominiums and many of the groups had been initially supported by the rural extension services.

Box 5.5:

An illustrative example of beneficiaries of the PRONAF agro-industry programme – the Malagutti extended family

In 1995 three families of Italian origin – two brothers and a cousin – decided to join forces and set up a group. One of the members had a small piece of land, some five hectares, dedicated to dairy production. The other two lived on their father's property of some 33 hectares where dairy and tobacco were the principal activities. Eleven years later, now with two more families, also cousins, the group finds itself at the head of four firms – a cheese plant, a shop selling agricultural inputs, a frozen pizza industry, and a plant still under construction for grated cheese. The dairy transforms 140 000 litres of milk per month into eight different products. The group also collects 300 000 litres of milk a month from as many as 190 farmers, which are processed via two partnerships with other firms.

How was such a transformation possible? Part of the explanation for the family's success was the culturally strong, communitarian, kinship relations soldered in the harsh conditions of frontier life. But equally important were the many years involved in social movements, political parties, trade unions and the Pastoral Land Commission. In these environments, habits of discussion were formed, a critical stance in relation to the dominant agro-industrial model was consolidated, and networks of access to information and expertise on a range of possible alternatives were established.

The group gained experience and confidence in collective organization during a period involved in relatively low cost, low risk, but low return agricultural activities. The decision to process products for sale on the market was seen as an option to stay in farming rather than move out to the city. Experience had already been gained in the sale of 'colonial' (non-pasteurized) cheeses at a small open market in the parking lot of the municipal football ground. This activity was made possible by the support of the local government – which set up the market – and the fact that little or no costs were involved. In this activity a client base was formed which extended beyond this market as unsold products were then negotiated in homes and commercial establishments in the town. This period also served to test which products had the best possibility of being profitable. The decision to shift from informal to formal markets involved heavy investment in a processing plant – achieved initially through the sale of land and animals – which could be certified by the Municipal Inspection Service (SIM), and in the establishment of a micro-firm to deal with the legal and fiscal implications.

Box 5.5 (continued):

An illustrative example of beneficiaries of the PRONAF agro-industry programme – the Malagutti extended family

But was this growth based on the distinctiveness of traditional colonial qualities? Here the issue is more ambiguous. Innovations under the pressure of scale were adopted – industrial pasteurization, and the adoption of cheeses of non-traditional shapes to accommodate packaging and transport – and activities were undertaken that are the antithesis of traditional values, as in the case of frozen pizza. In addition, half the milk collected was out-sourced to other firms in conventional markets. On the other hand, traditional agro-ecological products continue to be sold by the group on the open market and the extra milk continues to be collected to maintain income opportunities for the group's traditional suppliers. In interaction with the market the traditional shape of colonial cheeses was maintained. The Malagutti group crystallizes many of the dynamic tendencies at work in the region, which help to explain how family farmers with apparently few resources are able to launch successful undertakings that not only guarantee a livable income for themselves, but also provide a viable alternative for their children in the rural setting. At this stage, however, it would seem that the key to success is the pragmatic ability to mix the advantages of tradition, particularly as they relate to social and social movement networks, with the adoption of varied opportunities in conventional and institutional markets.

The goal in most cases was to emerge from informality and be able to operate under the fiscal, sanitary and marketing constraints imposed by legalization. The challenges of legality should not be underestimated and many producers prefer their informal status. The implementation of an agro-industry in Brazil today involves acquiring an environmental permit, the scaling of the agro-industry and the drawing up of the plant. This must then be submitted to a range of organs for approval. The property's water must also be subjected to testing. When approved, a technical project for financial operations needs to be drawn up and labels prepared for the product; these must be sent for approval to the appropriate body. In the APACO case, the producer must also participate in or create a subsidiary of the broader group cooperative. Once implemented, the producer must deal with accountancy issues, negotiate continuously with the environmental authority, subject the products to monitoring by the relevant sanitary body, undertake quality analysis of the product, devise marketing strategies, use the label 'Colonial Taste' together with personal labels, and use barcodes. These services are provided by the central support structure (UCAF) and must be paid for on a monthly basis. The agro-industry therefore must be a going concern.

In the region under the coordination of APACO, there are now 12 cooperatives and 117 family agro-industries involving 600 families. 784 items are being sold on the formal market at 4 000 sales points. There has been some US\$6 million of investment for an overall turnover of some US\$10 million per year. Net income per person is calculated at around US\$200 a month. 'Value added' is generally between 50 and 100 percent of the price the product would gain as raw material. The agro-industry generates on average of four jobs per family.

5.11 EPAGRI and the territorial network

Until this initiative, EPAGRI had not provided any specific support for agricultural processing or value added initiatives. Its influence, however, had been crucial in the professionalization courses and in the earlier experiences with condominiums. These associative activities were important for the consolidation of social attachments and were often the embryo of the group agro-industries. The pilot project served as a blueprint for EPAGRI's promotion of agro-industries in the Concordia region (where Sadia, the leading agro-industry in white meats, has its headquarters).

Unlike Chapecó, there was no history of group organization in the Concordia region nor was there a network structure such as that created by APACO. The farmers involved in the project tended to be more capitalized and their projects were generally on a large scale and closer to the industrial model, since they had no prior experience in the informal marketing networks which predominated in the APACO network. The Federal Government's Territorial Development Program was elaborated in this same period and the Concordia area coincided with one of the territories (Alto Uruguai) adopted in this programme. The EPAGRI technicians integrated the two initiatives and their organizing activity substituted for the lack of social networks. Both trust and the confidence to engage in collective action – which had been consolidated informally over the years in the case of Chapecó – was built up in the meetings, discussions and negotiations promoted by EPAGRI in the elaboration of the project.

In the case of Concordia the function of the support centre – which provides management and marketing assistance – was attributed to a second degree cooperative uniting some 16 municipality-based cooperatives of family farmers with rural agro-industries. In total, some 194 multi-family agro-industries were promoted, incorporating 1 000 families producing 23 different types of products and generating 800 direct jobs. Table 5.7 provides a comparison of the two experiences.

5.12 The experience of the settlements

While the APACO and the EPAGRI models may correspond more to the reality of family farming structures in the western region of Santa Catarina, they are not the only alternatives possible, or necessarily always the most appropriate. In the very different conditions of the agrarian settlements under the leadership of the Landless Workers Movement (MST) and therefore with a very collectivist orientation, a very different agro-industrial model has emerged. Mentioned above was the fact that a number of small-scale initiatives had been promoted in the settlements of the western region, including dairy products and chicken abattoirs. These were followed by a much more ambitious project in 1998 involving a dairy operation for the production of UHT milk, Long Life milk and packaged milk. In 2002, processing capacity was 100 000 litres per day, increasing to 300 000 litres per day in 2008.

Such a model involves a sharp separation between farmers as the producers of raw material and the processing and distribution activities conducted centrally under the control of the cooperative. Unlike the case of colonial products, we are also dealing here with an undifferentiated commodity typical of large-scale industry. The technology is imported and the packaging is supplied by a multinational; this amounts to some 30 percent of the final product price, leaving little room for price negotiation. For the farmer there is little in the way of innovation and technological learning: scale efficiencies and price become the dominant considerations. In defence of this option it can be shown that the plant not only provides income for the members of the settlement but is also an important outlet for family farmers in the region. In addition, the settlement is in the extreme west of the region, where there is little in the way of local markets and production is distant from important consumer centres.

The option for this traditional large-scale commodity model may be largely a reflection of an ideological commitment to collectivist strategies on the part of the MST. On the other hand the specific marketing justification carries weight, and the option for a UHT plant may be an appropriate response in the case of land settlements situated in isolated areas with very sparse local markets, a long way from the major consumer centres. The results so far are quite impressive. The settlement cooperative has some 300 members but there are as many as 3 000 suppliers of milk for an operation which has created 200 direct jobs, has a turnover of some US\$5 million a month, and is now the second most important activity in the municipality from the point of view of tax generation. The settlement cooperative has established a partnership with a transport cooperative and its president has now become the mayor of the municipality. The Long Life milk is sold under the collective brand, Terra Viva, which also serves as an umbrella brand for poultry, jams and pickled vegetables.

TABLE 5.7

A comparison of the APACO, EPAGRI and land settlement networks

	The APACO network	Epagri's territorial network	Land settlement networks
Origin of the network	Social and trade union movement with the support of the CPT	Initiative of EPAGRI technicians in Concordia	Movement of Landless Rural Workers (MST) and the Pastoral Land Commission (CPT)
Organizational form	<p>UCAF – association with participation of representatives from the agro-industries</p> <p>Agro-industries are affiliated to the regional or municipal cooperative</p>	Cooperative in each municipality with the agro-industries ceded to this via contract. The CECAF is a central cooperative to which the 16 municipal cooperatives are affiliated	Cooperatives and associations (integration between settlements and neighbouring small farmers)
Objectives of the support centres (UCAF, CECAF)	Create value added to family farm production; promote the Groups for Agricultural Cooperation (GCA); support processing of artisan and agro-ecological products for local and regional markets; provide technical assistance for marketing; management of the label 'Sabor Colonial' (Colonial Taste)	CECAF's principal function is to enable marketing outside the region and for scale in both purchases and sales	Large-scale organization of production, processing and marketing
Articulation with other networks	<p>Network of Agro-industries (UCAF)</p> <p>Cre\$ol system</p> <p>Networks of NGOs and social movements</p> <p>Municipal unions and Fetraf-Sul</p> <p>Federal Government: Ministry of Agrarian Development (MDA)</p> <p>International networks of fair trade and slow food</p>	<p>Association of the Municipalities of Alto Uruguai</p> <p>Municipal Governments</p> <p>Municipal unions of rural workers</p> <p>The Microbacias Project, The Territories Project: Secretary of Territorial Development (MDA)</p> <p>Secretary of Regional Development</p> <p>UNDP</p>	<p>Regional producer and transport cooperatives</p> <p>Small Farmers' Movement (MPA) and the Via Campesina. Partnerships with conventional industries</p>
Relation to the State	Greater autonomy of agro-industries in relation to Local Governments and State bodies	Greater influence of Local Government and technicians of EPAGRI in the cooperatives and in the central cooperative	Large autonomy in relation to the State, but initiatives based on public funding from the Federal Government

TABLE 5.7 (continued)

A comparison of the APACO, EPAGRI and land settlement networks

	The APACO network	Epagri's territorial network	Land settlement networks
Dominant values	Promotion of artisan values	Greater weight of the industrial values of scale and costs, but also promotion of artisan values	Dairy agro-industry organized on industrial lines, but with emergence also of artisan family agro-industry. Appeal to consumers on the basis also of civic values
Relations with the market	Members of the agro-industries are responsible for marketing; farmers make their markets on the basis of mutual trust between producers and consumers	Sales manager of CECAF organises the pre-sale of the local cooperatives production with the market	The Cooper-Oeste Cooperative establishes itself as the marketing arm. It develops its own distribution network for the conventional market (supermarkets and principal consumer centres)
Formation of agro-industries	Began in the informal market. As they build the market the farmers enter the UCAF network and build their agro-industries with a view to their legalization	Farmers join the cooperative and build their agro-industries, marketing their products from the outset within the formal market	Began with pig rearing condominiums and the production of the most popular type of milk (Milk category C) Production of colonial cheeses on the basis of informal associations Construction of a UHT dairy plant to access distant consumer markets
Use of the quality seal	The collective brand – 'Sabor Colonial' – aims to create a collective identity in relation to the local and regional market	No brand for collective use. The network aims to create an identification with the 'territory' of the AMAUC	Use of the collective brand name <i>Terra Viva</i> . Tries to establish an identity with consumers for its products on the basis of the agrarian reform
Technical assistance	Technicians hired by the UCAF and supporting agencies	Technicians from Epagri and local governments	The cooperative provides extension services with professionals who are mostly the sons of settlement farmers

5.13 Comparative overview of the three experiences

In Table 5.7 we provide a comparison of the dynamics behind each of the three networks constituted in the western region for the promotion of family-based agro-industries. This comparison focuses respectively on: the origins of the networks, the organizational form which they assumed, the objectives established by the coordinating body, types of articulation with other networks, relations established with the State, the dominant values espoused, relations with the market, the formation of the agro-industries, uses of the quality seal, and forms of technical assistance.

5.14 Conclusions

The western region of the State of Santa Catarina is in transition. The traditional white meats agro-industry remains strong although the intergenerational continuity of contract integration is in question. Even here, however, evidence of out-sourcing by integrated farmers suggests that strategies of concentration and scale are adapting to the realities of the region's farming structure (Mior, 2003). With urbanization and new levels of infrastructure (hotels, airports etc) the region's reputation has led to it becoming a centre for international trade fairs related to the sector. The tobacco sector and particularly the dairy agro-industry have also grown considerably as more and more farmers excluded from pig production look to these sectors for alternatives.

Alongside these tendencies, a convergence has emerged among social and political movements and small farmer organizations that an alternative path of regional development is necessary and possible. Such a path is seen to be based on strategies of direct access to markets for processed agricultural products from agro-industries created by the family farm sector. Many initiatives are driven by a supply logic – that of finding markets and generating income for family farm production. As a result, the profile of this movement is mixed and the appeal to superior product quality based on artisan, colonial values is combined with competition in conventional local and regional markets. In addition, institutional markets are gaining in importance with the more aggressive role of public purchasing policies and legislation favouring local production for school meals. This latter provides a stimulus to organic and agro-ecological production.

Survey research in the late 1980s showed that there was a high level of support for 'colonial' products both in the cities and the rural areas of the Southern Brazilian States (Oliveira, Schmidt and Turnes, 1999). More recently, Dorigon (2009) has shown how the extra-regional market for colonial products is being created through the extension of the region's social networks via migration and trading routes. The support for colonial quality markets is also seen as central to the promotion of the tourist qualities of the region. It remains to be seen, however, how extensive the markets and services are that can be generated on the basis of a colonial quality strategy.

As the authors have argued, there is no one model for family farm development strategies. Here we have identified three different model:

- ▶ the NGO/APACO approach promoting agro-industries based on small farmer groups and oriented to artisan quality products;
- ▶ the public sector EPAGRI model encouraging the creation of individual agro-industries, organized in cooperatives for marketing, by better situated family farmers and with greater concern for industrial norms;
- ▶ the agrarian reform, MST-inspired initiative betting on the advantages of scale through aggregation in markets for traditional commodities.

Each of these strategies can be defended as complementary given the heterogeneous character of family farming in Brazil and the variety of markets. At the same time, they draw on the different comparative advantages of the organizations central in promoting each initiative. On the basis of different strategies, each organization has been able to mobilize networks, which have opened up alternative markets and provided access to different resources.

In addition, eventual conflicts and competition have not annulled the important levels of cooperation achieved between the different actors in the region, whether public or private, social movement or trade union. This has led to a region-wide movement, which has identified new roles for family farming that are no longer limited to forms of contract integration with large-scale agro-industry. While these will remain an important and perhaps dominant component of the region's dynamic, a strengthening of the autonomous capacities of the family farm sector and its supporting social movements, drawing on the values of its 'colonial' artisan past, is now seen to be crucial to the region's future.

What are the lessons that can be learned from this experience? In the first place, the Santa Catarina experience suggests there are neither simple, nor rapid, nor uni-dimensional pathways for development. This applies to both strategies and actors. The heterogeneity of the rural world implies that diverse forms of economic and social integration can be equally appropriate. Nor is it a question of polarizing public versus private, local versus global, market versus society. Not only are the frontiers increasingly fluid, but civil society organizations can be as great a guarantee of the continuity of initiatives as the public sector. Collective action is a pre-condition for success, but such action must be capable of bringing together heterogeneous organizations, interests and capacities into networks of committed cooperation. It must, at the same time, be compatible with individual and small group action whose capacity to confront uncertainty and adversity is rooted in shared social networks. Above all, the Santa Catarina experience points to the key role of cumulative, collective learning concerned as much with organizational skills as with technical skills. In particular, the skills and knowledge gained in social movements are often a stepping stone to market success. However, the transformation of these resources into a durable basis for sustainable development depends very much on the ability

to negotiate an institutional and regulatory framework appropriate to small farmer initiatives. Even with the support of such a favourable framework, success in the end will depend on consolidating markets outside the region. The achievement of these objectives requires the construction of broader alliances closer to consumption, committed to the specific values of family-farm food production.

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CHAPTER 6

Public–private partnerships for agro-industry development: Sustainability options for fertilizer subsidies

PAUL THANGATA, MALCOLM BLACKIE AND PAUL SEWARD

6.1 Introduction

The private sector plays an essential role in the socio-economic development strategies of countries. In India for example, the share of the private sector in capital formation in agriculture is reported to be approximately three times higher than in the public sector (Kumar, 2005). The private sector is also the engine for economic growth. Harmony between public and private sector actors is a prerequisite for equitable growth (Uliwa, 2007). Private sector driven enterprises create not only employment opportunities but also added value through their forward and backward linkages with other sectors and the delivery of services and products to the society as a whole. Globally, the private sector is the largest and most successful investor in new technologies. The private sector contributes two-thirds of the global investment in research. The value of research investments by the private sector in the USA alone is estimated to be US\$180 billion/annum. However, the situation is different in developing countries. As a result of several bottlenecks, often of an institutional nature, the full potential of public–private cooperation and that of private sector involvement in socio-economic development has not yet been fully tapped in sub-Saharan Africa (SSA).

Public–private partnerships (PPPs) are increasingly being emphasized as a mechanism for improving public service provision and implementing development programmes. Important benefits can be obtained by fostering more effective PPPs. In developing countries, such partnerships are often used to mobilize complementary and scarce resources in the public and private sectors for projects involving the development of infrastructure, communities and agriculture. There are many cases of partnerships among farmers, private companies, government agencies, and nongovernmental

organizations (NGOs), under which each entity contributes human, physical and financial resources to foster the generation and diffusion of innovations, new forms of technologies, and knowledge to redress gaps in the development, production, processing and marketing of improved agricultural products.

There are different definitions of public–private partnership (PPP). Spielman and von Grebmer (2006) and reviews by Oladeinde, (2003) and Scanteam (2004) have defined PPPs or strategic partnerships as collaborative arrangements or alliances between public, private, and/or civil sector entities in which partners jointly plan and execute activities that seek to achieve social goals that can produce benefits for all that would otherwise have been provided through traditional Government procurement. The idea is to accomplish mutually agreed-upon objectives while sharing the costs, risks, and benefits incurred in the process. In some cases, the aim is for the public sector to promulgate policies, make investments, provide tax concessions, or otherwise offer calculated measures to stimulate private sector growth. The rationale behind the creation of PPPs is more relevant to this chapter.

The benefits associated with PPPs include increased economic growth, improved efficiency in service delivery and service expansion, reduction of financial burdens on government, and poverty reduction. When correctly structured, PPPs can improve access to basic services and can also play a vital role in relevant sectors in Africa, such as agriculture and rural development (Rwelamira, 2002). Additionally, collaborations such as PPPs help overcome many of the impediments posed by market failures, institutional constraints, and systemic weaknesses in agricultural research, by building on complementarities, exploiting synergies, and distributing costs and risk between the public and private sectors (Spielman *et al.*, 2007). The PPP process recognizes that both the public and the private sector have certain advantages relative to each other in the performance of specific tasks, and can enable public services and infrastructure to be provided in the most economically efficient manner, by allowing each sector to do what it does best. PPPs entail a sharing of responsibility between government and the private sector.

Collectively, partnerships improve the capacity of researchers to address problems in agriculture that cannot be solved by a single actor (Spielman and von Grebmer, 2006). In a study of seven cases of public–private partnership building in which private sector companies, producer associations, and research organizations engage in collaboration for the purpose of developing innovations in agricultural production and value chains, Hartwich *et al.* (2007a) found that many PPPs fail because of a lack both of skills among the partnering agents and efforts to strengthen these skills. In an attempt to analyse the underlying causes of limited successes and the origins of negative perceptions in PPPs between large multinational firms working with smaller researchers, Spielman and von Grebmer (2006) found mistrust and suspicion at an individual level to be the major contributing factors. There is limited emphasis placed on how the partners will interact effectively or how relationships might be improved. Hence, PPPs often suffer from lack of trust and commitment, with the result that they fail to meet their potential.

The good news is that developing countries are starting to embrace the role of the private sector in research and development. In sub-Saharan Africa agriculture, new initiatives are starting to appear and these small 'islands of successes' in PPPs require encouragement and support, to be shared as models in the development arena. The structural adjustment programmes (SAPs), meant that governments controlled all input markets by their direct engagement in produce markets. This has been cited as a reason why the private sector in sub-Saharan Africa has not responded very strongly to the deregulation of input markets. The reality is that the private sector has been unable to fill the gap left by parastatal agencies because of a lack of public sector support. One reason why the private sector could not fill the gap is that the SAPs had missed one important step in its implementation structure: not enough mechanisms were put in place to support the creation and growth of the private sector.

This chapter intends to outline some solutions to filling the gap left by the 'missed step' in the creation of a vibrant public–private partnership during the SAP-era. The first section presents a background review of public–private sector partnerships in agriculture. The second section describes the lessons from the three agricultural partnership models in Kenya, Malawi and Tanzania. In section four we look at the role of fertilizer subsidies in agriculture. We use the case of Malawi's agricultural input subsidy programme to show how subsidy programmes can be costly to governments, hence the need for PPPs. In section five, we illustrate a conceptual framework detailing how to initiate a PPP in an agricultural input subsidy programme. The chapter ends with a conclusion in section six.

6.2 Promoting agriculture and public–private partnership models in sub-Saharan Africa

It is recognized that PPPs constitute a new mode of operation in many fields of development, including the development of innovation in the agricultural sectors of developing countries. For PPPs to be successful, capacities to identify opportunities, develop common interests, and negotiate commitments, are all prerequisites (Spielman and von Grebmer, 2006). In Latin America, PPPs are new ways of carrying out agricultural research and development (RandD). These partnerships spur innovation for agricultural development and have various advantages over other institutional arrangements fostering RandD. From a review of Latin American partnerships by Hartwich *et al.*, (2007a), the following have been highlighted as important aspects:

- ▶ partnerships reduce the costs and risks entailed in research;
- ▶ they improve the quality and relevancy of research results due to synergies among the partners, and ensure greater adoption by user groups;
- ▶ they lead to the accumulation of complementary abilities, skills, and resources;
- ▶ they lead to higher competitiveness and better market positioning as a result of improved competencies;

- ▶ they promote development and poverty reduction by providing small-scale farmers with access to knowledge and technologies.

In Latin American agriculture, Hartwich *et al.* (2007a) found that PPPs are justified when addressing a problem, or capitalizing on an opportunity that requires collective action or the pooling of innovative capacity. Partnerships cannot be established as a quick fix but rather require cautious organizational development. Public-sector promoting agents such as donors play a crucial role in building partnerships, particularly in order to motivate actors in the agri-chain, build trust among partners, and provide credibility. As partnerships are formalized, there is a need for leadership to support the day to day needs of the partnership.

The agricultural sector in sub-Saharan Africa is vital because it is the main source of livelihood for smallholders. However, studies on agricultural RandD suggest that many countries in the region are unable to bring public and private sector assets and resources together as a means of advancing agricultural RandD. Evidence suggests that the constraints to greater cross-sectoral collaboration result from mutually negative perceptions between the sectors, unresolved issues of risk and liability, and high transactions and opportunity costs. A broad range of economic policies could change this, thereby putting the proper incentives in place to meet sub-Saharan Africa's technological needs and stimulate growth (Spielman, 2004).

The era of structural adjustment programmes (SAPs) was marked by the drive to reduce government direct support to farming communities and increase competition between producers, processing companies and supermarkets within agricultural markets (KIT, Faida MaLi and IIRR, 2006). To some extent this happened, but to date, most sub-Saharan Africa countries are dependent on the public sector to provide services in the agriculture and rural development sectors. For development to take place in sub-Saharan Africa, various actors in the supply chain must invest in a coordinated way. In Indian agriculture, for example, Kumar (2005) has highlighted that the involvement of the private sector in agriculture has advantages such as:

- ▶ making the agriculture supply chain more efficient and enabling value to be delivered to its customers;
- ▶ eliminating the existing inefficiency in agriculture marketing due to multiplayer structure of intermediaries;
- ▶ providing good infrastructure and technologies to cater for the agriculture sector.

The challenge facing many governments in sub-Saharan Africa is to improve significantly the enabling environment that will encourage private sector participation in supporting smallholder farmer development. The private sector needs to learn how to operate effectively, and build a customer base, among dispersed poor farming communities. This can be accomplished in a partnership environment where the public and private sectors work together for the purposes of helping smallholder farmers improve their livelihood systems.

6.3 Case models of agricultural public-private partnerships

6.3.1 The Farm Input Promotions (FIPS) partnership model – Kenya

Fertilizer subsidies have become popular in many sub-Saharan Africa countries for both political and economic reasons. However, in Kenya the government has opted for a supportive environment to promote the growth of the private sector in the input marketing system. Many private establishments are now involved in fertilizer and seed marketing to smallholders. One such private establishment is the Farm Inputs Promotions Africa, Ltd. (FIPS). The model encourages private sector partnerships that aim to facilitate efficiencies in the maize value chain by improving access to appropriate farm inputs, plus the promotion of agribusiness for the wider benefit of smallholder farmers. This is achieved by creating a self-sustaining farm input supply system which would serve smallholders effectively and at a cost that the poorest can afford. The project has an emphasis on farmer-participatory research and farmer experimentation.

The FIPS is an independent NGO with the aim of making appropriate farm inputs more accessible to small farmers in Kenya. It is a successor to the Sustainable Community-Oriented Development Program (SCODP), a local Kenyan NGO aimed at increasing input use among poor farmers in Kenya's Nyanza Province – particularly Kisumu and Siaya Districts – by promoting fertilizer and quality seed to improve food security. The NGO started by using the 'mini-packs' approach, involving the packaging of improved fertilizers in 100–200 gram packs and vegetable seeds in small quantities, and promoting these to small farmer communities in market places, schools, and churches. To get the inputs to the farmers, FIPS-Africa co-coordinates with the private sector in the re-packaging of the appropriate seeds and fertilizers in small, affordable promotional packages. With 150 gram mini-packs of seed and improved maize varieties donated by commercial seed companies such as Kenya Seed Co., Western Seed Co. and Monsanto, FIPS-Africa has been able to promote these among smallholder farmers.

Main aspects of the FIPS model

The FIPS strategy relies on a push-pull scenario – on the one hand farmers are made aware of benefits from improved inputs, including management; on the other dealerships are provided with appropriate inputs to meet the demand catalysed by promotions. Farmer to farmer exchange of information is encouraged.

There are three very important aspects to the FIPS model:

- 1) *Private sector and value chain analysis*: FIPS developed partnerships with private sector seed firms such as Monsanto, Western Seed Company and Kenya Seed

Company to make seed available to local stockists in small packs (1–5 kg). It also works with stockists to create awareness of available inputs supplies, and conduct awareness raising campaigns at markets and with farmer, church, and other village based groups. Through FIPS the seed companies provided, free of charge, 100–200 gram mini-packs of their varieties to FIPS for promotions and farmer evaluation. Later, FIPS collaborated with a Kenyan mineral firm, Athi River Mining (ARM), to produce two revised blends of multinutrient fertilizers called Mavuno, a planting formulation containing nitrogen, phosphorus, potassium, sulfur, calcium, magnesium, and traces of boron, zinc, molybdenum, copper, and manganese, and a top-dressing fertilizer supplemented with additional nitrogen (Thangata and Blackie, 2005). FIPS has built a good reputation among the different players in the input supply system.

- 2) *Skills and capacity development for farmers and stockists:* FIPS staff in collaboration with staff from the Kenya Research Institute (KARI) established farmer field schools (FFS). In the FFS concept, groups of farmers learn together and are empowered in basic principles of crop nutrition and management. The approach emphasizes joint problem analysis, learning and problem solving. All the activities are carried out in the farmers' own fields.
- 3) *Experimentation and farmer participation:* Farmers are encouraged to experiment with new technologies through innovative promotion exercises. After promotional awareness among small farmer communities in market places, schools, and churches, farmers can experiment on their own small plots using seeds and fertilizers. Incentives are provided to farmers to do their own experimentation.

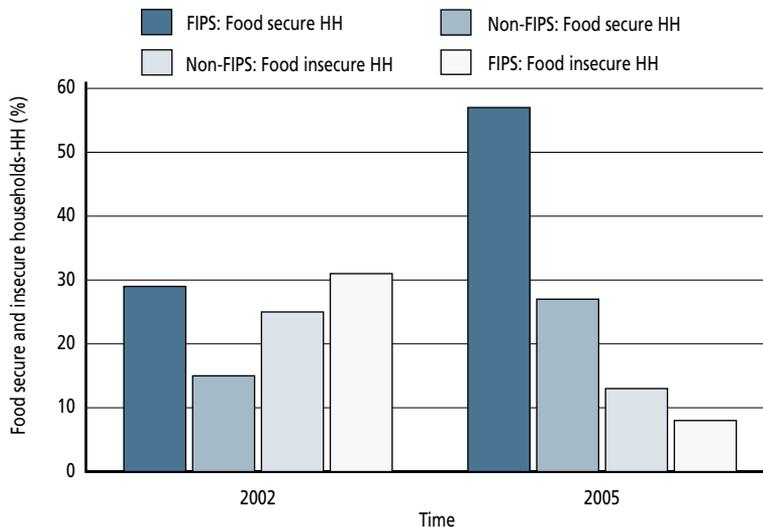
Lessons from the FIPS partnership model

An evaluation of the FIPS model in Kenya has shown that appropriate inputs supported by good agronomic training were directly benefiting smallholder farmers. This was attributed to the availability and affordability of the inputs needed. FIPS has earned the reputation of an 'honest broker' in linking resource-poor smallholders to the market. Important observational impacts include:

- 1) *Incremental strategy in the purchase of inputs:* Smallholder farmers adopt an incremental strategy in the way they purchase their inputs. They first take small steps by experimenting, at low risk and low cost, with small packs of inputs and are informed by data which they generate themselves. They start with very small quantities to apply to crops such as kale or cabbages. As farm produce increases and more profits accrue from the sales, convincing them that the technology has a positive impact on their livelihood, they then purchase more of the inputs.
- 2) *Crop diversification:* Once farmers are assured of the accessibility and affordability of productive and reliable inputs and gain experience in using the inputs, the households quickly diversify their farming systems into higher value options. As food security becomes assured, those with small land holdings expand production by renting more land.

- 3) *Direct and indirect impact on food security:* Evidence from FIPS areas suggests that both direct and indirect benefits of the approach are impressive and could further enhance the effectiveness of the initiative. Figure 6.1 shows data from the impact analysis of FIPS in Kenya (Thangata and Blackie, 2005). At the beginning of the programme, even among the better off households, food insecurity is prominent. Only 29 percent of the FIPS adopting households were food secure at the start of the programme in 2002. Within three years this group had increased to 52 percent (an increase of 23 percent). The number of FIPS participating households who were food insecure dropped substantially by 24 percent from 31 percent. But, even more importantly, there is a substantial impact beyond those directly collaborating with FIPS. At the start of the programme only 15 percent of the non-FIPS participating households were food secure. By 2005 the number had risen to 27 percent. The percentage of non-participating households that regarded themselves as food insecure when the programme began – 25 percent – had fallen to 14 percent, a decrease of 11 percent by the end of the three year period. Taking these trends and incorporating them into a standard adoption model, the region could very quickly be transformed through sustained support for the FIPS model.

FIGURE 6.1 Impact on household food security among participating and non-participating farmers in Embu, Kenya



Source: Thangata and Blackie, 2005.

6.3.2 The Malawi Agriculture Partnership (MAP) model

The Malawi Agriculture Partnership (MAP) was born out of the Sustainable Agri-Business Initiative (SABI). The SABI is a programme managed by the Malawi country office of the Africa Corporate Citizenship (AICC-Malawi). The AICC-Malawi is a non-governmental organization committed to promoting responsible growth and competitiveness in Africa by changing the way companies do business to benefit people, the economy and the environment. When the SABI tried to introduce a FIPS type model into Malawi in 2008 a modified version of its concept was needed, fundamental for the strategy to work within that country's context. The wide spread of the partnerships' activities and the emphasis on linkages with other parts of the value chain – as seen in the FIPS model – demands the willingness and the capacity to appreciate other parties' perspectives and requirements, and a determination to think and act 'outside the box' of usual duties.

Today, the SABI has created a platform for the private sector to work as a team to improve collaborative initiatives and encourage dialogue between the public sector and other agri-sector stakeholders. The main goal of the MAP is to improve specific value chains within a public–private partnership framework to support sustainable and profitable smallholder agriculture in Malawi. This will support the government's Agricultural Development Program (ADP), which emphasizes close partnership with the private sector. This PPP initiative being supported by the ADP is a new concept to most private sector organizations in Malawi. Previously, there had been no platform for the private sector to work as a team and therefore no partner to support the ADP initiative of poverty alleviation through remedial actions on all relevant parts of the value chain. This also meant that smallholder farmers had no or very little influence on policy developments and project activities that influenced their livelihood.

Main aspects of the Malawi Agriculture Partnership (MAP)

The MAP initiative focuses on encouraging dialogue and learning options for the following stakeholders:

- 1) *Smallholder farmers, the main actors*: Few farmers are integrated into productive and profitable commodity value chains. The MAP therefore aims to ensure that farmers have appropriate access to inputs and profitable output markets through effective institutional arrangements (e.g. outgrower schemes and development of stronger farmer associations).
- 2) *Malawi Government, the Ministry of Agriculture*: The overall policy-maker, the Malawi Government is a key partner. With help from the government, it is plausible that support services such as finance and public extension services will take on a more focused and effective role in value chain development.
- 3) *Private firms working in agriculture and agribusiness*: This focuses on improving linkages between farmers and private firms that provide various services to the agricultural sector. The MAP has already started analysing the strengths and

weaknesses of all players in the value chain. This aims to encourage relevant involvement by value chain partners and improved transaction efficiency and reduced risk, to encourage further private sector involvement.

Lessons from the Malawi Agriculture Partnership (MAP) model

The MAP is a new effort in the country. The process is an attempt to establish a new way for agricultural business development that supports the aims of ADP. Some lessons from the initiative include:

- 1) *Developing the market-commodity value chain:* The MAP development process (and specifically the rice and cotton partnerships) has been driven by needs and trust rather than formalities. To date, the MAP has developed the cotton and rice value chains. The programme is working on other similar initiatives led by the value chain.
- 2) *Trust among private sector players:* While in the FIPS model different private sector organizations showcase and demonstrate their product through one NGO, the SABI model allows partners to showcase the products at one place. Each is allowed to show the best from their efforts without any negative competition. There is trust among the private sector organizations. While it is similar to the FIPS model in Kenya, it is unique in the sense that the agri-business development farm at the Natural Resources College has both profit and development objectives. The different private sector players at the farm have different yet supportive roles.
- 3) *From smallholders to small-scale commercial farmers:* Like in the FIPS model, the farms are run as a business – therefore demonstrating the move from smallholder farming to smallholder-commercial farming. The fact that different private sector organizations demonstrate the management of different crops at one farm encourages crop diversification, and allows small scale farmers to visualize moving from subsistence agriculture to business-oriented farming in small steps. It also provides a learning environment for these private sector organizations to learn to operate effectively among different smallholders.

6.3.3 The Tanzania Agricultural Partnership (TAP) model

In Tanzania, a significant proportion of small-scale farmers cannot get reliable supplies of fertilizers. Inadequate supply and the lack of timely arrival of appropriate fertilizers are some of the major constraints to production. Others include limited access to extension support. The Tanzania Agricultural Partnership (TAP) is an innovative public–private partnership to support agricultural development, profitable commercial activities, and poverty reduction. Initially coordinated by the Agricultural Council of Tanzania, TAP is a grouping of local, national, and international partners willing to work together to respond to the major challenges and opportunities in agriculture. The Partnership combines commercial and development goals.

By doing so, it aims to provide increased choices and more services that are efficient to Tanzanian farmers. This will establish a sustainable, business-based foundation for small-scale farmers to move from subsistence agriculture to profitable and diversified commercial farming.

Some of the TAP's immediate objectives are to:

- ▶ improve the affordability and accessibility of appropriate inputs to smallholders;
- ▶ improve output market linkages;
- ▶ increase profitable agricultural production;
- ▶ stimulate private sector investment;
- ▶ establish benchmarks for best practices in development and commerce.

Main aspects of the Tanzania Agricultural Partnership (TAP)

The Tanzania Agricultural Partnership (TAP) was established from existing skills, knowledge, and institutions. It focuses on informal efficiency, operational linkages, and effective communication between partners. The TAP model aims to forge links and improve trust and understanding between key public and private sector operators. It is a vehicle for providing more choice and improved services to the country's farmers and agri-businesses. For the small-scale farmer in particular, this means an opportunity to move from subsistence agriculture to sustainable and business oriented farming.

- 1) *Commodity Investment Plans*: The TAP works on the promotion of Commodity Investment Plans (CIPs), a new approach to bring the public and private sectors together to focus on business-based agricultural growth. The CIPs are meant to establish and support value chain linkages over a specified time, usually 3 to 5 years.
- 2) *Knowledge and skills sharing*: The TAP provides a good basis for showcasing new technologies and production options. The 'farmer experimentation' encouraged by FIPS provides a valuable test bed for evaluation and widespread uptake of innovation among both farmers and their input and output marketing partners. Farmers experiment with different crop varieties and fertilizers that can increase productivity.
- 3) *Promotes partnerships among stakeholders*: TAP promotes partnerships for collaboration in production, trading, processing, planning, and market linkages.

Lessons from the Tanzania Agricultural Partnership (TAP)

So far, TAP has developed broad-based commercial development programmes to improve fertilizer supply, distribution, and profitable use in Tanzania through a public-private partnership. The TAP is already collaborating with FIPS-Tanzania (Farm Input Promotions-Tanzania), a new NGO piloting small input package and demonstration plots since 2007. Lessons from the TAP initiative include:

- 1) *Support to value chain linkages*: The CIP helps facilitate collaboration between the public sector, local producers, agro-businesses and other commercial services. A step-by-step guide on CIP training about how to prepare a commodity investment plan is under development.
- 2) *Knowledge and skills sharing*: The TAP provides a good basis for showcasing new technologies and production options. TAP is piloting small input package and demonstration plots.
- 3) *Warehouse Receipt System (WRS)*: This is another new initiative. The objective of the WRS is to ensure that farmers have a place where they can store their produce immediately after harvest, when prices are very low because of oversupply, and sell them for a better price later in the season. TAP provides training in Warehouse Receipt System (WRS), especially for farmers reluctant to take their produce to the warehouse for fear of embezzlement.

6.4 The role of fertilizer subsidies in agriculture

In the 1950s and 1960s, fertilizer subsidies were concentrated mostly on export crops and were geared to educate farmers in the proper use of fertilizers (IFDC, 2003). However, if not well planned, fertilizer subsidies can result in a number of distortions. Often they fail to reach the target farmer groups and benefit those who already have access to inputs. They can inhibit the development of fertilizer marketing based in the private sector and result in costly and ineffective state monopoly distribution systems. In addition, the price distortions can lead to the inefficient application of this important input by fertilizer users (IFDC, 2003).

Prior to the structural adjustment programme (SAP) years, sub-Saharan Africa governments' control over input and output prices by direct state engagement in produce markets was believed to have held back the emergence of private traders and service providers, and possibly stifled innovation at the farm level. On the other hand, the private sector response to deregulation has reportedly been weak. The private sector is unwilling to go to areas routinely visited by government employees in the past. However, the problem with the SAPs was that sub-Saharan Africa governments were coerced to reduce their role in the production and distribution of food without assuring a private sector strong enough to fill the resulting gap (Howell, 2005).

Recently, fertilizer subsidies have become popular in many sub-Saharan Africa countries. Most governments in Africa are interested in promoting the increased use of fertilizers through input support programmes, because this can contribute to long-term improvements in agricultural productivity and poverty alleviation. Economically, the benefits outweigh the costs of fertilizer subsidies in terms of foreign exchange savings resulting from import substitution. Not all subsidies are unproductive, if their main objective is to stimulate the development of an efficient and profitable fertilizer

marketing system (Morris *et al.*, 2007). Subsidies can also be a useful part of a broader strategy to overcome market failures from high transactions costs and risks resulting from poor infrastructure and access to information on new technologies. Nevertheless, fertilizer subsidies, if not well planned, can prevent the development of the potential for the private sector to market fertilizers. In general, subsidies create distortions that lead to inefficient application (IFDC, 2003). Present day subsidies have a short-lived impact and need to be modeled to make them sustainable in the long run.

It has been questioned why African policy-makers should reduce fertilizer subsidies when farmers in OECD countries enjoy generous subsidies and protectionism (Eicher, 2004). One of the arguments has been that these countries can manage and sustain subsidies while most African countries are dependent on donor aid. Understanding the issue from the perspective of African governments brings in a different dimension. Subsidizing the price of fertilizers to farmers is justified as one way to encourage smallholder farmers in developing countries to use greater amounts of fertilizer to increase agricultural production. Using fertilizer is risky in sub-Saharan Africa's rain-fed agricultural systems, where unreliable weather can make crop responses to fertilizer highly variable. Reducing costs may increase the chances of farmers taking that risk. Many farmers have difficulty raising enough cash to buy inputs, so a subsidy may make the purchasing of such inputs more attractive. Subsidies offset high fertilizer prices, reducing input–output price ratios. They also protect poor farmers from volatile world market prices (Blackie and Thangata, 2006; Thangata, 2006).

In sub-Saharan Africa, agribusiness development can provide part of the answer to the collapse in support services, which occurred in most African countries following structural adjustment. In many instances, agribusiness firms provide marketing, finance, input supply, and advisory services to producers, or serve as intermediaries for improving producer access to services. In brief, agribusiness development is inevitable. The real issues are not whether to accelerate but how to do so, how to ensure that maximum benefits are realized, and how to address equity and ensure fairness in the changes that will be taking place (FAO, 2005).

6.5 Redefining the role of government in agriculture

Efforts to promote subsidies of fertilizers for farmers should be made in ways that do not distort or displace these emerging rural input markets. To ensure this, fertilizer subsidies could be provided to poor and vulnerable households in the form of vouchers. If the vouchers are specified as redeemable from certified rural stockists, then such 'smart fertilizer subsidies' could be used to further develop, rather than undermine, rural agricultural input markets that serve the poor (Morris *et al.*, 2007).

On the one hand, agricultural policy should promote increased competitiveness and, in doing so, avoid giving the wrong signals to the market – in other words, stick to

research, infrastructure, and trade policy. On the other hand, agricultural policy should contribute to rural welfare policy by subsidizing the poor in ways that reduce their vulnerability – in other words, direct incentives to increase production. Public resources can be used to promote fertilizer use in a way that is more likely to foster the emergence of a sustainable input marketing system led by the private sector (Morris *et al.*, 2007). Gabre-Madhin (2007) has emphasized the need for ‘getting markets right’ instead of ‘getting prices right’. Getting markets right implies that markets’ order depends on underlying institutions and supporting infrastructure, requiring guidance from a ‘visible hand’ and a concerted effort for the public sector to facilitate the role and performance of the private sector. With poor infrastructure, the transportation costs in sub-Saharan Africa are bound to continue skyrocketing. Addressing the longer term infrastructural issues that hamper trade should therefore also be prioritized. Other important areas to be addressed are: irrigation, commodity exchanges, market information systems based on rural radio and short messaging systems, warehouse receipts, and market-based risk management tools (Gabre-Madhin, 2007).

As has been shown above, fertilizer subsidies and SAPs are/were not necessarily flawed programmes. The fact is that the private sector players that emerged during the SAP implementation were too small and too weak to provide the services needed by smallholder farmers (Howell, 2005). Additionally, there was a missing step in the SAP implementation that should have been followed. There is a strong link between long-term, carefully-implemented policies to transform the agricultural sector, and effective responsive programmes to alleviate the immediate impacts of food insecurity. Additional measures to transform the agricultural sector into a more modern commercial one – aimed at helping smallholder farmers increase food production and rural incomes in a sustainable manner – are necessary to ensure that a fertilizer subsidy programme generates the desired long-term results. In the following section we use the case of Malawi to illustrate how an agricultural input subsidy programme can be rolled out via a public-private sector partnership, with the aim of developing the private sector into a viable economic sector – and hence a government partner in the development of agriculture and economic growth in general. But first, we give a brief background to the present day Malawi agricultural input subsidy programme.

6.6 The challenges of agricultural input programme policy in Malawi

Over 75 percent of Malawi’s population is reliant on subsistence agriculture. Since independence in 1964, Malawi has pursued an agriculture-led development strategy. Fertilizer subsidies made a substantial contribution to Malawi’s economic growth and macroeconomic stability from independence until the early 1980s. Then the fiscal costs of sustaining them grew out of control as a result of both endogenous and exogenous factors (Blackie and Mann, 2005). In 2003, a disastrous cropping season

left 3.2 million people in need of food aid. Poverty was devastating even ahead of this crisis. The majority of the population in Malawi were already consuming less than 1 500 calories per day and few households had any assets to sell. In 2005, close to 5 million people faced starvation. During the 2004/2005 season, about 1.3 million people required emergency food assistance, estimated at 56 000 tonnes of cereals.

A new input subsidy programme was initiated in 2002 whereby improved seed and fertilizers are given to resources-poor smallholder farmers at a subsidized price. In 2007, Malawi exported maize to Zimbabwe. Now in its fourth year, the Malawi agricultural input subsidy programme has been reported as a success story. In 2009 Malawi was reported to have had a bumper maize harvest of 3.66 million tonnes, which was attributed to the success of an agricultural subsidy. The 2008/2009 maize surplus is expected to contribute to Malawi's economic growth rate. However, Malawi is still heavily dependent on outside development assistance, which accounted for 42 percent of expenditure in the 2006/2007 budget. This is unlikely to change in the short or even medium term. Most Malawians still depend on maize as their staple food crop, and this in turn is linked to a dependence on chemical fertilizer. The policy on maize self-sufficiency as the only means to achieving food security in Malawi may therefore be questionable.

Table 6.1 shows the cost of the Malawi input subsidy programme from the 2005/2006 season to the 2008/2009 season. The programme's national budget share keeps growing every season. Serious questions are being asked about the financial control and sustainability of the programme as a result of its burgeoning cost and increasing demand on the national budget. There has been considerable debate about the sustainability of input subsidies and their impact on the private sector, and about the impact of the programmes' costs on other social sectors (Dorward and Chirwa, 2009).

In policy terms, there are two 'African agricultures'. One is for those farmers in a position to produce for the market, and the other is for those rural families who partly rely on their crops and animals to keep themselves from poverty, with only

TABLE 6.1
Actual fertilizer programme costs in Malawi

Costs	2005/6	2006/7	2007/8	2008/9
Programme cost (US\$ million)	51.0	74.0	115.0	221.4
Cost as percentage national budget	5.6	8.4	8.9	13.5
Cost as percentage of GDP	2.1	3.1	3.4	5.5

Source: Extracted from Dorward and Chirwa (2009).

tiny and occasional market sales. The latter group requires direct subsidization of inputs (Howell, 2005). However, subsidized input programmes should be time limited, temporary measures to increase food security and reduce poverty.

The increase in programme costs has not only arisen because of increased fertilizer prices. The scale and scope of the programme has also been on the up. Increases in scale are demonstrable from targeted subsidized fertilizer sales rising by 24 percent between 2005/6 and 2008/9, and actual sales increasing by 65 percent from 2005/6 to 2007/8. The scope of the programme has expanded with the introduction in 2007/8 and 2008/9 of flexi vouchers (for legume and cotton seed as well as maize), cotton chemicals and grain storage pesticides, and an announced extension of the programme to support tea and coffee farmers in 2009/10. Concerns about the sustainability, cost, scale and scope of the programme require particular attention to effectiveness and efficiency.

The programme's costs cannot be sustained. A market-based agricultural reform that enhances the role of the private sector is necessary. To achieve food security and economic stability, and to break the vicious poverty and food insecurity cycle in which many smallholders are trapped, requires more than the provision of subsidized fertilizer. Subsidies are not inherently bad, but their implementation in a manner which does not actively reinforce the efficient and profitable use of inputs simply builds up unsustainable problems for the future. The input subsidies should be regarded as a short-term strategy aimed at helping farmers get out of a vicious circle. They are viewed as a 'lesser evil' in contrast to food imports as a more efficient use of government foreign exchange resources. However, despite its short-term successes and commendations from both international and local organizations, the fertilizer subsidy is not sustainable in the long term. The input subsidy programme can be used as a policy to encourage farmers to use fertilizers and improved seed, while building a strong private sector in a 'fast track mode'.

6.7 Towards a framework for linking the private sector to public agricultural input subsidy programmes

In sub-Saharan Africa, the role of government is increasingly being questioned as an engine to the economic growth of countries. Some of the activities being carried out by the public sector can equally be undertaken by the private sector. In recent years, policy-makers in sub-Saharan Africa countries have taken initiatives to work in close collaboration with the private sector. However, some actors in the private sector do not have the expected knowledge capacities to promote economic growth. There aren't many examples that sub-Saharan Africa countries can learn from in building public and private sector partnerships, especially in the agricultural input subsidy programmes.

There are several ways to create partnerships. For example, Hartwich *et al.* (2007b) documented a five step process: (1) identifying a common interest; (2) negotiating the partnership contract, including financing and organizational design; (3) operating the partnership itself; (4) evaluating it; and (5) deciding to terminate or continue the partnership. In the United Kingdom, three stages have been identified (Reeve and Hatter (undated) cited by Hartwich *et al.*, 2007a) while in the United States three phases have been suggested (Warner, 2003 cited by Hartwich *et al.*, 2007a). Tennyson (2003) has documented a process of 12 phases for the Global Alliance for Improved Nutrition.

The authors recognize that partnership building is a dynamic process, not a static event. However, the framework illustrated in this chapter is for a specific purpose: the linking of the public and the private sectors in the agricultural input market as an exit strategy, an alternative to publicly-supported agricultural input subsidy programmes, which are on the rise in this region. The authors see this as a pre-defined partnership, with the public sector on one side and only private sector actors interested in the agricultural sectors on the other. For a viable input subsidy partnership, we suggested four main steps: (1) the start-up phase; (2) the emergence phase; (3) the expansion phase; and (4) the maturity phase (Table 6.2). However, depending on the country's level of private sector growth, different countries will have different entry points in linking the private sector to agricultural input subsidy programmes. This means the starting point of the partnership should be flexible and can therefore start from any step, from I to IV (Table 6.2). The number of years at each stage is also bound to change depending on the stage of the country's private participation. However, it is advisable that the whole process should take 10 years or less. The evidence of the past 50 years demonstrates the critical role of time and learning as important ingredients in the development process (Eicher, 2004).

In this suggested framework, as a first step the public sector will still be in control of the inputs programme (Table 6.2). There is still the strategic importance of an active government's role in the early stage of development, because it is unlikely that private traders will deliver research, extension and credit services to smallholders, especially to those in remote areas (see Eicher, 2004, on Zimbabwe). However, the public sector should make sure that the infant private sector is supported; this could involve key sectoral ministries such as finance, rural development and agriculture. Government's role is to create an enabling environment for business development which includes providing macroeconomic stability, investment-friendly policies and infrastructure development. In addition to this, governments should continue strengthening agricultural research and development in order to improve responsiveness to farmers. There is a need for government to sharply increase investments in RandD. Government policy is influenced through stronger lobby groups in the agricultural and agribusiness sector. Their aims can be achieved if the private sector players have strong linkages and speak with one voice to influence any required policy changes that will support private sector growth. However, it is necessary to understand that government will still be in control of most of the input market systems while the

private sector is getting itself up and running. Additionally, the government will have some private sector enforcement mechanisms to act as a moderator in the system.

One of the determining factors of successful partnership is good leadership (Hartwich, *et al.*, 2005). In order to foment a strong private sector, there is a need to strengthen institutional arrangements for coordination. At this time, the entire stakeholder community should start establishing a neutral management body that will help foster networking between the public and private sectors. It is therefore important that a private sector management structure or secretariat is established. This could be an existing body, as was the case in Malawi and Tanzania, or a new transparent body able to mediate and support all actors equally. The inclusion of Consultative Group on International Agricultural Research (CGIAR) organizations and NGOs, both national and international and including faith groups, plays a vital role at this point; support from donors is very crucial at this infant stage. As argued by Hartwich *et al.* (2005), brokering is at times a prerequisite to the successful establishment of a partnership. Therefore donors have a role to play as catalyzing agents in this early stage of the PPPs. Other aspects of donor roles could range from budgetary support specific to agriculture to support for public-private dialogue.

The second stage is the emergence of the private sector: this is a crucial phase. It will require the newly-established management structure to work towards developing value chains for all major commodities, and identification of the main actors in the chain. Similarly, the public sector is expected to assist the private sector by, for example, strengthening microcredit facilities, reviewing and starting to repeal any policies that might affect the proper growth of the private sector (such as restrictive import policies, licensing or tax disincentives), and eliminating duties and taxes on fertilizers. It is also important that government continues its support for the creation of farmer organizations and the strengthening of research and development (RandD), in order to improve responsiveness to farmers. It is necessary that government continues to oversee the private sector, given that there is potential for the early days of PPPs to be overcrowded with 'briefcase' type private sector dealers that are only interested in tapping into sources of government or donor funding. Donor support for capacity development of the private sector and the corollary financial services will be required.

In the third stage (years 4–6), the private sector begins to show signs of growth by starting to build its reputation; it is getting ready to be trusted with the responsibility of running the input programmes without government interference. Communication, knowledge sharing and capacity development should continue to be addressed at this stage. Similarly, knowledge sharing and market information systems improve supply chain effectiveness. Still, the private sector needs more public and donor support.

By the fourth stage, from years 7–10, the private sector should have matured and be able to take over control of the inputs sectors. The result is an efficient and effective

TABLE 6.2
 Framework for linking public and private sectors in agricultural input subsidy programmes for economic development

Step	Stage	Key private sector roles	Key public sector roles	Key donor roles
I.	EARLY (INFANCY) PARTNERSHIP DEVELOPMENT [Year 1] (Very limited private sector involvement)	<ol style="list-style-type: none"> 1. Creation of a neutral transparent management structure (secretariat) that will foster networking between the public and private sectors and be able to mediate. This could be an existing or a newly-established body 2. Capacity building farmer empowerment and farmer organizations 3. Support the establishment of rural retail networks for input trading systems; involve key government ministries such as finance, rural development and agriculture; include NGOs, faith groups and CGIAR organizations 	<ol style="list-style-type: none"> 1. Inputs markets very much under state control 2. Establish a voucher system redeemable at several private agri-dealer shops 3. Governments start working on policy reforms that support space for private sector actors to take root 4. Creation of supportive private sector enforcement mechanisms 5. Review restrictive import policies, licensing or tax disincentives 6. Infrastructure development aimed at reducing transaction costs 7. Increased funding for RandD and market information systems 8. Support private sector credit financing 	<ol style="list-style-type: none"> 1. Support capacity development in farmer organization 2. Support government in capacity development for working with and supporting the private sector 3. Training and business support development for small and medium-sized rural enterprises 4. Dedicated grants for the agriculture sector 5. Play the role of catalyzing agent in brokering public-private sector dialogue

Expected outcome: A well coordinated public-private partnership framework to achieve market cohesion, efficiency and cost effectiveness in place.

TABLE 6.2 (Continued)
Framework for linking public and private sectors in agricultural input subsidy programmes for economic development

Step	Stage	Key private sector roles	Key public sector roles	Key donor roles
II.	EMERGENCE [Year 2–3] (Limited private sector involvement)	<ol style="list-style-type: none"> 1. Effective coordination and administrative procedures in place 2. Commodity/ market/ value chain analysis for all major commodities 3. Identifying key stakeholders in the different market chains (initially this will be crowded with many actors) 4. Capacity development of farmers and farmer organizations 5. Building trust among partners and experience sharing in operating with smallholders 6. Support activities that create trust among partners 7. The communication process starts through knowledge sharing among the different actors in the market chain 	<ol style="list-style-type: none"> 1. Removal of restrictive import policies, licensing or tax disincentives; elimination of duties and taxes on fertilizers 2. Continue to support creation of farmer organizations; continue the voucher system 3. Continue improving transport infrastructure to reduce fertilizer distribution costs 4. Continue the strengthening of RandD in order to improve responsiveness to farmers 5. Review tariff barriers, trade agreements and trade negotiations that might deter the growth of the private sector 6. Start licensing the best private sector partners (those who share the principles and values of development) 7. Strengthen microcredit facilities 8. Support pluralistic demand-driven extension services 9. Private sector loan grantee 	<ol style="list-style-type: none"> 1. Continue support for capacity development of the private sector 2. Encourage the financial services sector to support the private sector, including farmers 3. Support the creation of a private sector innovation fund 4. Matching grants 5. Support lesson learning studies

Expected outcome: Investment-friendly climate supporting the private sector.

TABLE 6.2 (Continued)
 Framework for linking public and private sectors in agricultural input subsidy programmes for economic development

Step	Stage	Key private sector roles	Key public sector roles	Key donor roles
III.	PRIVATE SECTOR GROWTH [Year 4–6]	<ol style="list-style-type: none"> 1. Private sector becomes public sector's reliable partner in the input marketing 2. Demonstrable progress with market-chain innovations through reputation. This is the winning stage. Only reputable actors survive at this stage 3. Human capacity development to improve the business acumen for both farmers and private sector 4. Dealership capacity development to be able to make good business decisions at the local level and advise farmers on proper fertilizer use; site specific technology dissemination models 5. Farmers are able to experiment with new technologies 6. Support private sector and farmers' entrepreneurial capacity 	<ol style="list-style-type: none"> 1. About 75 percent of input market under private sector 2. Review any unintended undesirable outcomes from policies discouraging market liberalization 3. Continue the development of infrastructure such as road network, irrigation, etc 4. Monitor, review and drop private actors not falling within an agreed threshold 5. Government progressively hands over input market system responsibilities to private sector 6. Promote regional investment-friendly climate to support private sector growth 	<ol style="list-style-type: none"> 1. More funding to private sector (could be through matching grants) 2. Support the strengthening of government policy coordination to improve the business environment and market opportunities. 3. Publicize success stories and 'best bets' interventions and provide support for scaling out

Expected outcome: Well developed domestic markets, and more competition among private traders to benefit farmers.

TABLE 6.2 (Continued)
Framework for linking public and private sectors in agricultural input subsidy programmes for economic development

Step	Stage	Key private sector roles	Key public sector roles	Key donor roles
		<ol style="list-style-type: none"> 1. Support linkages between private sectors and credit providers 2. Support committed partners, i.e. fee paying for the secretariat 	<ol style="list-style-type: none"> 1. Government support for banking sector's involvement in the agriculture sector 	<ol style="list-style-type: none"> 1. Support for studies on trade privatization 2. Support financial services sector
<p>Expected outcome: Strong linkages between private sector (including farmers) and enhancement of the financial sector.</p>				

TABLE 6.2 (Continued)
 Framework for linking public and private sectors in agricultural input subsidy programmes for economic development

Step	Stage	Key private sector roles	Key public sector roles	Key donor roles
		<ol style="list-style-type: none"> 1. Knowledge management: improve information sharing is fundamental to farmers' adoption of technology 2. Support effective farmer experimentation with new technologies and options, and farmer participation in the generation of innovative markets 3. Support the diversification of smallholder agro-economic activities 4. Broaden value chain to bring in weaker members that might have not had the capacity to contribute in the initial stages (for example, small seed companies that use public germplasm and who are very effective at reaching cash poor and remote farmers) 5. Data collection, analysis and dissemination to all stakeholders 	<ol style="list-style-type: none"> 1. Review the potential to privatize trade in fertilizer with an objective to transfer the fertilizer management and distribution services to private sector hands 	<ol style="list-style-type: none"> 1. Support studies on knowledge management 2. Support to pluralistic extension services

Expected outcome: Increased communication and ongoing feedback between private sector and government on the positive impacts of the policy reform measures.

TABLE 6.2 (Continued)
Framework for linking public and private sectors in agricultural input subsidy programmes for economic development

Step	Stage	Key private sector roles	Key public sector roles	Key donor roles
IV.	MATURITY [Year 7–10] [Private sector expansion]	<ol style="list-style-type: none"> 1. Private sector becomes trusted partner of government 2. Private sector able to assist government extension services with own staff at the local level 3. Private sector firms make inputs available to farmers country-wide in a timely manner 4. Farmers are empowered with the information they need to select (and adapt if needed) the best technology combinations for their conditions 5. Farm productivity rises, farmers gradually diversify into other production activities 	<ol style="list-style-type: none"> 1. Complete government disengagement; input market under the private sector; complete privatization of input market systems 2. Broad-based participation in the market by indigenous entrepreneurs and smallholders 3. Government still provides oversight on the private sector 4. Good road network 5. Support licensing of stockists at the local level 	<ol style="list-style-type: none"> 1. Support to the monitoring and evaluation of the fertilizer market
<p>Expected outcome: Improved availability and affordable inputs at the grassroots level due to an efficient, effective and stronger private sector able to reduce transaction costs, therefore benefiting smallholder farmers.</p>				

private sector that is able to procure and deliver inputs in a timely manner to its beneficiaries. Depending on the private sector's developmental stage, countries can start the process from any level. This process should be an iterative one that has to be monitored continuously. By this time, the private sector should have standardization of practices in place and hence be self-regulated. Public resources can be used to promote fertilizer use in a way that is more likely to foster the emergence of a sustainable, private sector-led input marketing system (Morris *et al.*, 2007).

6.8 Conclusions

This chapter has assessed three case examples of public–private partnerships in sub-Saharan Africa, one in its early growth stages and the others in their infant stages. It has been argued that agricultural input subsidies are not a problem *per se*. The problem has been in the way they are implemented. The authors have argued that with the spiraling of the costs of input subsidy programmes, subsidies cannot be sustained despite being politically good. Economically, their benefits outweigh the costs of fertilizer subsidies in terms of foreign exchange savings resulting from import substitution. We have shown that unlike in the structural adjustment programmes (SAP) era, private sector development can provide part of the answer to the present day agricultural input programmes through the creation of partnerships between the public and private sectors. These can work together to develop the private sector so that it is able to handle the responsibilities. We have shown this was the missing link in the SAPs of the 1980s and 1990s: most sub-Saharan Africa governments were asked to privatize when there was no strong private sector.

The main message of this chapter is that in considering possible entry points for public interventions to increase fertilizer use in sub-Saharan Africa, it is important to adopt a long-term perspective. The issue is not whether fertilizers subsidies are bad or not. Governments have a social service role to play. However, governments also understand that they will not be able to finance input subsidy programmes forever at the expense of other services. It is in governments' interest to partner with the private sector, although in Africa, the private sector will need government support in many aspects. It is therefore important that the public and private sectors work as a team with the aim of developing the economy. Government should therefore use its support to develop demand and key actors on the supply side. This will require a deliberate policy on the part of the government and a change in the role of the private sector. Small steps will have to be taken in building strong relationships and trust between the public and private sector players. Otherwise, farmers – who are the main stakeholder groups – will lose out.

Understanding private sector activities and public–private interactions is indispensable for designing appropriate public policies and allowing the private sector to play its full role in a nation's development process. A public sector bias against recognizing

the role of the private sector discourages its growth. The authors have presented a four-stage process that should foment a strong private sector able to take charge of the input marketing systems in most of SSAs. The expected outcome is an improved, sustainable and profitable agriculture sector that is able to help poor smallholders in Africa improve their livelihood systems. The framework presented in this chapter has shown the need for supporting both smallholders and the private sector to increase demand on one side, and improve supply on the other. Government should see its support to the private sector as a sustainable 'exit strategy' to the input subsidy programmes.

The authors conclude that improving service provision and developing a market for services through stimulating innovation and experimentation at the group level, rather than subsidizing the market for inputs, provides a cost effective route to broad-based uptake of economically-viable improved technologies and to improved incomes among the poor. If well developed and properly implemented, this framework allows for a gradual withdrawal of subsidies in a phased manner. The end result is a liberalized, sustainable, private-sector driven input economy.

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CHAPTER 7

Agro-industrial investment promotion in Tunisia

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7.1 Introduction

In April 2007, a document submitted to the Agriculture Committee of the Food and Agriculture Organization of the United Nations (FAO) stressed the growing importance of agriculture and agro-industries in developing regions, and the role the sector plays in economic development and poverty reduction. Indeed, almost 75 percent of the world's poor live in rural areas and agriculture is their main livelihood. Rising incomes combined with increasing urbanization has led to the growing importance of agro-industries development (World Bank, 2007). Despite this recognition, the potential of agriculture and agro-industries as an engine of growth remains under-exploited in many developing countries. Agro-industries development is a key driver to increasing agricultural productivity and increasing food availability. These industries are also an important source of employment and income in rural areas. In this context, the creation of an enabling environment through political incentives for investment in this sector, including investment in improved productivity, infrastructure and institutional development, are of particular interest (FAO, 2009). This chapter presents a synthesis of policies by the Government of Tunisia aimed at encouraging investment in and development of agro-industries.

In Tunisia, Agro-Food Industries (AFI) have been developed through a dynamic process of division and restructuring of labour between agriculture and industry. Initially, these industries depended heavily on agriculture and were mostly limited to adding minimal value to agricultural products by simple processes such as basic packaging and storage activities. As they improved their manufacturing processes and services, increasingly incorporating technology and furthering the degree of processing and industrial transformation, this dependence was reduced. Currently,

the food sector is an essential component of the industrial fabric and occupies an important place in the economy.

This change in the dynamics of the food industry is the result of a series of fiscal and financial incentives introduced in the early 1990s, whose main objectives are the promotion of investment and improvement in productivity. However, despite the improved performance of the sector, investment in the food industry remains hampered by several constraints, including those linked to production and supply. In addition to issues related to prices and quality of raw materials, the seasonality of agricultural production, the lack of an efficient agricultural product assembly network and the high procurement costs associated with inbound logistics, means that the quantities delivered to the industry are insufficient, compared with the existing processing capacity.

The challenges of promoting agro-industrial investments in Tunisia are reviewed in this chapter. Following this introduction, the investment policy in Tunisia is presented in section two, after which a discussion of the performance of food industries is made in section three. Section four analyses constraints hindering the promotion of investment in agro-industries. It also shows that beyond the financial and fiscal incentives, investment promotion in the food industry requires an extension of organized and controlled collection, increased storage capacity, and organization of marketing. Furthermore, institutional measures are needed; they should aim to consolidate the role of producer and service cooperatives and regulate the relations between the different stakeholders. Section five concludes the chapter and suggests policy recommendations.

7.2 The main components of the investment policy

Four phases can be distinguished in the evolution of government policy in encouraging investment in Tunisia (Euro-Mediterranean Forum of Economic Institutes of Sciences, FEMISE, 2005, 2005). The first phase (1962–1969) was marked by the predominance of public investment. The second phase (1970–1980) corresponds to a period where the state was focusing more heavily on private sector development and where incentives were granted according to specific sectoral codes. The third phase coincides with the implementation of the structural adjustment programme (1987–1992). It entailed opening up to international trade, raising the need to revise the existing codes to reflect the changing situation, and to enact developments relating to the companies involved in international trade (1998) and services (1989). Since 1994, the objective of investment policy has been the intensification of investment, increasing efficiency of production factors and strengthening the private sector contribution to investment. The Investment Incentives Code (1993) and the National Upgrade Program (1996) are the two main pillars of the benefits granted to companies.

7.2.1 The Investment Incentives Code

Since 1994, investment in Tunisia is governed by the Investment Incentives Code, which serves to simplify previous legislation that had become too complex and whose effectiveness was questioned by both public policy-makers and investors. This code, presented as 'unique', was developed to reduce the distortions generated by the coexistence of a multitude of past policies and laws. The main objectives of the Code are the revival of investment, export promotion and promotion of regional and agriculture development.

The Investment Incentives Code is characterized by a set of regulations and numerous incentives governing both national and foreign investment. Established in 1993, the code was amended in 1995 with the emergence of new legislation revising and adding new provisions to these texts, particularly in 1999 and 2001, defining and redefining the regional development areas, new investors, small- and medium-sized enterprises (SMEs) and new technologies. The Code reinforces the openness of the Tunisian economy and covers all sectors, except mining, energy, the financial sector and domestic trade, which are governed by specific laws.

The Code and all related texts provide a set of fiscal and financial incentives favouring export regions, small and medium-sized enterprises, new investors and other more specific aspects. The incentives offered are both financial and tax related, designed to reduce the cost of investment generally.

The tax code applies to investments made in the following activities: agriculture, fisheries, manufacturing, public works, tourism, handicrafts, transport, education and training, vocational training, cultural production and animation, animation for young and childhood agegroups, health, environmental protection, real estate, other non-financial services such as IT services, studies, expert advice and assistance, as well as services related to maintenance of equipment and facilities. Other financial and tax benefits are granted as additional benefits and in activities considered priorities, such as exports, regional development, agricultural development, promotion of research and technology development, new entrepreneurs and SMEs, and investment support.

Specifically for agricultural development, the following provisions are made:

- ④ Full tax exemption on reinvested profits and income.
- ④ Full tax exemption for the 10 first years of operation.
- ④ Value Added Tax (VAT) suspended on imported capital goods that have no locally-made similar counterparts.
- ④ The State may incur infrastructure expenses to develop areas meant for fish farming and for cultivations using geothermal water.
- ④ 7 percent bonus on investment value.
- ④ 8 percent additional bonus on investment value, that can be granted for agricultural investments achieved in hard-climate regions: Gabes, Gafsa,

Box 7.1 Key measures of the Investment Incentives Code**Fiscal measures**

- Tax relief for shareholders up to 35 percent of profits or net revenue subject to corporate tax or personal income;
- Tax relief on profits reinvested back into the company up to a limit of 35 percent of taxable corporate profits;
- Ability to opt for the accelerated depreciation of equipment and production equipment;
- Exemption from customs duties, charges having equivalent effect, and payment of VAT (10 percent), for imported equipment not manufactured locally;
- Suspension of VAT on locally manufactured equipment when this was acquired before the entry into production;
- Payment of VAT (10 percent) for equipment acquired locally after the entry into operation of investment creation;
- Exemption from tax on profits during the first 10 years for: revenue from exports, agricultural projects, projects for regional development;
- 50 percent reduction of tax rate for export earnings from the 11th year for an unlimited period, 10 years for the regional development projects.

Financial measures

- Premiums investment – grants are provided for the protection of the environment, 20 percent of the cost of facilities, and regional development: 15 percent or 25 percent of project costs according to the location and the agricultural development; 7 percent of project cost with an additional 8 percent for agricultural projects in arid areas; 25 percent for fisheries projects in the north coastal ports from Bizerte to Tabarka.
- Full support by the State of social security contributions for a period of five years in the following cases: employment of new graduates and projects established in areas of regional development promotion.
- Support by the State of 50 percent of social contributions for five years for the use of second and third shifts, for companies that do not work with continuous fire.
- Coverage of costs of infrastructure: support provided in whole or in part by the State for certain infrastructure expenses, e.g. for the development of aquaculture and crops using geothermal energy, where projects are established in the fields being given encouragement.

Source: <http://www.tunisianindustry.nat.tn/en/doc.asp?mcat=12&mrub=92&msrub=207&dev=true#dev.agricole>

Medenine, Kebili, Tataouine and Tozeur. This premium can reach as high as 25 percent for areas around Gafsa that are in the process of converting from mining to other activities.

- ▶ 25 percent additional bonus on investment value for fishing projects in the north coastline ports from Bizerte to Tabarka.

Although it has become an incentive framework for investment, this Code has become rather complex for investors. There is an incompatibility between the spirit of a unique code and the plethora of texts governing the benefits to investment. Indeed, the new code has resulted in a proliferation of legislation to clarify its provisions and in a large number of changes (Aissa, 2002). Legislative changes have been enacted to respond to the changing economic situation facing the country, but the increasing number of clarifications has introduced a negative climate and uncertainty for business development. To date, more than 100 amendments to the code can be identified, the majority of which were made by law. (FEMISE, 2005)

The instability of the regulatory framework mainly concerns the scope of the Code. The list of sectors eligible for benefits is extensible because the decree establishing the activities under the Code was subject to nine changes – once in 1995, three times in 1996, twice in 1997, twice in 1998 and once in 2000. Projects eligible for ‘additional’ benefits have also been subject to repeated changes. From 1994 until 2000, forty decrees granting additional benefits are identifiable (Centre for Administrative Innovation in the Euro-Mediterranean Region, C.A.I.MED, 2003). This uncertainty plaguing the ‘new’ regulation of investment incentives is again wasteful, and is not likely to encourage investment because it introduces a complexity, a lack of clarity and transparency, and a sense of discrimination between beneficiaries who were precisely the source of its revision.

7.2.2 The National Upgrade Program

Technology remains one of the most decisive factors for industrial competitiveness. Given the changing international environment, it has become increasingly important for exporters from developing countries that have adopted an export promotion strategy to monitor and adapt to changes in the global industry to remain competitive. Countries that until recently had a comparative advantage associated with low wages now need to compete in a world where technology has become an important criterion of competitiveness. Today, the product life cycle can be extremely short, new production techniques lead to a restructuring of the international division of labour that reduces the direct costs of labour, and the increasing use of artificial materials is reducing the need for imported raw materials. In the absence of technological progress, the competitiveness of labour-intensive industries would be threatened and would be increasingly dependent on other forms of cost reduction, particularly the decline in real wages.

While some large Tunisian enterprises use advanced technology, this is not the case for smaller enterprises that have little access to it. However, the importance of technology for the success of exports on the one hand, and the inability of existing industrial structures to support technological development in the early stages of their industrialization on the other hand, raised the question about the desirability of State intervention in technology development in support of industries that are not yet equipped to cope with competition. This debate sets head-to-head the critics of state intervention, who refer to the failure of interventionist policies to ensure sustainable development and growth, and in the opposite camp those who advocate an active industrial policy, basing their arguments on the imperfections of information, capital and technology markets, externalities, economies of scale and learning by production. The success of the newly-industrialised countries during the 90s has revived the debate, highlighting the effects of a focused and selective industrial policy to promote infant industries. The experience of these countries shows that the State can play an important role in technological and industrial development, as well as long-term growth of industrial productivity. Industrial expansion and the successes of production for export have certainly benefited from industrial policies and the selective interventions of governments.

In Tunisia, the objective of export promotion, diversification and growing a range of exports makes the creation and accumulation of new technological capabilities a necessity for the economy. Use of technology affects the ability of industries to modernize and become competitive in markets increasingly open to foreign competition – hence the importance of the National Upgrade Program (NUP). This Program – spearheaded by the State for the modernization of the economy – emphasizes the adaptation to new competitive framework of strategies and training practices, research and development and the use of technologies. The NUP began in 1996 and aims to achieve international standards in quality and costs, and increase the competitiveness of industrial enterprises. This Program was developed by the Government to allow the Tunisian production system to adapt better to the exigencies of highly-competitive global markets. It is intended for companies in thriving businesses, without economic difficulties, and acting in industry and related services.

Some specific aims of the NUP are to:

- ▶ help the manufacturing industry to adapt and modernize strategies, methods and practices – organizational, management, innovation, training, distribution, marketing;
- ▶ encourage industrial partnerships and strengthen the socio-economic environment of the enterprise, e.g. by improving basic infrastructure and technological modernization of public institutions involved with the private sector;
- ▶ meet the challenge of increased competition through association agreements with the EU and via the dismantling of the Multi Fibre Arrangement (MFA).

The Program provides public financing for the implementation of upgrade plans through a Development Fund for Industrial Competitiveness. This is financed through a tax of 1 percent on local and imported products. Export enterprises subject to this tax are exempt.

Measures undertaken are exclusively oriented to incentives for investment, whether tangible or intangible. The aim is clearly to increase the rate of competitive and sustainable private sector investments to a level that can initiate a movement towards accelerated growth. These investments need to be directed to the improvement of competitiveness – only those contributing to productivity gains are eligible under NUP. Investment capacities which do not entail a technological leap are thereby excluded. Investments eligible for incentives provided in the Upgrade Program are defined by the following three areas:

- 1) *Intangible investments*: These are all intangible investments contributing to the improvement of the enterprise's competitiveness, including human resources, organizational skills, studies and exploration. These investments include shares of technical assistance concerning:
 - ▶ the production, control and planning processes in the organization of the enterprise;
 - ▶ improving the quality of products, technology transfer and acquisition of patents and licenses;
 - ▶ the training and qualifications of human resources.
- 2) *Capital equipment*: This involves all equipment investment contributing to improving the competitiveness of the company, including the replacement of equipment for technological improvement, the acquisition of equipment leading to increased efficiency (reduced costs and/or waste; improved productivity), the purchase of equipment for the balancing of production lines, and optimizing the utilization of existing equipment.
- 3) *Financial restructuring*: The upgrading of enterprises in some cases may require financial restructuring. This restructuring encompasses strengthening of capital (injection of new money), consolidation of the balance of financial structures (working capital), reducing the volume of inventories (in connection with the activity), the financing of investments on adequate permanent capital, and the optimization of resources to manage credit debts.

To encourage companies to undertake such investment programmes, the NUP provides the payment of premiums fixed by Article 6 of the Decree of 18 December 1995, as follows:

- ▶ 20 percent to the share of investment in modernization – productivity as part of the upgrade financed by own resources and 10 percent of those investments if financed by other resources;
- ▶ 70 percent of the cost of the diagnostic study to a maximum of 20 000 Tunisian Dinar (TND) and 50 percent of the cost of other intangible investments.

These last two levels of premiums will be adjusted later (Decree No. 97–2126 of 10 November 1997) with a ceiling set at 30 000 TND for the diagnostic study and a premium for intangibles increased to 70 percent. Moreover, it is expected that the premium on the diagnostic studies is granted – with the consent of the company – directly to the organization that conducted the analysis.

Notwithstanding the late disbursement of premiums, the National Upgrading Program can be considered a success because it has directly contributed to a boost in private investment, especially for operational companies. A survey completed by the Upgrade Office in 2002, concerning 1 103 companies in which the programme was approved by the Steering Committee, shows that companies had integrated the exigency of competitiveness in a local and international competitive environment. By late May 2004, 2 950 industrial enterprises had joined the Program, accounting for more than half of industrial firms with more than 10 employees and 25 percent of all industrial enterprises. Among these, 67 percent had diversified their production, 78 percent had developed new product lines while improving their manufacturing process, and nearly 82 percent of companies had improved their rate of equipment use. Furthermore, 75 percent of companies had adopted a quality and certification programme, and 69 percent had undertaken a restructuring of their business function to focus their efforts on improving their export development strategy. In 2007, the number of companies affiliated reached 4 187 with an investment of 2 594 million TND, almost 70 percent of the investment made by the entire industry. Table 7.1 shows the situation in 2009.

TABLE 7.1
Upgrade applications by sector (end April 2009)

Sectors	Applications approved	Investments (million TND)	Share of investment by sector	Premium granted (million TND)
Agro-food industry	359	911	19%	122
Leather and footwear industry	218	173	4%	27
Chemical industry	159	346	7%	45
Diverse industries	395	643	13%	94
Construction materials industry	140	953	20%	83
Mechanical industry	360	830	17%	127
Textile and clothing industry	1 279	939	20%	172
Total	2 910	4 795	100%	670

Source: API 2009.

TABLE 7.2

Investments in the manufacturing sector, 1988–2007 (Annual average in millions of dinars and at current prices)

Industry Sectors	1988–1992	1993–1997	1998–2002	2003–2007	Average annual growth, 1988–2007
Agro-food	80.97	133.64	207.10	235.00	8.58%
Construction materials	69.57	107.52	145.38	196.76	6.51%
Mechanical	78.72	83.92	152.00	211.00	7.54%
Chemical	34.25	65.84	87.22	111.42	7.15%
Textile and clothing	142.57	144.72	219.26	183.28	2.22%
Diverse	51.45	75.20	113.78	127.04	6.62%
Total	457.55	610.84	928.74	1 064.50	6.07%

Source: Central Bank of Tunisia.

Beyond the quantitative achievements, these measures tend to have benefited large companies and have resulted, essentially, in physical investments (Table 7.2). Indeed, for large companies, the opportunity offered by the Upgrade Program has come to fill a vacuum in terms of incentives. It is currently the only programme for which they are eligible (with the exception of cases where they have a regional or technological investment). This is the only instrument in Tunisia that supports investment without conditions related directly to the Investment Incentives Code. As such, it complements the Code, which has ignored the large-scale enterprises.

However, given the structure of Tunisian industry – mainly composed of small enterprises – this Program will in future focus more on smaller enterprises and intangible investments such as organization, information systems, methods of modern management, marketing, and research quality. Indeed, after its initial phases, which benefited mainly large companies, the Program has become more oriented towards small enterprises (whose average investment is less than 3 million TND). The share of small enterprises in the programme has increased from 21 percent in 1996 to 64 percent in 2006, and this trend is persisting.

7.3 The performance of agro-food industries in Tunisia

In the recent past, The Tunisian agro-food industry has registered improvements in all of its economic indicators. This result has come about through the dynamism of investments in this sector and the consolidation of its contribution to increased production and employment.

7.3.1 Investment

The agro-food industry ranks first among the manufacturing industries in terms of investments (Table 7.2). The investments made by the agro-food industry have increased from 24 million TND in 1986 to 270 million TND in 2007, which is ten times more than the rate of average annual growth of 12.2 percent.

After a period of stagnation during the 1980s, annual investments in the agro-food industry resumed growth. During the period 1995–2000 they recorded a steady increase, from 130 million TND in 1995 to 241 million TND in 1999. Starting from 2000 the trend reversed, down to 200 million TND in 2002. In 2003 there was a recovery which has registered an investment of 210 million TND (+5 percent). This recovery has continued, reaching 270 million TND in 2007.

In relative terms, the share of food in the Gross Fixed Capital Formation (GFCF) of manufacturing experienced a decline until the mid-80s. In 1986, the GFCF of AFIs represented less than 10 percent of investments in manufacturing. Starting in 1987, the share of the agro-food industry in manufacturing investment experienced a strong recovery. In the late 1990s, this share exceeded 20 percent. Over the period 2003–2007, nearly 24 percent of manufacturing investment was made by the agro-food industry.

New investment opportunities in the sector, generated by the implementation of the Structural Adjustment Program since 1986, are one of the main reasons for this recovery. In addition, the National Upgrading Program has enabled the sector to engage in a new dynamism based *inter alia* on innovation, compression of costs, and quality control, through complementarities between physical and intangible investments.

For the agro-food industry, the Upgrading Program seeks the restructuring of production and the modernization of processing factories, as well as the achievement of stringent standards of quality and food security, enabling enterprises to be more competitive. By joining the Upgrading Program the sector has shown a good adhesion of enterprises in the implementation of quality assurance systems, as well as better management and the establishment of laboratories.

Investment in the food industry is provided mainly by the private sector, with a share of about 90 percent of investments. Private investors cover the entire investment in the canned food industry (40 million TND), the cereals processing industry (33 million TND) and the olive industry (22 million TND). Public investment in the sector (a total of 21 million TND) mainly involves assistance to restructure some large enterprises, such as State participation in tobacco processing (12 million TND), sugar production (5 million TND) and milk processing (4 million TND).

Foreign investment in the agro-food industrial sector remains relatively low. The sector recorded a total of 125 units formed in partnership with local businesses, of which only 69 have more than 10 employees. Of these, 59 companies are joint ventures while only 10 were fully foreign-owned.

7.3.2 Production and 'value added'

The evolution of agro-food production was achieved at a slower pace than the economy as a whole, but at a faster rate than that of agricultural production. As a result of its role in processing agricultural products, the sector's performance was moderate and lies between that of agriculture and manufacturing. In the period 1997–2007, agricultural growth averaged 2.4 percent per year; food industries averaged 3.5 percent while manufacturing industries grew at a rate of 5.4 percent.

However, this growth has not been steady. The sector recorded an impetuous growth during the years 1995–1999, progressing from 3 180 million TND in 1995 to 4 928 million TND in 1999. In the following years, mainly because of the poor performance of the olive sub-sector, the contribution of the agro-food sector to economic activity was reduced, reducing the rate of contribution of the entire manufacturing sector in the formation of national income. The year 2003 is considered a turning point, when a positive value was recorded for the contribution of the agro-food sector with a growth rate of 3 percent. Depending on the situation of agriculture, the food industry has successively experienced strong growth (in 2004) and a slight decline (in 2005), caused by adverse economic conjuncture and climate conditions.

Among the sub-sectors, the highest growth rates were achieved by the dairy industry, whose production registered an average growth of 4.0 percent per year between 1988 and 2007 (Table 7.3). The national production of milk achieved self-sufficiency in drinking milk by 1999 and still covers almost all of Tunisia's milk needs. During the same period the production of canned food rose at an average growth rate of 3.6 percent per year. The production of olive oil ranked third, with an average growth rate of 3 percent per year.

TABLE 7.3
Evolution of production in the sector of food industry

	1988–1992	1993–1997	1998–2002	2003–2007	Average annual growth 1988–2007
Cereal processing (1 000s tonnes)	1 184.48	1 412.52	1 520.16	1 482	1,63%
Canned food (tonnes)	97 928.2	95 203.8	135 889	148 100	3,61%
Milk (1 000s Hectolitres)	1 902.54	2 242.2	2 970.08	3 488	4,08%
Olive oil (1 000s tonnes)	142.8	157	128	174.4	2,98%

Source: Ministry of Agriculture, Yearbook of agricultural statistics 2007.

TABLE 7.4

Breakdown of enterprises with 10 or more employees by activity and by system

Activities	Totally exporting	Other than totally exporting	Total
Oils and fats industry	14	312	326
Fruit and vegetable industry	17	45	62
Cold storage	56	81	137
Fish industry	39	37	76
Cereal and derivatives industry	4	234	238
Beverage industry	8	51	59
Milk and derivatives industry	-	37	37
Sugar and derivatives industry	2	24	26
Meat industry	1	24	25
Other food industries	21	59	80

Source: API 2008.

However, despite these performances, food industries are characterized by the predominance of primary processing of agricultural products. Nearly 55 percent of food industries are accounted for by grain processing (18 percent), slaughter of animals (22 percent) and manufacturing of olive oil (15 percent). Bakeries (2 400 units), and oil processing (1 440 units) constitute the bulk of agro-industrial units, representing 80 percent of companies in that sector. Some large modern capitalist industries exist in the processing of cereals, sugar refining and dairy product processing, but the sector remains dominated by individual small enterprises with low technical and financial resources.

The evolution of the production of agro-food industries is confirmed by a steady growth in added value. Between 1984 and 2007, the added value of the food industry increased with an annual average rate of 9.2 percent at current prices and 6.3 percent at constant prices. Thus, negligible until the mid-1980s, the share of the food industry in GDP grew to around 3.5 percent (average 2003–2007).

The agro-food industry is the second ranking in terms of contribution to the added value of manufacturing industries. With some of the added value of 17.5 percent (average 1994–1998), the food industry comes after the textile and leather industry (35.4 percent) and ahead of the engineering industry (13.2 percent). In 2003–2007, nearly 20 percent of the added value of manufacturing industries was created by the agro-food industry, against 18 percent for mechanical industries and 29 percent for textiles.

The dynamics of investment and production permits the food industry sector to consolidate its role in job creation. In 1994, the agro-food industry employed 48 600 persons representing 10.7 percent of manufacturing jobs. With an average of 2 000 posts created annually, the number of jobs reached 73 000 in 1999. In 2008, the sector had about 5 500 enterprises, of which a thousand included 10 or more employees, employing a total of 85 000 persons and representing 13 percent of all jobs in the manufacturing sector.

7.4 Constraints that still exist

Agro-food industries in Tunisia are experiencing difficulties and constraints associated with issues such as low-skilled workers, irregular supply of inputs, variability of the quality of agricultural products, outdated equipment in several units, non-compliance with food safety standards (particularly hygiene and quality) and the predominance of individual small enterprises with low technical and financial resources. The strong protection of domestic enterprises and the weak presence of international firms accounts for much of the fragility of several companies and their continued activity only at the early stages of the processing of agricultural products. However, it is two constraints that are mainly responsible for holding up the improvement of agro-food investment: the under-utilization of processing capacity and the problem of quality management.

7.4.1 Under-utilization of processing capacity

The partial operation of installed capacity penalizes the profitability of investments. Examples from processing of cereal products, the dairy industry and the processing of tomatoes illustrate this situation.

Grain processing

The transformation of cereal products, particularly durum wheat, includes the first processing phase (grinding at the mill) and the second processing phase (baking bread, producing pasta and other products). In Tunisia the sector comprises 28 mills. Seven units have been newly created in the last 10 years; they have a crushing capacity equal to 0.66 million tonnes per year but operate only at 0.21 million tonnes. Twelve units were rehabilitated and upgraded during the same period, and though their crushing capacity is around 1.66 million tonnes, they operate at only 1.2 million tonnes. The remaining nine older units have a crushing capacity of 1.2 million tonnes, but used only 0.55 million tonnes.

Nationally, the rate of utilization of available capacity is about 58 percent for all processing units and 53 percent for 28 mills. This is in large part the consequence of the anarchic development of processing capacity, particularly that relating

to milling and pasta, which has led to the decrease in use of existing processing capacity. This rate was 90 percent in 1988, falling to 86 percent in 1991 and to 70 percent in 1996; by 2006 it stood at just 58 percent.

Milk processing

Despite the increase in milk production in recent years, several challenges still hinder the development of the dairy sector. Tunisia has 13 dairy centrals with variable production capacity, of which only 11 are operational. The combined production capacity of 11 operational dairy centrals (1 980 000 litres/day) far exceeds the amount of milk collected at the national level (1 566 300 litres/day) and the population's consumption needs. Utilization of production capacity varies from one dairy central to another, of course, but around half of them operate at a rate of 50 percent of the installed capacity. It is likely that some factories using only half of their capacity will at some stage face financial difficulties that will result in their closure. This is a situation that seriously threatens the industry if the quantity of milk required by consumers does not increase significantly. The closure of processing plants could also lead to the ceasing of operations in milk collection centres, also impacting producers linked to these.

Tomato processing

The transformation of the tomato is the main activity of 32 units of production of canned fruits and vegetables in Tunisia. It represents 75 percent of their turnover, estimated at 150 million TND per year. The daily processing capacity rose from 19 680 tonnes in 1990 to 33 630 tonnes in 2005, and the number of units fell from 41 to 32 respectively over the same period. Until the first quarter of 2005, 22 processing units benefited from the upgrade programme for a total investment of 64 678 million TND.

Despite the great potential for transformation, the average capacity utilization rate of factories is about 30 percent. They operate at 66 percent of their full capacity during one month per year (from July 10 to August 10) and most often for 24 days only, as happened from 1996 to 2002. At the beginning and the end of the season, totalling six to seven weeks, the utilization rate is only around 8 percent. Considering the average capacity of 31 000 tonnes/day during the first three years of the 10th Plan, the authors believe that factories ran at full capacity for only 18 days in 2002, 20 days in 2003 and 24 days in 2004. This figure is low compared with other countries, where the potential for production of fresh tomato at a maximum theoretical processing capacity was, in 1996 and 1997, 80.9 days in California, 55.5 days in Brazil, 28.5 days in France and 41.7 days in Turkey (GICA, 2000).

A priori, the underutilization of production capacity may be attributed to the inadequacy, irregularity and seasonality of agricultural production. This is especially true in the case of Tunisia, where the performance of the agricultural sector remains relatively modest and where production is highly dependent on the weather. However, it is also important to note that the quantities actually delivered to

the processing units are often insufficient and in some cases much lower than the quantities produced (milk, tomato). This is explained by the inadequacy and inefficiency of the product assembly network and the high cost of transportation of agricultural products.

Thus, if the intensification of agricultural production is a necessary condition for the promotion of processing activities, the development of the food industry is also dependent on the conditions of raw material supply. The development and intensification of the system for collecting agricultural products should enable the supply of raw materials to the industry in more competitive conditions, in particular by ensuring a regular stream of inputs. This constitutes an important lever for the promotion of investment and increased production.

Indeed, milk production has increased significantly, particularly through the reorganization of the dairy sector and in particular through the establishment of the primary network of milk collection. The network of milk collection has increased from 11 centres in 1983 with a capacity of nearly 50 000 litres/year to 281 centres in 2005, with a daily collection capacity of nearly 2 000 000 litres. The quantities of milk collected increased from 20 500 tonnes in 1987 to 489 000 tonnes in 2004. The 10th Plan envisages the establishment of 21 new collection centres with a capacity of 63 000 litres/day, as well as the expansion of capacity of 18 existing centres for an additional 54 000 litres/day.

The establishment of a fairly dense collection network has allowed a significant proportion of produced milk to be channelled to the industry. Thirteen dairy factories producing drinking milk and derivatives have been installed. The quantities of milk processed by the dairy industry has been multiplied by 5.5 in 15 years, from 104 000 tonnes in 1989 (27 percent of milk production) to 562 000 tonnes in 2002 (60 percent of production). The quantities processed increased from 104 000 tonnes in 1989, representing 29 percent of milk production, to 297 000 tonnes in 1996, representing 48 percent of production, and 523 000 tonnes in 2003, or 59 percent of production.

However, despite the importance and extension of the collection network for milk, 40 percent of production still escapes the organized collection. This suggests the importance of continued efforts and resources to increase the reach of the milk collection network. In parallel with the intensification of production, the development of the collection circuit of milk is urgent as a pre-requisite to the competitiveness of the sector. This is especially so given the introduction of milk quotas in Europe and the depletion of surpluses; the price of milk powder has increased in proportions that made more attractive the use of domestic rather than imported milk.

For cereals, their collection remains dependent on climate conditions, with large differences from one year to the next. The quantity of grain collected by State agencies, in particular the Grain Board and central cooperatives, is estimated to be

TABLE 7.5
Upgrade applications by sector (end April 2009)

	1988–1992	1993–1997	1998–2002	2003–2007
Durum wheat Production (tonnes)	8 288.8	8 941.8	8 329.2	13 069.0
Collection (tonnes)	5 044.4	5 711.9	5 374.3	6 441.5
Collection rate (%)	60.86%	63.88%	64.52%	49.29%
Tender wheat				
Production (tonnes)	1 976.4	1 755.3	1 773.8	2 982.0
Collection (tonnes)	1 385.2	1 244.3	969.9	1 816.1
Collection rate (%)	70.09%	70.89%	54.68%	60.90%
Barley				
Production (tonnes)	4 061.8	3 396.3	2 551.6	5 772.6
Collection (tonnes)	1 318.6	721.7	195.2	474.2
Collection rate (%)	32.46%	21.25%	7.65%	8.21%
Total cereals				
Production (tonnes)	14 326.9	14 093.4	12 654.6	21 865.8
Collection (tonnes)	7 748.2	7 677.9	6 539.5	9 214.6
Collection rate (%)	54.08%	54.48%	51.68%	42.14%

Source: Ministère de l'Agriculture « Budget économique 2008 » et « Annuaire des Statistiques Agricoles.

7.7 million quintals on average per year (1988–2007), or approximately 49 percent of the total production. This average, varying from one product to another, has suffered for a few years from a slight downward trend, as shown in Table 7.5.

To better understand the reasons for the low collection rate of grain, the General Directorate for Research and Agricultural Development (DGEDA) carried out a survey concerning the destination of grain after the harvest, for the crop year 2004/2005. The main findings of the survey showed that the Office of Cereals and the central cooperatives had collected 40 percent of total production, while the quantities sold to intermediaries exceeded 21 percent. The remaining quantities are partly retained and stored by producers and partly sold on the parallel market. The same survey indicated that the main reasons for the retention of the crop at the producer level are the urgently-needed liquidity at harvest time, the low prices offered by the Office of Cereals, and the remoteness of producer locations.

The real problem lies in the monopoly still held by the Office of Cereals on collection and marketing. Since its inception the Office was the primary collector of grains. Grain marketing is entrusted exclusively to the Office of Cereals (by Decree-Law No. 62–10 of 3 April 1962, amended by Decree-Law No. 70–7 of 26 September 1970), which has the sole authority to collect, import and distribute grain products to industries as well as to livestock feed factories. Under the guidance of the State,

which has encouraged the Office to gradually disengage from private sector type activities, grain collection also began to be carried out by two central cooperatives, two service cooperatives and two cooperatives specialized in the collection of cereal seeds. Since the 2004/2005 season, two private collectors have also entered this market.

The sharing of collection by different types of operator shows that cooperatives account for about 67.8 percent of the collection, followed by the Office of Cereals with 31.4 percent. But the millers are still dependent on a single supplier, which is the Office of Cereals. Even supply from the central collection cooperatives is carried out with the permission of the Office on a monthly basis. The efforts to encourage the private sector to invest in the collection of grain do not seem to be yielding results. With only two operators, the private sector does a very small proportion of collection, some 0.8 percent of the total amount (Ministry of Agriculture, 2008). The supply problem arises mainly during the years of poor harvest, particularly because very few millers have invested in storage given the lack of encouragement, and this despite the existence of regulations in the Investment Incentives Code.

Finally, for the tomato industry, although the last few years have seen a remarkable improvement in yields and production, the amount flowing to the processing units remains insufficient. The average quantities collected and delivered to these units represent only 43 percent of production. The number of designated collection operators varies from year to year. For the period 1990–1997 there were an average of 211 centres per year. The number decreased to 184 in 2002 and 2003, and 125 in 2004. This can be explained by the seasonality of the production of tomatoes, but also by the fact that collectors deem too low the commission they receive, 3 percent of the value of the product.

These examples highlight the importance of collection and supply in the promotion of investment in the agro-food industry. The collection is certainly one of the most important links in the food chain. The network of collection centres plays a key role in the production line but also as a centre of influence and service to producers. The collection centres aim to help small and medium-sized producers sell their product to manufacturers with minimum cost and risk. It is also a means to provide industrial supplies in sufficient and regular quantities. Hence, there is a need to improve the sprawl and the density of the collection network.

To achieve this objective, the density of the collection network should be increased to reach small producers, often remote from roads and network centres. The establishment of centres in certain areas would allow the gathering of a significant part of production which still escapes the organized collection. Economic and institutional measures towards this goal should be higher on the present agro-food development agenda in Tunisia.

In economic terms, consideration should be given to extending the application of financial and tax benefits that exist in the agricultural sector to the processing industry too. Additionally, the construction of collection centres should receive the benefits of the investment code. At the institutional level, a large effort is required in terms of restructuring marketing and the collection circuit, in addition to streamlining administrative structures. This is particularly important in the case of the Office of Cereals, whose mission should be redefined to be limited to market regulation, grant management and commercial activities that are limited to ensuring food security. Collection and marketing activities should be delegated to cooperatives and private sector investors. The encouragement of private operators to invest in collection may even reduce the cost of collection and thus allow its extension to reach the majority of producers.

These measures may be supported by the introduction of contract farming to govern the transactions between producers and processors. The use of contracts allows producers to have a guaranteed market outlet and ensures that industry provides a regular and sufficient supply of raw materials. The processing industry through its associations and producer organizations can, in this respect, play an important role in creating a climate of trust and ethical relationships between producers and their first buyers.

7.4.2 The problem of quality management

Trade liberalization, changes in consumption patterns and the formation of regional groupings have resulted in profound changes in the global food system. The fierce competition to gain and/or maintain market share, forcing food companies to add value to their products, is expressed by a differentiation process incorporating quality as a fundamental aspect.

In today's highly competitive agricultural and agro-food markets, quality becomes an essential element of a company's strategy and a determinant of consumer choice. With the dissemination of increasingly strict quality and safety standards, government and businesses are forced to adapt, by respectively ensuring that appropriate regulatory institutions are in place and by conforming to their certification norms.

In developing countries, one of the greatest challenges that the public sector faces in promoting the agro-food sector is the proliferation of industrial standards and quality criteria established by private companies and industry groups. Similar challenges exist in complying with certification norms set out by international NGOs promoting fair trade, organic food and sustainable agriculture.

In Tunisia, the economic openness achieved by entering into a free-trade agreement with the European Union signified that quality assurance and certification have become essential means to meet the requirements of the internal market and to win

new international markets. It is in this context that a National Program of Quality Promotion was launched in 2005.

The National Program of Quality Promotion is part of efforts to provide the Tunisian industrial sector with modern quality management. For this purpose, it offers to industrial and service enterprises the possibility of achieving a certification at international standards and benchmarks in various areas. The programme, which spans five years (2005–2009), receives financial support from the State through the Industrial Competitiveness Fund (FODEC-ITP) and from the European Union through the Industrial Modernization Program (IMP). It provides beneficiary enterprises with Tunisian and international experts who will deliver technical assistance and support during the period of implementation. The areas covered are quality management, safety, hygiene, environment, and sector management systems leading to certification. The National Program of Quality Promotion also provides assistance to laboratories for tests, analysis and meteorology, and similar services to inspection organizations for the implementation of quality systems in accordance with ISO 17025 and ISO 17020.

In terms of achievements, 333 companies joined the programme in 2007 against 233 in 2006. This number increased to 492 in 2008, reaching 530 companies in February 2009. The objective was to reach a total of 600 member companies by the end of 2009. Meanwhile, the number of Tunisian companies certified to Quality Benchmarks standard over the period underwent an explosive evolution, rising from 10 companies certified in 1995 to more than 800 in late 2007. At the end of February 2009, the total number of certified companies reached 1 106, which corresponds to the achievement of 85 percent of the national goal of 1 300 companies.

For the agro-food industry, the National Program of Quality Promotion plans to assist companies according to specific sector norms (Hazard Analysis and Critical Control Point (HACCP)/ISO22000: management system of food security specific to food industry; British Retail Consortium/Institute of Packaging (BRC/IoP): safety requirement packaging of food). In 2008, food companies represented 21 percent of all those joining the national programme of quality. Among the companies that are certified, 17 percent of them are agro-food businesses.

A Technical Agro-Food Centre (TCAF) was established in 1996; it is an advisory and assistance organism for companies in the food industries. It acts as a service provider, responding to enterprises' requirements within the framework of technical assistance missions, product development, training and information, prospective studies and innovation awareness. Some services are undertaken on behalf of administration. Recently, the Centre Technique de l'Agro-Alimentaire/Agribusiness Technical Center (CTAA) was endowed with an analytical laboratory, which will shortly be made available to service the industry's needs for physico-chemical, microbiological or sensory analysis.

Despite the positive results achieved so far, a significant effort to improve food quality still needs to be made. The quality of the finished products Tunisia

produces is still not always in conformity with the standards desired or expected. Of course, one can never achieve quality products when quality management, mastery of manufacturing processes, and regular monitoring at critical points of production are not a concern for all professionals, which seems to be the case in the country. In the case of the agro-food industry, the problem is compounded when the inputs themselves, the agricultural products, do not meet the required industry standards.

Illustrating these difficulties, The Study on the Positioning of the Milk and Derivative Sector concluded that Tunisian milk quality is poor as regards fat composition, organoleptic properties, bacteriological counts and milk fraud, e.g. milk watering and the addition of bacteria inhibitor substances. The low quality of milk is a major obstacle to sector development. Large volumes of milk produced in Tunisia are not of merchantable quality or fit for industrial use (Ministère de l'Industrie et de l'Energie/ Ministry of Industry and Energy, 2005). This situation can be attributed to quality issues that start at the dairy farms where good practices of feeding and hygiene are not followed. The problem is aggravated by the inefficiencies that still exist in the milk collection systems.

The number of collection centres is still insufficient to handle the production. An important part of milk production does not flow through organized collection routes and a high percentage of milk produced is collected and sold by hawkers. These informal traders constitute a mobile collection system that serves a certain type of producer, because hawkers often offer more attractive producer prices than those of collection centres. They also serve small and medium producers who cannot deliver to collection centres, because they lack means of transport. No control is performed on milk that is sold direct to dealers in terms of hygiene and sanitation control. Adding to this, there is widespread fraud by watering and by the addition of formaldehyde and other illegal products to the milk.

These problems have serious implications in the processing industry, impairing the development of products derived from milk. Fraudulent practices are widespread, as efforts to improve the quality of milk remain ineffective. The industry for its part also shares responsibility for the problem, since some of its segments accept the hawker's remaining unsold milk late in the day, especially during periods of low milk production. Although Tunisian legislation prohibits milk hawking, the authorities are reluctant to enforce it because of the potential socio-economic consequences, as informal milk trade generates employment along the distribution chain. As such, informal milk traders benefit from the lack of organization of producers, the opportunism in some segments of the industry and the tolerance of the Government. Similar quality issues exist in the cereal processing industry. The quality of wheat delivered to the processors is generally very heterogeneous, which is still a contentious issue between the Grain Board and millers. Several factors negatively affect the quality of cereals, including the purchasing system and the conditions of collection and storage, to name a few.

Currently the Office of Cereals has started a quality initiative by creating several regional laboratories and a central laboratory for analysis of local wheat. The use of these facilities by the central cooperatives of grain collection can improve the purchasing system, by permitting the consideration of quality differentials in payments to farmers. Producers will therefore be enticed to deliver better quality products if they wish to receive better remuneration. The problem remains unsolved for imported wheat, however. Indeed, 80 percent of crushed wheat, which is tender wheat, is imported by the Grain Board as the single operator in the sector.

Finally, for the collection of processing tomatoes, many producers are not equipped with the necessary equipment for packaging and transportation in according with required standards, given that this is a seasonal activity which occupies the collectors for three months at most. Moreover, it is often the case, especially at the end of the campaign, that some canners accept batches of fresh or 'table' tomato that should normally be refused without discussion, even if a severe sorting is then performed.

In summary, to ensure high quality management of the agro-food sector it appears necessary that the actions of the Program of Quality Promotion should be strengthened via economic and institutional measures, in order to improve the quality of inputs and agricultural products supplied to industrial units. For example, in economic terms, it is necessary to promote a quality payment system according to a price that reflects the quality standards of agricultural products supplied to industrial units.

At the institutional level, laws and regulations for the collection of agricultural products need to be developed further. Similarly, it is important to standardize the quality standards of products and develop quality management observance at the farm, collection, industry and the distribution levels.

7.5 Conclusion

The financial and tax incentives introduced by the Investment Incentives Code, or as part of the Upgrade Program, have certainly boosted investments in the Tunisian food industry. The performance of this sector has been positive: increased investment, improvement of production, added value and a significant contribution to job creation in the country.

However, the development of the sector remains hampered by certain constraints that need to be addressed. Among these, a key issue to be tackled is the under-utilization of production capacity caused by inadequate and irregular supply. This can be explained by the disorganized and low density (deficiency) of the collection circuit and marketing of agricultural products. Improved approaches to the coordination of the production chain from beginning to end, including contracting,

are therefore needed. Furthermore, despite efforts to improve quality management, the quality of finished products is below current expected international standards; naturally this adversely affects the success of Tunisian food businesses in an increasingly global and competitive market.

So in addition to the fiscal and financial incentives which have already proven their effectiveness in promoting agri-food investments, other measures to improve the economic and institutional framework of the agribusiness sector of Tunisia are needed. These measures should aim to strengthen and improve the efficiency of the collection circuit, encourage private operators to invest, and increase the role of producer organizations in the coordination of relations between the various stakeholders.

Overall, there is a need to strengthen the integration and linkages between different components of the agro-food system (Goodman, 2002; Wilkinson, 2002). Ensuring such integration requires a set of institutional measures to strengthen the role played by industry and producers' associations. Moreover, as emphasized in the Global Agro-Industries Forum (2008), institutional reforms are important drivers of agro-industrial development, particular in developing countries. The same report emphasized that associations, including producer organizations and cooperatives, have a valuable role to play in bringing producers nearer to their clients and in crystallizing and expressing the views of such groups. This can be achieved by adopting collective action in building links between groups, facilitating relationships with other companies and organizations by providing training, and disseminating information technology and legal support.

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CHAPTER 8

Policy reforms for agribusiness and rural development: The case of township and village enterprises in China

HUGH DENG

8.1 Introduction

The Food and Agriculture Organization of the United Nations (FAO) has identified that food and agricultural systems in the Asia–Pacific region are undergoing profound changes. Along with rising per capita incomes, technological advances, urbanization and trade growth, the role of governments in policy reforms for agricultural and agribusiness development has become significant. This chapter aims to present a preliminary overview of the policy reforms for developing agribusiness and rural enterprises in China.

According to FAO, agribusiness represents the collective business activities that are performed from farm to fork. It covers the supply of agricultural inputs, the production and transformation of agricultural products and their distribution to final consumers. Agribusiness and rural enterprise development in China has been accompanied by continuous policy and institutional reforms. During this process, the development of a particular form of agribusiness and rural enterprise development, i.e. township and village enterprises (TVEs), became an extraordinarily successful phenomenon in China's agricultural and rural areas. China's *Law on Township Enterprises* in 1997 defined TVEs as enterprises in townships or villages under jurisdiction in which the rural collective economic organizations or peasants' investment exceeds fifty percent of the total, or has a dominant effect, and which have the duty of supporting agriculture.

China's TVEs played a significant role in engineering growth for the national economy. As millions of rural residents were employed by TVEs, these businesses exerted a considerable influence on the development process in the country.

For example, TVE employment grew from 28 million in 1978 to a peak of 135 million in 1996, with a 9 percent annual growth rate. TVE value added, which accounted for less than 6 percent of GDP in 1978, increased to 26 percent of GDP in 1996. TVEs' share of industrial output increased from 9 percent in 1979 to 30 percent in 1990 and 47 percent in 2000 (Yano and Shiraishi, 2004). At their peak, TVEs contributed about one-third of GDP and more than 50 percent of industrial value added.

This chapter seeks to explain why the Chinese policies on TVEs could sustain a rapid growth for the national economy and peasants' income. Questions are addressed on China's agricultural system, rural enterprises and agribusiness development. Two general approaches, corporation vs. cooperation, are currently under debate. The 'corporation approach' argues that there is a need to expand 'agrarian capitalism', including land rights transformation and trading. The 'cooperation approach' insists that 'agrarian capitalism' is not an appropriate way to increase farmers' incomes but rather forces peasants to withdraw from their land rights, and is linked to serious rural–urban migration problems¹.

The debates surrounding the corporation and cooperation approaches affect agricultural policy reforms and the future direction of agriculture in China. This chapter will investigate the Chinese TVEs' experience as regards these two approaches by considering historical studies, statistics and comparative analyses. While the income gap between rural and urban residents continues to grow, Chinese agriculture and agribusiness have maintained a high growth rate during the past decades. China has issued a number of 'Number One Documents' (NODs) to address agriculture and agribusiness policies. Based on these NODs and other relevant documents, the chapter reviews China's policy reforms for agribusiness and rural enterprise development with a view to identifying lessons that can be useful for developing countries.

The chapter also provides general information related to Chinese agribusiness policy, its evolution and development, based on a brief review of the literature. Several unique features affecting China's agricultural production, consumption and trading patterns are reviewed to understand better and anticipate how the country's agribusiness might change in the near future. The discussion begins with an assessment of China's agriculture and agribusiness characteristics, followed by a review of the evolution of its agricultural and agribusiness policy reforms. The recent development of China's agribusiness policy and its future direction will be discussed further. The chapter closes with some remarks on the challenges and prospects facing the sector, along with possible recommendations for China's agribusiness development and implications for other developing countries in the Asia–Pacific region, from a global perspective.

1 While the 'corporation approach' is represented by Justin Lin, Chief Economist of the World Bank (Director of the China Centre for Economic Research at Peking University), the 'cooperation approach' is represented by Tiejun Wen, Director of the School of Agricultural Economics and Rural Development in the People's University in China.

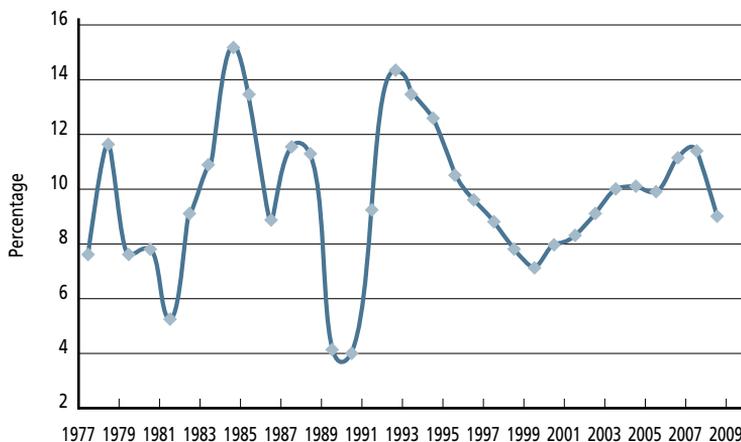
8.2 Characteristics of China's agribusiness

Some general characteristics of the Chinese agribusiness related to its economic development are identifiable. Since the beginning of its institutional and policy reforms three decades ago, China's economic growth has surpassed that of Brazil, Russia and India (which along with China, are called the 'BRICs' – an acronym based on the first letter of these countries' names). The country has integrated rapidly into the global economy through trade and foreign direct investment. This section looks at China's economic and agribusiness characteristics, focusing on its policy reforms and economic growth, water and land resources, demographics and agricultural employment.

8.2.1 Rapid economic and agribusiness development

China's economy and agribusiness sector have maintained a persistent growth over three decades. Until its recent economic slowdown, the country had experienced a sustained period of rapid economic expansion, with GDP growth averaging 9.5 percent over the last two decades. In the wake of the global economic recession, China's GDP growth slowed to a seven-year low of 9 percent in 2008 (Figure 8.1). Nonetheless, China remains the single largest contributor to global economic growth. It is the world's second largest economy in purchasing power parity terms. At the end of 2007, China overtook the USA to become the world's second largest exporter of goods, and it is now the third largest exporter of goods and services combined, after the USA and Germany. Despite this growth, China's per capita GDP remains relatively low at around US\$3 180.

FIGURE 8.1 China GDP real annual growth rate, 1977–2008



Source: <http://www.chinability.com/GDP.htm>.

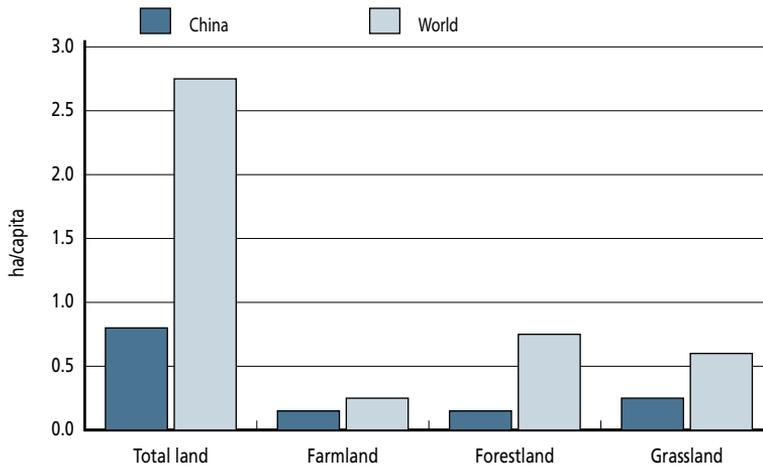
During this period agribusiness and rural enterprises became an important part of the economy. Between 1981 and 1990, the total industrial output of TVEs grew at an average rate of 28 percent, which doubled that of the national average and more than tripled that of the state sector (Xu and Zhang, 2009). As a result of TVEs' rapid growth, the non-state sector's share of industrial output increased from 22 percent in 1978 to 47 percent in 1991, while the state sector's share declined from 78 percent to 53 percent in the same period (Qian and Xu, 1993). TVEs' development peaked in the mid-1990s, as shown in the Appendix (Table 2), with employment in TVEs reaching 61 million in 1995. TVEs' share of GDP increased from 14.3 percent in 1980 to 37.5 percent in 1995 (Table 3). It is not an exaggeration to affirm that TVEs were the major engine of China's growth and industrialization in the early stages of China's policy reforms.

The growth of agribusiness and rural enterprises as TVEs in China can partly be explained by the Chinese policy reforms and Government support provided through these. In the late 1970s, China's economy was in difficulty with an agricultural crisis on the way. While the population grew, food was in a short supply. Per capita grain production never averaged much above 300 kilograms. Of 800 million peasants, 250 million were impoverished (Du, 2004). Since 1978, when the 3rd Plenum of the 11th Central Committee of the Communist Party of China (CPC) took place, China defined its socialism as meaning that development of the country's productive forces moving together towards wealth. The policy focus shifted to support economic and agricultural development. This policy reform was essential in freeing Chinese people from the previous ideological and institutional constraints, providing the possibility of establishing a new institutional and ideological environment and, in turn, encouraging further policy reforms and development.

8.2.2 Limited land and water resources

China's policy reform in its agribusiness and rural enterprise development is constrained by limited land and water resources (Figure 8.2). Before the reforms, the exploitation of land and water resources was beyond sustainable levels. The cultivation of steep hillsides was causing massive sedimentation loss, estimated at over 2 billion tonnes per year, decreasing productivity in areas losing topsoil, reducing water storage capacity in reservoirs, and increasing the likelihood of floods. In the North Plain, groundwater was falling rapidly in some areas, and several surface-water sources periodically dry up before reaching the sea. For example, the Yellow River ran dry for long periods of the year in the 1990s (Lohmar and Gale, 2008).

Industrial and urban growth increases competition for China's limited land and water. The non-farm economic boom in the country means that housing complexes, industrial parks, power stations and other projects, are being built on land converted from agriculture. Competition for land within agriculture is intense. The increasing production of meat, dairy products, fruit and vegetables, competes with grain cultivation.

FIGURE 8.2 Comparison of *per capita* land in China and the World

Source: Hao, 1996.

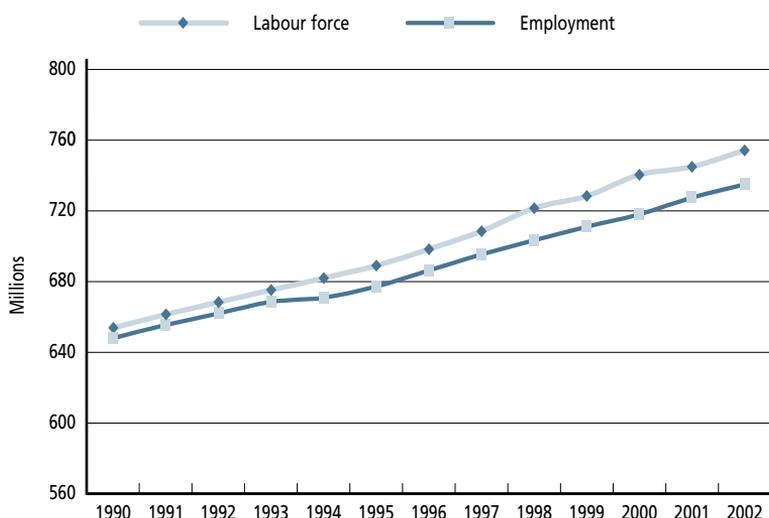
Until the 1990s, water management in China was associated with exploiting it as a cheap resource to boost agricultural and industrial production without considering the opportunity costs. While reforming land and water policies helped improve the efficiency of resource allocation, other approaches, such as encouraging agribusiness and rural enterprise development, also considered the urgent need to bring about more sustainable practices and contribute to economic and agricultural growth.

China's policy reforms include the integration of urban and rural areas, and of agriculture and industry, by taking the road of leaving the limited land but not the village, entering the factory but not the city. This policy became an important motivation for TVEs as a particular form of agribusiness and rural enterprise in China. Moreover, TVEs were guided by the national plan and industrial policies, oriented by the market, led by local governments and run by rural collective industries and cooperatives. All of these led to farmers' and enterprises' self-development, self-adjustment, and self-management for profits and losses. The objective of absorbing surplus rural labour was also supported by the broader rural markets.

8.2.3 Population and employment situation

A persisting challenge for Chinese policy-makers is the generation of employment in the face of the growing labour force (Figure 8.3). TVEs bring steady jobs and income to the vast surplus of rural labour, which eases the impact of massive migration to cities. Since the 1980s, as TVEs rose in large numbers the ability to absorb surplus

FIGURE 8.3 Labour force and employment in China



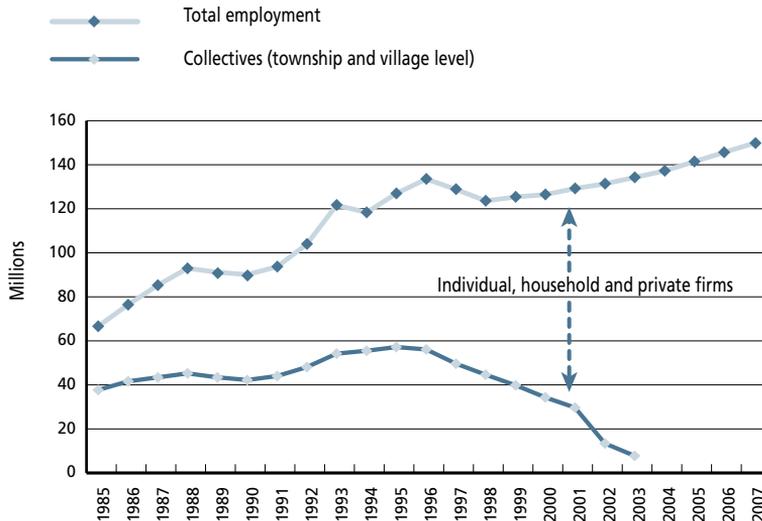
Source: Ghose (2005).

workers increased greatly. In 1998, 125 million workers served in TVEs, representing 27 percent of China's workforce and over 50 percent of surplus labour in rural area. In 2000, the figure rose to 128 million, representing an increase of millions over the previous years. By 2007, the figure had reached more than 150 million (Table 2).

Given China's dense population, TVEs provide significant relief to the employment situation. It is projected that the country's population will increase from around 1.3 billion presently to 1.5 billion around the year 2030, then decline slowly thereafter until it is under 1.4 billion in 2050. China's urban population is projected to increase from just over 450 million in 2000 to almost 970 million by 2050, an increase of 520 million people. Part of this increase, around 130 million, will be attributable to the 'natural' increase of the urban population. The lion's share, some 390 million, will come about through rural-urban migration, with China's urban population exceeding its rural population by about 2015 (Gilmour and Cheng, 2004).

With the development of TVEs, pressure from China's rural labour force flocking to cities may be relieved, although from the mid-1990s onwards the rate of rural surplus workers absorbed by TVEs seems to be slower (Figure 8.4). Insufficient jobs and a slowing increase in income for the rural population may become a new impetus for promoting TVEs in China.

FIGURE 8.4 China's TVE employment



Source: Naughton, 2007

8.2.4 A significant agriculture and agribusiness sector

China has sustained a growth of almost 10 percent a year since the introduction of economic reforms in the late 1970s. Among the most remarkable phenomena of the Chinese economic boom is the emergence of TVEs established in rural and peri-urban areas, owned and operated by local governments and rural people. The gross output of TVEs registered an average annual growth of approximately 25 percent between 1980 and 1995. As one of the most dynamic elements of the Chinese economy, the TVE sector has contributed by substantial measures to China's overall economic growth and agricultural development, especially in rural areas. By 1995, TVEs accounted for approximately a quarter of China's GDP, two-thirds of the total rural output, 45 percent of the gross industrial output, and more than one-third of China's export earnings (Zhang, 1999).

TVEs built China's foundation of rural craft and for the processing of agricultural products. Starting from 1978, TVEs have boomed to be a pillar of the rural economy. In 1987, the output of TVEs outran the total agricultural output. By 1990, TVEs earned US\$13 billion, representing 23.8 percent of China's total foreign currency earnings. In 1999, China had more than 2 million TVEs, with 127 million employees generating 2 500 billion Yuan in added value, which made up more than 60 percent of the social

added value of the rural areas. In 2000, the added value of China's TVEs stood at 2 720 billion Yuan, or a 9.14 percent increase over the previous year. The net income *per capita* of the rural population rose from 134 Yuan in 1978 to 2 210 Yuan in 1999 (Bramall, 2007).

As a particular form of agribusiness and rural enterprise, China's TVEs include manufacturing, agriculture, traffic and transport, construction, commerce and catering services. The products of TVEs are wide ranging, including rural commodities, articles for daily use, food products, agricultural processing products, and light industrial products. Many of these products have been launched in the international market and TVEs became an important source of Chinese exports.

8.3 The evolution of TVEs

TVE is the collective term for agriculture-related enterprises run by rural villages, which are not state-owned or private. During the period of the people's communes, industries or small enterprises run by communes or production brigades were called 'commune/brigade-run enterprises' (CBEs). After the disintegration of the people's communes, this term was transformed to TVEs, which became the mainstay of rural enterprises. Since the beginning of the 1980s, various forms of enterprises run by villages and individuals have emerged. In 1984, the term TVEs formally appeared in official documents for all collective-based rural enterprises.

TVEs are not unique to China. Many countries, especially those in the developing world, implement programmes to promote rural industries or agribusiness. However, the evolution of this particular Chinese form of agribusiness and rural enterprise demonstrates some extraordinary characteristics and roles, which have figured differently during the development periods compared with the experiences of other countries. The evolution of China's policy reforms related to TVEs' development since the late 1970s is reviewed next, focusing on the 1990s especially. This evolution generally involved the following stages:

- ▶ institutional and policy reform to establish initially agricultural-related TVEs, from the late 1970s to the mid-1980s;
- ▶ development and expansion of TVEs and agribusiness in the 1980s to the mid-1990s;
- ▶ re-establishing agribusiness since the late 1990s.

8.3.1 The rise of TVEs (late 1970s – mid 1980s)

There was an attempt at various levels of Chinese government to develop agribusiness, and promote the productivity and profitability of TVEs, once China's policy and institutional reforms were in place. TVEs underwent their initial establishment and expansion from 1978 to about 1985. At this stage, because of the

recently enacted 'open door' policy, most controls on TVEs² were lifted, and restrictions on bank lending to TVEs were also removed. During this period the administrative structure known as people's communes was replaced by the townships. CBEs was renamed as TVEs and these included individual and private enterprises. The number of TVEs rose from 0.15 million in 1978 to 1.22 million in 1985. TVEs' share of GDP increased from 14.3 percent in 1980 to 16.3 percent in 1985 (Table 3, Annex 1), and employment in the TVE sector reached 69.8 million in 1985. Within this figure, employment in collective enterprises increased from 28.27 million in 1978 to 41.52 million in 1985.

The development of TVEs at this stage showed that China's policy strongly impacted agribusiness in rural areas. During this phase, Chinese policy reforms provided guidelines and an environment conducive to encouraging agribusiness. In 1978, the 3rd Plenum of 11th Central Committee of the CPC proposed the emancipation of the mind by seeking truth from practices and facts. This milestone conference acknowledged that 'socialism' means developing productive forces and moving together towards wealth. Subsequently, a number of specific policies were introduced to increase the efficiency of CBEs and open a window for individual and private enterprises³. Particularly, the policy reforms at this stage started and focused on the agricultural sector, which included an attempt to transit from CBEs to TVEs as part of the de-collectivization process. In the mean time, local governments applied the reform policies to create rural enterprises in order to generate employment and enhance revenues.

This particular type of agribusiness and rural enterprise became a remarkable innovation for Chinese farmers. TVEs in this period had a number of features under a flexible policy scheme. In terms of ownership structure, TVEs were set up by townships, villages, households and even individuals, which was called 'self-employment' at that time; TVEs were even jointly developed with foreign partners. In terms of ownership structures, some had a collective basis and/or partnership entities; others were individual or private operations. In terms of the scales of business, these covered the full gamut from large to medium-sized to small. Geographically, TVEs were located in rural areas: these businesses originated from the countryside. Typically, most TVEs at this stage originated from three major areas: Wenzhou in Zhejiang Province, Suzhou, Wuxi and Changzhou in Jiangsu Province and the Pearl River Delta in Guangdong Province (Figure 8.5). The rise of TVEs in China undoubtedly played an active role in promoting rural employment and economic growth. In particular, TVEs to a certain extent reduced the disparity between the urban and rural economy, and encouraged the development of agribusiness and rural enterprises.

2 Until the end of this stage, TVEs were called commune and brigades enterprises (CBEs). According to Zhang (1999), the name CBEs has been replaced with TVEs since 1984. Article 2 of the Law of the People's Republic of China (PRC) on TVEs in 1997 defines TVEs as "various types of enterprises set up with investment mainly from rural collective economic organizations or peasants at township and towns (including villages) responsible for supporting agriculture". This is what we understand that China's TVEs are a particular agribusiness.

3 As a result of the policy changes, China registered its first individual enterprise in Wenzhou, Zhejiang Province in December 1980 and its first private enterprise in Dalian, Liaoning Province in April 1984.

FIGURE 8.5 China and its provinces



8.3.2 Development and expansion (mid 1980s – mid 1990s)⁴

After the mid-1980s, China's policy reforms focused on building and developing a market-oriented mechanism. The first stage of the reform focused on the institutional changes, namely building the household responsibility system (HRS), when it became necessary to develop a marketing-oriented mechanism. This stage experienced a long journey from the mid-1980s to the mid-1990s, including the two chairmanships of Zhao Ziyang and Jiang Zemin. During this period, China developed and expanded agribusiness rapidly to reach a peak in terms of TVEs' output, GDP share and employment.

With the world's highest long-term economic growth, China owes its first steps in the policy reforms that brought this about to Zhao Ziyang. It was he who introduced agricultural reconstruction in Sichuan, breaking up collective-based communes and entrusting the use of land to families. During Zhao's time, agricultural production rapidly increased. Zhao set the stage for so-called 'socialism with Chinese characteristics'. Deng Xiaoping is well known as 'the architect of modernization', but the first steps, those breaking with the past, were enacted by Zhao and his predecessor, Hu Yaobang. In October 1987, the 13th National Party Congress of

⁴ Annex 2 presents a summary of the key policy statements related to the reform processes enacted in China since 1978.

the Central Committee of the CPC took place. In his speech, *March along with the Chinese Characterized Socialist Road*, Zhao pointed out that the ultimate goal of the reforms would be the legalization and systemization of democracy to support and nurture a healthy market economy.

In October 1992, at the 14th National Party Congress of the Central Committee of the CPC, Jiang delivered a speech on behalf of the Central Committee titled *Accelerating the Reform, the Opening to the Outside World and the Drive for Modernization, so as to Achieve Greater Successes in Building Socialism with Chinese Characteristics*. As a General Secretary, Jiang indicated that the Central Committee gave priority to strengthening agriculture and increasing farmers' incomes. During his presidency, Jiang reiterated the fundamental contribution of agriculture to China's development.

TVEs at this stage experienced a process of development and expansion, culminating in the fast growth of the mid-1990s. The economic slowdown in the late 1980s led to stagnation in TVEs' numbers at about 1.9 million from 1989 to 1991. The growth of employment in TVEs slowed down from 95.45 million in 1988 to 92.65 million in 1990. However, this period of stagnation was short. When China's economy grew in 1991 and 1992, TVEs also revived. By 1994, the number of TVEs reached a historical peak at 2.5 million, and employment increased from 96 million in 1991 to 135 million. During this period, while employment in collective enterprises increased constantly, private enterprises – of which TVEs were a part – experienced especially rapid growth.

By the mid-1990s, the development of TVEs in China revealed some new features, particularly that the structure of TVEs' production was diversifying compared with that of the late 1970s. Taking TVEs in Zhejiang province as an example, we see that among the three major sectors, the output value of textiles was smaller compared with the other two, building materials and electrical machinery. By 1994, the textile sector became the largest, accounting for over 27 percent of total output, more than the share of electrical machinery (24 percent) and building materials (8 percent) (Bramall, 2007). This evidence suggested that TVEs' production in China was more consumer-oriented, which might have been beneficial to people who lived in the countryside, and to increasing farmers' incomes as a target for China to develop this type of agribusiness.

8.3.3 Agribusiness reconstruction (mid 1990s – present)

When reviewing the Chinese experience in agribusiness development in a broad perspective, the growth of China's TVEs in both output and employment during the 1980s and 1990s was extraordinary in two senses. First, the rate of growth was exceptionally fast by international standards. Nothing comparable has been seen in South Asia, sub-Saharan Africa or Latin America. Second, the growth rate

of the rural non-agricultural sector or agribusiness was unprecedented by Chinese historical standards – and therefore unexpected (Bramall, 2007). Even the Chinese leaders were surprised. As Deng Xiaoping, a late leader of China, pointed out: “In the rural reform our greatest success – and it is one we had by no means anticipated – has been the emergence of a large number of enterprises run by villages and townships... this result was not anything that I or any of the others had foreseen; it just came out of the blue”⁵.

Since the mid-1990s, China’s economic and agricultural reforms have entered into a new stage. China’s population has increased by about 90 million over the past decade. Among the 900 million rural inhabitants, by 2007 about 150 million worked for urban and township enterprises. In these circumstances, the key to ensuring food supplies and farmers’ incomes lies in endeavours to consolidate the base of agriculture and agribusiness. In this period, China called for greater efforts to address agricultural and rural issues by constructing a so-called socialist new countryside to balance the disparities between urban and rural areas. During the 1980s, the central committee of the CPC and the State Council issued five NODs to address agricultural and rural issues. From 2004, there have been successive years in which NODs focused on agricultural and rural issues. The key messages of these documents were to increase farmers’ incomes (2004), improve agricultural production capacity (2005), push forward the ‘new countryside’ scheme (2006), develop modern agriculture (2007), and consolidate the foundation of agriculture (2008).

The mid-1990s marked a turning point in the TVE development process. Since then, China’s economic and agricultural reforms have appeared in policy debates aimed at the restructuring and even privatization of state and collective enterprises, including TVEs. From 1995 onwards, China conducted policy reforms starting with its state-owned enterprises (SOEs). This included two major reforms: privatization of small state-owned enterprises at the county level, and mass lay-offs of excess state workers at the city level. Local governments initiated these reforms for SOEs and TVEs that were proceeding in economically sensible ways. ‘Privatization’ in the Chinese model is based on an adequate economic foundation. There were a range of incentives to drive local governments towards reform, including the imposition of significant budget constraints and increased competition from the non-state sector.

China set up its ‘zhuada fangxiao’ (grasping the large and letting go of the small) policy at the 15th National Party Congress in 1997, in order to reform SOEs. This policy was also applied to TVEs and therefore affected TVEs in many ways, as much as it did small-scale SOEs. The recentralization of the Chinese fiscal system from 1995 put increasing pressure on the budgets of TVEs; this combined with growing pressures on Chinese banks to restrict lending to TVEs. The main response of local governments to these pressures, introduced by the mid-1990s, was the privatization

⁵ Deng, 1987

of TVEs in order to raise revenues. Statistics revealed that employment in collective enterprises decreased from 60 million in 1995 to 33.7 million in 2001. In the same period, employment in private enterprises increased from 68 million to 97 million.

8.4 Recent policy developments

Since the late 1990s, TVEs in China have experienced a relative slowdown in output and employment. The effect of this reduced growth is an important consideration when discussing Chinese agricultural and agribusiness development. It has been argued that the slowdown of TVEs demonstrates a collapse or a shift away from existing business models. One particular effect of TVEs' development was to absorb rural workers in productive enterprises and prevent significant urban migration. With the slowdown of TVEs, urban migration grew, reaffirming that TVEs were playing a role in increasing farmers' incomes by employing a large number of rural workers.

However, TVEs are currently facing challenges to develop further. As a particular form of agribusiness and rural enterprise, the role of TVEs as growth promoters will not be fulfilled until the difference in incomes between the rural and urban sectors is minimized. This will be a long-term process in China, in which we can envisage that TVEs will move on through a number of readjustment and restructuring policies. Yet, TVEs have already played a significant role in fostering China's rural and national economy. After the initial policy and institutional reforms in agriculture and the development of a market-oriented system, TVEs accumulated experience allowing for further reforms, particularly of collective and rural enterprises and agri-related businesses.

It is recognized that TVEs need to continue upgrading with further development; there is a need to set up a number of policies and actions to encourage institutional reforms. In that respect and as observed earlier, two general policy approaches are being debated in China: corporation versus cooperation. The corporation approach argues that there is a need to expand 'agrarian capitalism', including land rights' transformation and trading in order to modernize agriculture and develop agribusiness. The cooperation approach instead postulates that 'agrarian capitalism' is not an appropriate way to build a strong agricultural sector and increase farmers' incomes, because it forces peasants to withdraw from land rights, leading to serious rural-urban migrations. The next section looks at the changes and challenges that TVEs are facing and discusses their policy directions.

8.4.1 Changed situation and challenges

Beginning in the twenty-first century, China was urged to make efforts to increase farmers' incomes, recognizing that this goal is of enormous significance to overall national development. By continuing efforts to push forward the adjustment of agricultural and

rural economic structures, China is looking to increase farmers' incomes by developing agriculture and agribusiness. The Government has called for focused attention on raising the quality and competitiveness of agricultural products and has forcefully implemented a strategy to revitalize agriculture through scientific and technological advances.

Currently, China's rural reform has been further deepened and agribusiness development is encouraged. At the end of the twentieth century, China started to voice its plans on agricultural industrialization and maintaining stability in rural areas. In September 1997, the 15th National Party Congress of the Central Committee of the CPC took place. Jiang Zemin, on behalf of the Central Committee, delivered a report titled *Hold Highly Great Banner of Deng Xiaoping Theory for All-Round Advancement of the Cause of Building Socialism with Chinese Characteristics into the 21st Century*. This report made a summary of the history of reform, prepared for the future, and drew up some schemes for China's economic and agricultural modernization.

In November 2002, the 16th National Party Congress of the Central Committee took place. On behalf of the Central Committee, Jiang Zemin delivered a report to the Congress entitled *Build a Well-off Society All-round Way and Create a New Era in Building Socialism with Chinese Characteristics*. In the First Plenum of the 16th CPC Central Committee, Hu Jintao was elected to be General Secretary of the CPC, which marked the beginning of a new period for China's reforms, particularly for agricultural and agribusiness development. In October 2003, at the 3rd Plenum of the 16th Central Committee of the CPC, *Decision on Several Issues about Perfecting Socialist Marketing Economic System* was put into force.

Against this background, TVEs had a major impact on the economic rise of China. They served as a major stepping stone of institutional change when legal protections were not in place. TVEs also filled a market niche for daily goods and for increasing farmers' incomes along with the economic and policy reforms. As development and reform go further, China's TVEs need to overcome a number of difficulties and challenges. These mainly include the out-of-date management systems, the limited application of technology, and the regional disparities and imbalances.

8.4.2 Outdated management systems

China's TVEs are mostly small, with a dominant model of 'family-based' operations. These small and privately-run businesses generally lack management knowledge and skills, which puts them at risk of losing market to competition. Inappropriate management approaches lead to a slowdown in the absorption of excess labour supply, a potential source of development in China. Many TVEs exclude professional management talents with marketable skills. Although China's policies encourage highly educated people to work for rural development, the present management systems of TVEs are not benefiting from the increased availability of educated, younger workers coming out of universities and colleges.

In spite of these challenges, many TVEs are undergoing change and further reforms. TVEs are businesses that can take advantage of both public and private sector incentives, as they are run on a family or private basis but participate in and are supported by local governments. This particular characteristic allowed some TVE managers to acquire the skills necessary to develop their enterprises.

8.4.3 Limited technology application

Another challenge that TVEs are facing is limitations in the application of technology. A survey of 37 sectors has shown that technology-intensive industries such as machinery, electronics or pharmaceuticals made up only 20 percent of the added-value of large TVEs. In the mean time, traditional labour-intensive sectors, such as textiles, clothes, light industry, and building materials, remain the pillars of TVEs. There are a limited number of agri-food processing businesses and their production is also low (Liang, 2006). China's TVEs were successful in the past partially because they supplied internal and export markets with labour-intensive and low-tech products. Fueled by the national economic growth and policy reforms, TVEs created the 'Made in China' brand for international markets. TVEs normally relied on some network of overseas Chinese links, mainly in the South Asian regions, for capital, technology, product design and quality control. They benefited from instant access to global markets through these special links. However, global development with a high technological profile will prevent TVEs from maximizing their advantages if they remain constrained by technology limitations.

8.4.4 Regional disparity

Given the enormous growth in foreign direct investment in China after the 1990s, foreign entrepreneurs working with knowledge-based multinationals that possess strong global business insight generated serious competitive pressure for TVEs. The economies of Beijing and Shanghai are driven particularly by the world-class multinationals that deal with a vast range of Chinese suppliers. Since the 1980s coastal businesses in China have maintained high productivity and efficiency, and enterprises in these regions have become serious competitors for businesses like TVEs. Under these circumstances, many TVE managers found their opportunities were better served through growing inland Chinese businesses in rural areas, and agricultural-related sectors that are relatively flexible compared with development in coastal areas driven by foreign investment.

According to a 2006 survey, TVEs in the eastern region in 2003 created 2.4 billion Yuan of added-value, 15.3 percent more than that of the previous year. Those in the central part of China produced about 1 billion Yuan, an increase of 8.9 percent over the previous year, while the western region generated 2.1 billion Yuan, or 12.9 percent more than the previous year. The growth rate in the east was 6.4 percent

higher than that of the central region, and 2.4 percent higher than the western region (Xue, 2006). These three regions made up 66.2, 28.0, and 5.8 percent respectively of the national total added-value, indicating an ever widening regional disparity.

8.4.5 Policy recommendations

Since the beginning of the twenty-first century, China has launched a number of national policies, including six NODs concerned with agriculture, agribusiness and farmers' income. These policies intended to encourage management reform, increase technology and narrow both the regional disparity between east and west and the income gaps between rural and urban residents. During this process, a strong call for further policy reform was made, so as to develop agriculture and agribusiness in order to increase farmers' incomes by facilitating the flow of capital to the countryside and rural areas. This argument proposes to transfer farmers' land to businesses, such that farmers become agricultural workers or shareholders. In order to facilitate the flow of capital, land would be transferred from agricultural to non-agricultural use.

The above-mentioned approach has been under debate. For agricultural-based countries with a high population density, like China, the policies chosen for agriculture and agribusiness development are of great national importance. If a country chooses the capital intensive route, small farmers may be displaced, increasing the supply of low cost labour. While this may be beneficial for the attraction of foreign investment, it forces farmers to live off the land, which may lead to social and environmental problems. Ultimately, this strategy may not improve business development. A route of agribusiness development in which farmers are organized into corporations and associations could be an alternative.

China has a huge rural population, a characteristic that can only be changed via a long-term process. The rural economy and agribusiness are the main sources of income for farmers. From a policy perspective, it is therefore necessary to ensure that farmers have a share of the benefits of growth. Farmers are the main forces to develop agribusiness and agriculture. In order to organize them and develop agribusiness, the Chinese government is developing policies on reforming the structure and ownership of TVEs. It is also supporting TVEs in reconstructing and applying technology and development strategies, as well as encouraging enterprises in the food processing sector. These policies need to be reinforced.

8.4.6 Ownership and management reform

There is awareness about the need to reform the ownership structure of TVEs in order to develop them in an era of globalization. In the early stages of their development, TVEs were established on the basis of collective ownership. Since the

beginning of this century, most TVEs have undergone ownership structure reforms and town administrations have generally withdrawn from their previous leadership over TVEs. To further reform the TVEs' ownership structure there is a need to allow diversified forms of property rights. For example, relatively small TVEs may be set up as partnerships and shareholding cooperatives. Larger TVEs may be established under a formal shareholding system. This would align the governance of TVEs with a modern business system, stimulating them to face global-level market competition.

TVEs in China are particular because of their distinction from SOEs and private businesses. In other words, TVEs could be rapidly developed in terms of their advantages *vis-à-vis* both SOEs and the private sector. The particularity and flexibility of TVEs allows them to compete either with SOEs or private businesses. In terms of hiring practices, for example, TVEs may have employees recruited from farms or other enterprises supported by government, in periods of labour shortages. Although TVEs are subject to the competitive pressures of the market place, they have more flexibility to access to capital from the government or collectives. Additionally, compared with both SOEs and private operations, managers from TVEs tend to have more authority and autonomy.

8.4.7 Innovation and technology development

Innovation and technology development in TVEs is a key for growth and success. China's TVEs in many sectors are not hi-tech or innovative. For example, TVEs in the brick, cement, coking and metal-casting sectors were set up primarily to absorb rural labour, to provide essential low cost products, and to contribute to improving livelihoods in a localized area. As a result of limited exposure to market forces, training and technology transfer in these TVE sectors has been needed, along with corresponding innovation and technology development.

In order to facilitate the upgrading of technologies, TVEs need to increase their attention to research and development (RandD). While taking advantage of their labour-intensive nature, China's TVEs must also now raise their technology profiles, including the adoption of environmentally-friendly and energy-saving technologies, in order to compete in the global market. Via innovation and technological development, TVEs will continue to be an important part of Chinese economic production and social welfare, and will contribute significantly to the improvement of the local and global environment. TVEs in the brick-making, cement, metal-casting and coking sectors continue to use outdated, inefficient technology, which leads to high pollution, particularly greenhouse gas emissions. The finance needs to be available for technological upgrades so that TVEs can reduce pollution and produce higher quality products. In many cases such upgrades would be economically and financially justifiable alone. China should consider the TVE sector to be strategic to the development of the rural economy. As such, policies are needed to bring TVEs into a competitive market, while continuing to support their role as employers and engines of rural development.

8.4.8 Food processing

The food processing sector is of central significance to the development of large agricultural countries like China. As such, there is an important role for TVEs to play in policy reforms related to the promotion of this sector. Recognizing this role, the Chinese government has fostered the sector through fiscal concessions to encourage investments in value addition to agricultural production.

Indeed, developing the production chains by promoting processing to increase value addition provides special opportunities for TVEs, as China's agri-food industry has an urgent need to catch up with developed countries, because of its large population and growing demand for food and agriculture products. In China, the ratio of processing output value relative to agricultural production has been estimated at 0.6 to 1, compared with 3 to 1 in developed countries (Liang, 2006). Because only 30 percent of TVEs are involved in this sector, there are significant opportunities for further growth (Liang, 2006).

Further benefits from increased participation of TVEs in the agri-processing sector can be expected. According to Kumar (2007), the growth and development of the food processing sector is expected to strengthen the links between the industry and agriculture. Growth in food processing would enhance the profitability of food crops, by increasing demand for these and by promoting better links between farmers and markets, avoiding excessive intermediation. The cultivation of produce for food processing would make agricultural production more efficient, while the demand for consistency in food quality would help standardize production and processing practices. Moreover, improvements in the value-added chain from farm to fork could lead to more favourable terms of trade for agriculture (Kumar 2007).

8.5 Conclusion

China's TVEs have been characterized here as particular forms of agribusiness and rural enterprises. Even if they may not be fully taken into account by Government investment plans or production goals, TVEs can be freely set up with the support of bank facilities and/or via collective or individual capital outlays. Although mostly small in scale and laggards in terms of technology adoption, TVEs have many features that are favourable to their competing in Chinese and international markets, and can develop even further. They also play an important socio-economic role, by contributing to value addition and absorbing surplus workers in rural villages.

The development of TVEs in China was prompted and supported by a number of Government policy reforms reviewed in this chapter. These reforms were gradually implemented and adjusted as lessons were learned over the years. The experiences of China with TVEs may be a useful guide for other countries as well, especially in

the Asia region, where there are many similar economic and social circumstances in towns and villages. Indeed, China's reforms and experiences have inspired similar efforts in a number of developing countries, such as Viet Nam, for instance.

The TVE experience in China is particularly interesting for agribusinesses development. Many agri-food businesses utilize local resources, including human capital, to develop their enterprises. By using local inputs, agribusinesses strengthen the local economy, particularly benefiting local farmers via increased incomes, as well as other enterprises and industries through the linkages that are created backward and forward in the agri-food chains.

The progress of TVEs in China has attracted attention from developing countries in particular. By and large, the Chinese experience represents a proof of vitality, in spite of the transitional problems and challenges over the three decades or so that TVEs have been in development. The sector has provided an example of replacing traditional industrialization approaches with a special form of agribusiness and rural enterprise development promotion via institutional reforms, including the ownership structures of firms and the role of local government in fostering agribusiness and rural enterprise development. The conclusion that can be drawn is that, although the experience of one country may not necessarily apply to all others, there are useful lessons to be learned from the Chinese TVE development experience.

Annex 1: Statistical tables

TABLE 1
Selected statistics of China's agriculture and agribusiness

Year	Population (10 000s)	Gross output* (100s millions RMB)	Household (10 000s)	Rural persons** (10 000s)	Agri machinery (10 000s kw)	Irrigated area (1 000s hectares)	Chemical fertilizer (10 000s tonnes)	Sown area (1 000s hectares)	Sown grains (1 000s hectares)
1978	96 259	1 118	17 347	N/A	11 750	44 965	884	150 104	120 587
1980	98 705	1 454	17 673	N/A	14 746	44 888	1 269	146 380	117 234
1985	105 851	2 506	19 077	1 946	20 913	44 036	1 776	143 626	108 845
1990	114 333	4 954	22 237	2 593	28 708	47 403	2 590	148 362	113 466
1991	115 823	5 146	22 566	2 727	29 389	47 822	2 805	149 586	112 314
1992	117 171	5 588	22 849	3 118	30 308	48 590	2 930	149 007	110 560
1993	118 517	6 605	22 984	3 703	31 817	48 728	3 152	147 741	110 509
1994	119 850	9 169	23 165	4 064	33 803	48 759	3 318	148 241	109 544
1995	121 121	11 885	23 282	4 380	36 118	49 281	3 594	149 879	110 060
1996	122 389	13 540	23 438	4 416	38 547	50 381	3 828	152 381	112 548
1997	123 626	13 853	23 406	4 706	42 016	51 239	3 981	153 969	112 912
1998	124 761	14 242	23 678	4 874	45 208	52 296	4 084	155 706	113 787
1999	125 786	14 106	23 811	4 799	48 996	53 158	4 124	156 373	113 161
2000	126 743	13 874	24 149	5 442	52 574	53 820	4 146	156 300	108 463
2001	127 627	14 463	24 432	5 615	55 172	54 249	4 254	155 708	106 080
2002	128 453	14 932	24 569	5 816	57 930	54 355	4 339	154 636	103 891
2003	129 227	14 870	24 793	6 186	60 387	54 014	4 412	152 415	99 410
2004	129 988	18 138	24 971	6 102	64 028	54 478	4 637	153 553	101 606
2005	130 756	19 613	25 223	6 242	68 398	55 029	4 766	155 488	104 278
2006	131 448	21 549						157 021	105 489

* Gross outputs value of farming

** Rural persons engaged in non-agricultural industries

Source: National Statistics Bureau of China, 2007 (some data is not available).

TABLE 2
China's GDP by ownership (billion Yuan)

Year	Total	SOEs	TVEs	Private
1980	199.7	151.7	28.5	N/A
1985	344.9	223.7	56.3	21.0
1990	685.8	374.5	167.3	83.1
1995	2 495.1	830.7	935.9	523.6
2000	4 003.4	1 377.8	942.5	1 773.1

Source: Xu and Zhang (2009).

TABLE 3
Selected statistics on China's TVEs (millions, unless indicated)

Year	TVEs (number)	Employment (total)	Employment (collective)	Employment (private)	Percentage share (rural)	Fixed asset (b)	Value- added (b)	Revenue (billion Yuan)
1978	0.15	28.27	28.27	N/A	9.23	22.96	20.83	9.55
1979	N/A	N/A	20.09	N/A	N/A	28.02	22.83	11.16
1980	0.14	30.00	30.00	N/A	9.42	32.63	28.53	12.63
1981	N/A	N/A	29.70	N/A	N/A	37.54	32.15	12.23
1982	N/A	N/A	31.13	N/A	N/A	42.93	37.44	12.80
1983	N/A	N/A	32.35	N/A	N/A	47.56	40.84	13.67
1984	N/A	N/A	38.48	N/A	N/A	57.50	63.32	15.50
1985	1.22	69.79	41.52	28.27	18.83	75.04	56.27	20.40
1986	N/A	79.37	45.41	33.96	N/A	94.67	61.12	21.10
1987	N/A	88.05	47.18	40.87	N/A	122.96	96.20	24.90
1988	N/A	95.45	48.94	46.52	N/A	158.43	117.24	34.98
1989	1.87	93.67	47.20	46.47	22.88	192.07	138.41	33.39
1990	1.87	92.65	45.92	46.72	19.42	220.20	167.29	31.85
1991	1.91	96.14	47.69	48.44	20.01	262.63	201.83	39.90
1992	2.09	106.25	51.76	54.49	22.00	349.08	300.79	53.48

TABLE 3 (Continued)
Selected statistics on China's TVEs (millions, unless indicated)

Year	TVEs (number)	Employment (total)	Employment (collective)	Employment (private)	Percentage share (rural)	Fixed asset (b)	Value- added (b)	Revenue (billion Yuan)
1993	2.45	123.45	57.68	65.78	25.43	516.09	513.81	109.30
1994	2.49	120.17	58.99	61.19	24.62	631.56	701.93	135.20
1995	2.20	128.62	60.60	68.02	26.24	912.33	935.93	177.53
1996	2.34	135.08	59.53	75.55	27.55	1 002.23	1 025.85	203.56
1997	2.02	130.50	53.27	77.24	26.61	1 253.93	1 004.94	203.40
1998	2.00	125.37	48.29	77.08	25.57	1 344.31	997.13	196.90
1999	2.07	127.04	43.69	83.35	25.94	1 391.58	991.33	201.28
2000	2.09	128.20	38.33	89.87	26.20	1 368.52	942.49	200.90
2001	2.12	130.86	33.72	97.13	26.66	1 351.45	911.78	195.00
2002	2.11	132.88	N/A	115.02	27.14	1 774.67	1 206.73	272.18
2003	2.19	135.73	N/A	123.37	27.82	N/A	N/A	
2004	2.21	138.66	N/A	N/A	N/A	N/A	N/A	
2005	N/A	142.72	N/A	N/A	N/A	N/A	N/A	
2006	N/A	146.80	N/A	N/A	N/A	N/A	N/A	
2007	N/A	150.90	N/A	N/A	N/A	N/A	N/A	

Source: The data is mainly collected from the School of International Relations and Pacific Studies, University of California at San Diego, USA (<http://irps.ucsd.edu/assets/022/8597.xls>), along with other sources, such as the China Statistical Yearbook and China's TVE Yearbook (some data is not available).

TABLE 4
Growth and employment of TVEs in China, 1978–2004

Year	ALL TVEs	Industrial TVEs	Industry share (%)	Total employment	County-level employment	County share (%)
1978	37.8	22.3	59	74.51	24.02	32
1979	40.1	24.2	60	N/A	N/A	N/A
1980	48.2	28.8	60	80.19	26.93	34
1981	53.2	33.5	63	N/A	N/A	N/A
1982	62.0	37.3	60	N/A	N/A	N/A
1983	66.9	41.3	62	N/A	N/A	N/A
1984	98.8	55.9	57	N/A	N/A	N/A
1985	109.4	66.3	61	89.90	26.92	30
1986	118.3	72.6	61	93.33	28.09	30
1987	182.7	127.2	70	96.54	29.45	31
1988	200.3	142.6	71	99.84	31.11	31
1989	220.1	159.7	73	101.10	31.37	31
1990	250.4	185.5	74	103.50	31.97	31
1991	278.4	216.0	78	106.70	33.38	31
1992	389.6	309.9	80	108.90	34.85	32
1993	607.0	479.0	79	108.90	37.81	35
1994	691.4	566.9	82	108.80	39.41	36
1995	815.9	676.3	83	N/A	N/A	N/A
1996	931.9	756.4	81	112.40	43.01	38
1997	1 086.1	868.2	80	110.44	42.77	39
1998	1 190.5	981.5	82	90.58	36.76	41
1999	1 365.7	1 134.5	83	85.72	35.43	41
2000	1 476.5	1 211.5	82	81.02	34.10	42
2001	1 577.5	1 310.3	83	76.20	32.71	43
2002	1 744.7	1 471.1	84	71.63	31.12	43
2003	1 934.9	1 643.4	85	N/A	N/A	N/A
2004	2 058.8	1 757.9	85	67.10	30.03	45

Note: a) data source: Bramall, 2007:56/58 (some data is not available) - b) numbers of TVEs in thousand - c) employment in millions.

Annex 2: Significant events related to China's policy reforms and TVE development (1978–2008)⁶

1978, December (18–22), the 3rd Plenum of the 11th Central Committee of Chinese Communist Party (CPC). **Background:** *Per capita* grain production under 300 kilograms; and of the 800 million peasants, 250 million impoverished. **Turning points:** Emancipating the mind of people, and seeking truth from facts.

1979, Spring, Fengyang County, Anhui Province: contracting collective land to families. National Agricultural Commission established. The Central Committee relayed the *Summary of Discussions on Rural Issues* from the National Agricultural Commission's Party Group: the authorization of this document by Hua Guofeng, President of the Central Committee of the CPC, opened a small window for the Household Responsibility System (HRS).

1980, Fall, No. 75 Document, *Some Issues in Further Strengthening and Improving Agricultural Production Responsibility System*: Yao Yilin, Director of the National Plan Commission, Deng Xiaoping and Hu Yaobang, *et al.* Agreed: Hardship regions are allowed to carry out HRS.

1981, Winter, The Central Committee held a national conference on rural issues. Soon after the conference, the Central Committee's first special **NOD in 1982** for the agricultural sector, namely, *Summary of the National Conference on Rural Issues*, was released: public ownership of land and other means of production would be unchanging, as would the responsibility system.

1982, 1–11 September, the 12th National Party Congress of the Central Committee of the CPC and **Hu Yaobang's** *Creating a New Stage of Socialist Modernization*: The various forms of the production responsibility system had liberalized the productive forces and needed to be maintained for a long time. Premier Zhao Ziyang reaffirmed that the output-linked contract system effectively displays the superiority of the socialist economic system in rural China in the present stage. Runsheng Du, Secretary General, Rural Department of the CPC at this Congress in a speech, *Historic Shift in Rural Development*, argued that household output contracting and household work contracting could embody the unification of public and private benefits and of near-term development and the distant goal of modernization.

6 This information is collected by the author from a variety of sources, including *China Rural Reform: Review and Outlook*, Chinese Ministry of Agriculture, 2007; *The Evolution and Characteristics of Agricultural Policies in China*, the Chinese Ministry of Agriculture, 2008; *The Course of China's Rural Reform* Runsheng Du, International Food Policy Research Institute, 2006.

1983, NOD, *Some Issues on Current Rural Economic Policy*, proposed a further goal to strive for the 'two shifts' (from self-sufficiency to comparatively large-scale commodity production, and from traditional to modern agriculture) and 'three bits' (a bit more liberalization of ideas, a bit bolder reform, and a bit more realistic attitude, to help speed up the two shifts).

1984, NOD, *Notes on the Rural Work in 1984*, to perfect the production contract system and foster market mechanisms: a) the period of land contracts should be extended to 15 years, during which paid transfer of land use rights should be permitted; b) the free flow of rural private funds should be allowed, combining the cooperative joint stock system with the buying of stock to earn dividends; c) peasants should be allowed to go to cities to seek employment and/or do business; d) individuals should be allowed to run enterprises and hire staff; e) state operated businesses, supply and cooperatives should gradually open up to market transactions and withdraw from their monopolies. In this year, the central government and state council circulated the *Report on Creating New Development for Commune-run Enterprises* formulated by the then Ministry of Agriculture in support of township and village Enterprises (TVEs).

1985, NOD, *Ten Policies on Further Invigorating the Rural Economy*, focused on reforming purchase and marketing system with developing forestry, enhancing transport, supporting rural enterprises, encouraging free movement of talented people, enlivening financial markets, perfecting the rural cooperative system, strengthening the building of small cities, and developing the foreign trade oriented economy. In **October**, the 3rd Plenum of the 12th Central Committee of the CPC on *Decision on Reforming Economic System*: a) reconstructing the urban and rural relationship; b) reforming the unified procurement system; c) adjusting the industrial structure.

1986, NOD, *On Development of Rural Work in 1986*, made a commitment to increase investment in agriculture and water facilities, and to guarantee a rise in grain production to 450 billion kilograms, starting with the 7th Five-Year Plan.

1987, October, the 13th National Party Congress of the Central Committee of the CPC. The National Party Congress is the highest body of the CPC, which is distinguished from the National People's Congress. After its ascent to power in 1949, the party held no congress until 1956, when it was the eighth congress since the party's founding in 1921. The 9th National Party Congress convened in April 1969, the 10th in August 1973, the 11th in August 1977, and the 12th in September 1982. In his speech, *March along with the Chinese Characterized Socialist Road*, **Zhao Ziyang** proposed a plan for political and economic reform to the 13th Party Congress. The ultimate goal of this reform package was the legalization and systemization of democracy, to establish the kind of democratic politics that could support and nurture a healthy market economy.

1992, 12–18 October, the 14th National Party Congress of the Central Committee of the CPC. **Jiang Zemin**, on behalf of the Central Committee, delivered a report titled *Accelerating the Reform, the Opening to the Outside World and the Drive*

for Modernization, so as to Achieve Greater Successes in Building Socialism with Chinese Characteristics.

1993, 11–14 November, the 3rd Plenum of the 14th CPC Central Committee outlined the framework of a socialist market economy. This meeting passed the *Decision on Issues of Building a Socialist Market Economy*. The meeting pointed out that a socialist market economy system was integrated with a basically socialist system. In such a system, the market plays a fundamental role in resource allocation within the context of State macroadjustment and control.

1997, 12–18 September, the 15th National Party Congress of the Central Committee of the CPC. **Jiang Zemin**, on behalf of the Central Committee, delivered a report titled *Hold Highly Great Banner of Deng Xiaoping Theory for All-Round Advancement of the Cause of Building Socialism with Chinese Characteristics into the 21st Century*. The report made a summary of the history, prepared for the future, and drew up a cross-century blueprint for China's reform, opening and socialist modernization drive.

1998, 12–14 October, the 3rd Plenum of the 15th CPC Central Committee approved the *Decision on Important Issues of Agriculture and Countryside Work* and set the goal of building a socialist new countryside by 2010. The plenum summed up the achievements and experiences of reforms since 1978, outlined agricultural and rural development goals, and issued strategies and policies on economic, political and cultural construction in rural areas. The Decision reflected the Party's understanding of the need to strengthen rural reform and development.

2002, 8–14 November, the 16th National Party Congress of the Central Committee of the CPC. On behalf of the Central Committee, Jiang Zemin delivered a report to the Congress entitled *Build a Well-off Society All-round Way and Create a New Era in Building Socialism with Chinese Characteristics*. In the First Plenum of the 16th CPC Central Committee, **Hu Jintao** was elected general secretary of the CPC.

2003, 11–14 October, the 3rd Plenum of the 16th CPC Central Committee approved *The Decision on Issues of Completing the Construction of a Market Economy*, which mapped out reform and development for the next 10 years. It displayed an outlook on development and put forward ideas and measures for constructing a socialist market economy. The outlook on development embodied 'five balances': urban and rural; among regions; economic and social development, man and nature, domestic development, and opening up to the outside world.

2004, NOD, *Several Policy Issues on Promoting the Increase of Farmers' Income*, released by the CPC Central Committee and the State Council. This was the sixth such document issued by the Central Committee since China implemented agricultural reform in 1978. The previous five documents were all released in the 1980s. The dissemination of this document demonstrates that the new government started paying attention to the gap between urban and rural incomes and intended to revitalize its stagnant agriculture in the near future.

2005, NOD, *Several Policy Issues on Further Strengthening Rural Work and Increase Comprehensive Capacity of Agriculture Productivity*, put forward the requirements for agricultural and rural work in 2005 and stressed that the ideas adopted by the central authorities aimed to improve agricultural infrastructure, make faster progress in agro-science and technology, and increase the capacity of agricultural production as a major, urgent strategic task for the country.

2006, NOD, the Central Committee and the State Council issued *Several Opinions Concerning Promoting Construction of a New Socialist Countryside*. The NOD of 2006 noted that the historic task of building a new socialist countryside was put forward at the Fifth Plenum of the 16th Central Committee.

2007, NOD, *Several Policies on Vigorously Developing Modern Agriculture and Steadily Promoting the Construction of a New Socialist Countryside* was released on January 29, being the 9th NOD since reform and opening-up. The document stipulates that developing modern agriculture was a top priority in building the new socialist countryside. Modern equipment, science and technology, industrial systems, management and development ideas were used to promote agricultural development in order to improve quality, economic returns and competitiveness of agriculture.

2007, 15 October, Hu Jintao, general secretary of the Central Committee of the CPC and Chinese President, addresses the opening ceremony of the 17th National Congress. On behalf of the Central Committee, Hu delivered a report titled *Hold Highly Great Banner of Socialism with Chinese Characteristics and Strive New Victories in Building a Moderately Prosperous Society in All Respects*.

2008, NOD, *Several Policies on Essentially Strengthening to Construct Agricultural Infrastructure and Further Promoting the Development of Agriculture and Increase of Farmers' Income*, calling for greater efforts to address rural issues when the nation, with a rural population of 900 million, is combating mounting inflationary pressure and striving for sustained, rapid and healthy economic growth. The document pointed out that an enduring mechanism for consolidating the base of agriculture should be quickly developed; great importance should be attached to grain production; supply and demand for major farm products should be balanced with product safety guaranteed.

2009, NOD, *Thoughts on How to Further Stabilize the Development of Agriculture and Increase Farmers' Income*, facilitating the trading and transfer of household-level land use rights; increasing agricultural subsidies to cover more cereal crops, agricultural inputs, and agricultural machinery purchases; reducing administrative layers from four to three to improve efficiency and accountability. In pursuing policy priorities for its agricultural sector, China faces challenges with respect to rural–urban migration, rural credit, transport infrastructure, water scarcity, and environmental issues.

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CHAPTER 9

Institutional innovations and models in the development of agro-industries in India: Strengths, weaknesses and lessons

VASANT P. GANDHI AND DINESH JAIN

9.1 Introduction

Agro-industries have been given high priority in India due to their significant potential for contributing to rural and small farmer development. The emphasis on village-based agro-industries was initiated by Mahatma Gandhi in the 1920s as a part of India's independence movement. However, even today the development of agro-industries is a central part of the national development strategy due to their significant role in bringing value-addition to agriculture's output, increasing rural incomes and employment, and alleviating poverty in the countryside (India, Planning Commission 2008). Having said this, the sector faces a number of challenges and bottlenecks to its growth including difficulties sourcing raw materials, rural market imperfections, supply-chain inefficiencies, investment constraints, and product marketing challenges (Srivastava and Patel, 1994; Goyal, 1994; CII-Mckinsey, 1997; Gandhi *et al.*, 2001). Questions remain as to what institutional arrangements/models would be appropriate and should be encouraged for the organization of agro-industrial activity that would work and maximize the contribution to rural and small farmer development.

Mahatma Gandhi's approach of village agro-based industries was founded on a strong economic, social and political ideology (Goyal, 1994), but later failed because it became a blanket basis for nationalists to favour less efficient techniques of production, oppose modern industry, and foster incompatibilities with market preferences. After independence and up to the early 1980s, agro-industrial policy was dominated by the thinking of Prime Minister Nehru and his economic think-tank led by P.C. Mahalanobis, who argued that India needed large industries for the capital goods sector, while the consumer goods sector should be reserved for small-scale agro and rural industries which were labour-intensive and required less capital. This was

consistent with reducing demand on the limited available capital and savings, and expanding employment. However, such agro-industries failed because of outdated technology and management, and their inability to meet changing and expanding demand for quality goods from a rapidly growing population with rising incomes.

From the early 1980s and particularly after liberalization reforms in the early 1990s, there has been significant opening out towards promotion of agro-industries, stressing market demand, up-to-date technology and efficient management of the supply chain. However, this trend may lead to large, private, capital-intensive agro-industrial enterprises and a strong risk that the interests of small farmers and the rural poor will be bypassed. This would result in a negative outcome for rural employment, and a weakening of the development linkage for which agro-industries have been given priority in India. Major questions for the future remain on what policies and institutional models would be appropriate. In this context, this chapter examines the experience of various innovations and institutional models of organizing agro-industries that have been experimented with in India. The experiences and lessons learned may be useful for future agro-industrial development in India, as well as in other developing countries.

9.2 Features of agro-industries in India

Data from the Annual Survey of Industries (India Ministry of Planning, 2007) shows that 41 percent of all factories in India are agro-industries that contribute 19 percent of the manufacturing value added and 43 percent of manufacturing industry employment (this does not include the employment generated in the agriculture sector). These figures indicate that agro-industry contribution to both employment and manufacturing GDP is very significant, substantiating the national priority status that has historically been given to this sector in India (Table 9.1).

What are the structural and financial characteristics of agro-industries in India? Table 9.2 shows that only 21 percent of total industrial fixed capital is invested in agro-industries, while the sector employs 41 percent of Indians engaged in industrial employment. This tells us that, on average, agro-industry continues to be relatively labour-intensive and capital saving. The share of payment to labour out of the total value added is also greater at 35 percent in agro-industries, compared with 21 percent in other industries.

Furthermore, agro-industries require relatively less fixed capital and more working capital as compared with other industries (43 percent vs 30 percent). Agro-industries on average are able to generate employment for 31 persons per fixed investment of 100 000 rupees (Rs.), whereas the figure for other industries is much lower at 11 persons. These figures do not include added employment generated in agriculture and the input supply chain through backward linkages. On average, agro-industries generate 47 percent value added income over invested fixed capital annually, as compared with

TABLE 9.1
Importance of the agro-industry sector in India: some features (2005/06)

Industries	Percentage share		
	No. of factories	Employment	Net value added
Agro-based food industries	18.35	15.27	7.52
Agro-based non-food industries	22.69	27.63	11.45
Total agro-based industries	41.05	42.90	18.97
Other (non-agro) industries	58.95	57.10	81.03
All industries	100.00	100.00	100.00

Source: Ministry of Planning, 2007.

53 percent for other industries. Agro-industries are also able to absorb more inputs from other sectors (e.g. agriculture) as a percentage of the value of output compared with other industries. These features indicate that the agro-industrial sector deserves the priority given to it in the national strategy of development with employment.

The Food and Agriculture Integrated Development Action Plan (FAIDA) report of the Confederation of Indian Industry (CII) and McKinsey and Company (1997) shows that there is great scope and potential for development of food processing and agro-industries in India. However, there are various major constraints to the rapid development and growth of agro-industries in the country. The literature indicates that agro-industrial growth in India has historically been constrained by both supply of raw materials and slow growth in consumer demand for agro-industrial products (Srivastava and Patel, 1994; Boer and Pandey, 1997). Srivastava and Patel (1994), Kejriwal (1989) and Gulati *et al.* (1994) indicate that apart from the quantity of raw materials, the quality of the raw material is also a major constraint. Available raw material is often of unsuitable quality, processing varieties are frequently not available, and the period of availability of the raw material is too short and unreliable. Gulati *et al.* (1994) indicate that only about 5 percent of the fruits and vegetables grown in India are commercially processed. Both quantity and quality supply constraints indicate that there is a major need to improve the linkages between small farmer suppliers – who constitute the majority of raw material producers – and agro-industries. Effective and innovative institutional arrangements that would address multiple objectives are required.

Srivastava and Patel (1994) indicate that another major constraint is the obsolete technology used in processing, resulting in low efficiency and poor quality of output.

TABLE 9.2
Some structural and financial features of agro-industries in India (2005/06)

Description	Share of fixed capital (%)	Total persons employed per factory	Fixed capital per factory (Rs. million)	Emoluments as a percentage of net value added	Percentage of working capital to invested capital	Net value added to fixed capital	Employment to fixed capital ratio (per Rs. 222100 000s)	Material input consumed to value of output
Agro-based food industries	7.47	54.10	17.63	31.19	50.72	51.71	30.68	84.68
Agro-based non-food industries	13.41	79.16	25.60	37.44	36.55	43.84	30.92	76.84
Total agro-based industries	20.89	67.95	22.04	34.96	42.47	46.66	30.84	80.62
Other (non-agro) industries	79.11	62.96	58.11	21.10	29.51	52.63	10.83	75.82
All industries	100.00	65.01	43.30	23.73	32.68	51.38	15.01	77.01

Source: Ministry of Planning, 2007.

According to Boer and Pandey (op. cit.) a major problem in improving technology is the very small size of the average agro-processing unit, suggesting a clear need to integrate in order to achieve a larger scale of operation. However, Goyal (op. cit.) and others have shown that private sector industrial concentration is often associated with delinking from small farmer suppliers and losses in rural employment.

Srivastava and Patel (1994) show evidence of two additional major constraints to Indian agro-industrial development, namely the small market size for many processed products, and difficulties in obtaining adequate financing. The financial institutions in India are mainly geared to lending for fixed capital requirements, while agro-industries, as shown in the analysis above, have a large requirement of working capital. Banks lend working capital, if at all, at higher interest rates than other capital loans. Furthermore, the government of India typically considers processed and packaged goods as luxury items; as a result, their production is heavily taxed. There are also myriad special regulations and licensing requirements for specific agro-industries, such as the Milk Product Order for the dairy industry. These policies create disincentives for investment in higher value-added agro-processing.

9.3 Agro-industry models in India

The challenges arising from the aforementioned constraints in the creation and functioning of agro-industries on the one hand, and the need for their continued growth to contribute to rural and small farmer development on the other, call for new and innovative approaches and models for their organization in India. Several models have been tried and need to be evaluated to provide lessons for what is required in the future in India, and perhaps other parts of the developing world as well.

Whatever the nature of the model, a few key success factors have been observed (Gandhi *et al.*, 2001):

- ▶ creation of sufficient incentives for farmers to produce the required quantity and quality of raw materials, and supply the produce as stipulated in the contract (rather than sell elsewhere)
- ▶ required farm inputs and technology need to be provided and the question of who bears what costs (and risks) should be transparent and well understood;
- ▶ access to high quality processing technology;
- ▶ ability to address new and changing consumer demand through effective market intelligence;
- ▶ adequate performance and capability to attract capital for investment and growth;
- ▶ overall, adequate attention to the crucial issues of ownership, organization, management and quality control.

Some significant questions asked in this light are:

- ▶ How do the models perform in organizing production and procurement from large numbers of small farmers, thereby ensuring a significant impact on rural incomes and employment?
- ▶ To what extent are the models able to ensure adoption of appropriate modern technology and practices by the farmers, generating the required quantity and quality of output at a reasonable cost?
- ▶ Are the models able to ensure the use of up-to-date modern technology in processing and meeting the high working capital and other capital needs in a business characterized by seasonality and variability?
- ▶ Are the models able to deliver the necessary strong marketing efforts to compete in and open up nascent markets for processed agri-food products?
- ▶ Are the issues of sound ownership, management and control, adequately dealt with to ensure sustained performance in delivering benefits to the main stakeholders, including the farmers, consumers, investors and the government (nation)?

9.4 Study of different agro-industry models

This section examines a range of different agro-industry models that have emerged and developed in India. They include government, cooperative and private business initiatives, and span many sub-sectors including dairy, fruits and vegetables, grains and oilseeds, horticulture and poultry. Using the available literature, the section examines their evolution, structure and operation, and provides observations on their performance with respect to the questions posed above.

9.4.1 Model 1: The AMUL cooperative model

A model which has been quite successful in certain agro-industries (such as dairying) is the cooperative model of the Kaira District Cooperative Milk Producers' Union (AMUL). This approach evolved out of a successful dairy cooperative initiative in the Kaira district of Gujarat state. Even though milk was produced efficiently in the rural areas of India, its movement from rural areas to urban markets, where demand was high, was difficult. As a result of this private dairying had picked up in urban areas and the urban periphery, but this production method proved troublesome, unhygienic and inefficient. Seeing the opportunity, a private dairy at Anand in Gujarat state, Polsons, developed a business of milk procurement from the rural areas in the Kaira district through middlemen, for its processing and transport to Bombay some 425 km away (Korten, 1981).

In the mid-1940s, however, in the face of Polsons' exploitative practices and resentment towards its middlemen, the milk producers/farmers of Kaira district went on strike, refusing to supply to Polsons. On the advice of a prominent leader of India's independence movement, Sardar Vallabhbhai Patel, they decided to come together

to form a cooperative body of their own. This body later became the Kaira District Cooperative Milk Producers' Union, popularly known as AMUL (based on its original name of Anand Milk Union Limited). The cooperative union started procuring milk through affiliated village milk cooperative societies, processing it, and sending it by its own means to Bombay. The model and its methods were perfected by the cooperative under the leadership of its enlightened chairman, Tribhuvandas Patel, and its competent professional manager, Dr Varghese Kurien. It has grown enormously over the years, spawning other district unions and becoming a state cooperative federation that now markets milk products across the whole country (Table 9.3).

TABLE 9.3
AMUL at a glance

Members:	15 District Cooperative Milk Producers' Unions	
No. of producer members:	2.7 million	
No. of village societies:	13 141	
Total milk handling capacity:	10.21 million litres per day	
Milk collection (total 2007–08):	2.69 billion litres	
Milk collection (daily average 2007–08):	7.4 million litres	
Milk drying capacity:	626 metric tonnes per day	
Cattle feed manufacturing capacity:	3 090 metric tonnes per day	
Sales turnover	Rs. (millions)	US\$ (millions)
1996–97	15 540	450
1997–98	18 840	455
1998–99	22 192	493
1999–00	22 185	493
2000–01	22 588	500
2001–02	23 365	500
2002–03	27 457	575
2003–04	28 941	616
2004–05	29 225	672
2005–06	37 736	850
2006–07	42 778	1 050
2007–08	52 554	1 325

Source: <http://www.AMUL.com/business.com>.

AMUL's structure

In this model, ownership rests with the farmers on a cooperative basis. It has a three-tier organizational structure, with primary cooperatives at the village level, a cooperative union at the district level, and a cooperative federation at the state level. Broadly, the village cooperatives take responsibility for procurement of the produce from the farmers, the district union is responsible for transportation and processing, and the federation is responsible for marketing and strategic planning and investment. The cooperatives are governed by a rotating board of farmer-elected directors, but the management is carried out by professional managers who are properly empowered and largely independent. Apart from the agro-industrial activity of the dairy business, the cooperative undertakes substantial developmental, agricultural, and dairy extension activities, and provides veterinary, breeding and other services.

The primary level under the three-tier structure is the Village Cooperative Society. Its membership consists of village milk producers (usually 200 or more members per village) and is governed by an elected Managing Committee consisting of 9 to 12 elected representatives of the members. The Managing Committee elects a Chairman and appoints a Secretary and staff. The main function of this cooperative society is to collect milk from the milk producers of the village and make payments based on quantity and quality. It also provides support services to the members such as veterinary first aid, an artificial insemination breeding service, sale of cattle-feed, mineral mixtures, and fodder seeds, and training on animal husbandry and dairying.

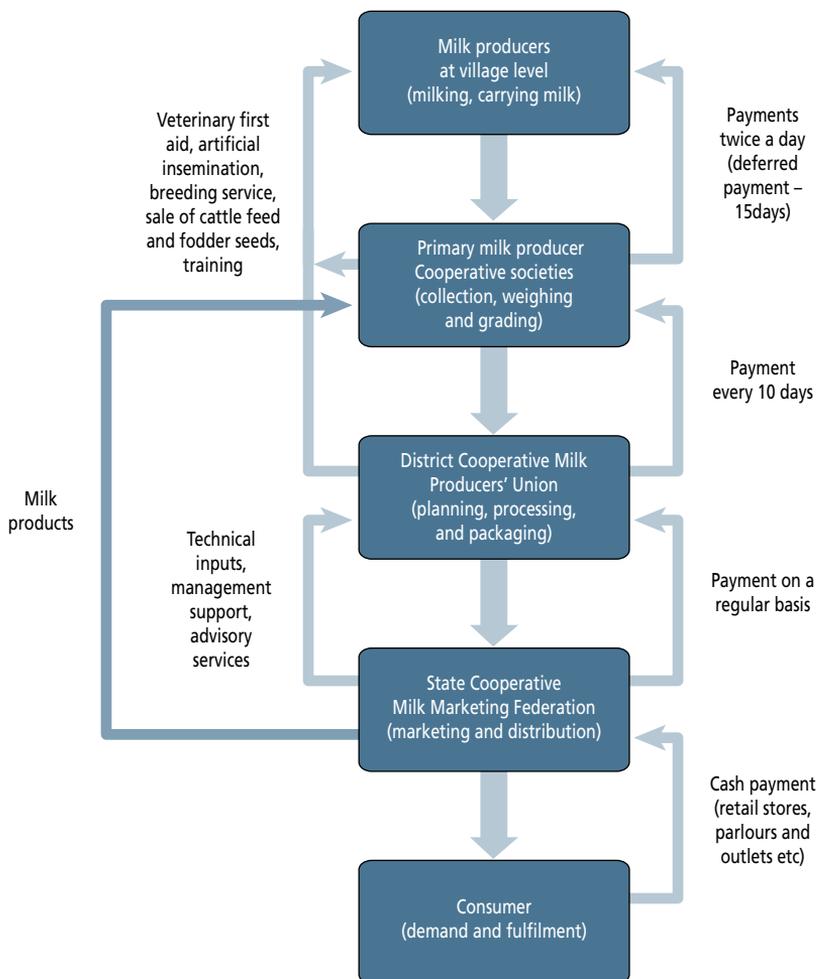
The district-level Milk Union is the second tier under the three-tier structure. Its membership consists of Village Societies of the district through their Chairmen, and is governed by an elected Board of Directors consisting of 9 to 18 elected representatives from among the Village Society Chairmen. The Board of Directors elect a Chairman and appoint a professional Managing Director and staff. The main function of the Milk Union is to procure raw milk from the Village Societies of the district, transport it from the villages to the Milk Union owned dairy plant, and process it into pasteurized milk and other milk products. It also offers significant supporting activities such as veterinary services, breeding services, cattle feed and other inputs for the village societies and producers, and undertakes initiation, training and supervision of the village level societies.

The State-level Federation is the apex tier under the three-tier structure. Its membership consists of Milk Unions of the State through their Chairmen, and is governed by an elected Board of Directors from among the Chairmen of Milk Unions. It elects a Chairman and appoints a professional Managing Director and staff. The main function of the Federation is the marketing of the milk and milk products manufactured by Milk Unions. The Federation manages the distribution network for marketing of milk and milk products and maintains the supply chain network. It also provides support services to the Milk Unions such as technical inputs, management

support and advisory services. The structure and services of the model are outlined in Figure 9.1.

Though not as significant at the national level, the National Cooperative Dairy Federation of India (NCDFI), is another national body that formulates, promotes and lobbies for policies and programmes to help safeguard the interests of milk producers.

FIGURE 9.1 Outline of the structure and functioning of the AMUL model



Source: based on Sridhar and Ballabh (2006).

Political functioning

At the village level, a Dairy Cooperative Society is formed with primary milk producers. A milk producer becomes a member by paying an entrance fee and buying a share of the Society. A farmer producer becomes eligible for a voting right in the Society if she/he is a member and supplies at least 700 litres of milk per year, with 180 days of supply in a year. The allocation of voting rights is by 'one member one vote'. Members of the Society elect a managing committee as per the by-laws, and the committee elects its Chairman. Committee members are honorary and their role is restricted to policy formulation and overseeing the programme. The Society undertakes a few critical functions like collecting milk (twice a day), making regular payments to milk supplier members, and providing cattle feed, fodder, animal breeding and health care services to members.

Member producers bring milk to the Society every morning and evening. Initially, the Union provides each Society with a fat testing machine free of charge. The quality (i.e. fat content) and quantity are assessed, and the amount payable to each producer is worked out. When the producer comes to the centre in the evening, she/he is paid for the morning delivery; for the milk delivered in the evening, money is paid the next morning. Apart from the daily cash income, members also receive bonuses and a difference in price at the end of the year. The amount of the bonus is pro rata to the value of milk supplied by the producers at the Society. The Society also makes profit on the milk it sells to the Union and receives the difference in price. The entire profit of the Society is generally not distributed to member producers. A part is allotted for developmental activities within the village and maintenance of the Society. Societies also act as disseminators for various activities of the Union such as member education and production enhancement. The staff at the Societies are also trained to undertake veterinary first aid and artificial insemination.

The Cooperative Union is the representative of all the Village Societies located at the district level and is governed by a Board of Directors made up of representatives from village societies, financial institutions, the State cooperative department, dairy experts, the Federation, government nominees, and the Managing Director of the Union. The Board elects a Chairman and Vice Chairman and appoints a Managing Director who in turn appoints supporting staff. The Board is responsible for policy formulation and the staff are responsible for looking after the day to day operations. One-third of the village representatives on the Board retire every year and the vacancies are filled by election. The Chairman is elected every year.

Practical functioning

Given the perishable nature of milk, it was imperative for the Cooperative to devise ways and means of transporting the milk procured from distant villages in the shortest possible time, and under refrigerated conditions to the processing units. Hence, milk transportation routes are designed in a manner that all villages are covered in the shortest possible time and in a cost-effective manner.

Bulk cooling units and chilling centres are often set up along these milk routes. Milk is collected by unions from villages twice a day with the help of contracted private transport vehicles. Milk from the Society is measured for its quantity and quality (Fat and SNF, i.e. 'Solids Not Fat') and is paid for on this basis. Payments to the Societies are made every 10 days. Cooperative Unions also provide many services to their farmer members. The Union runs mobile veterinary dispensaries to provide veterinary care free or at a small charge to the members, runs semen production centres for breeding, trains the Society staff in artificial insemination (AI), and conducts various technical extension programmes for increasing the production of milk.

The Gujarat Cooperative Milk Marketing Federation (GCMMF) is the sole marketing agency for the products produced by different cooperative unions, under the popular brand names 'AMUL' and 'Sagar' (Kurien, 2003) and has a network covering over 3 500 dealers and 500 000 outlets (Subramanyam, 2004). There are 47 depots with dry and cold warehouses to carry inventory of the entire range of products. The distribution network comprises 300 stock keeping units, 46 sales offices, 3 000 distributors, 100 000 retailers with refrigerators, an 18 000-strong cold chain, and 500 000 non-refrigerated retail outlets. Products marketed include fresh milk, UHT milk, brown beverage milk drink, infant milk, milk powders, sweetened condensed milk, butter, cheese, ghee, yogurt/curd, breads, pizzas, *mithaae* (ethnic sweets), icecreams, chocolate and confectionery. The network follows an umbrella branding strategy. AMUL is the common brand for most product categories produced by various unions. By insisting on an umbrella brand, GCMMF avoids interunion conflicts and creates opportunity for the union members to cooperate in developing products.

GCMMF's technology initiatives include development of new products, processing technology, measures to enhance milk production and quality, and e-commerce. Village societies are encouraged through subsidies to install chilling units. Automation in processing and packaging areas is adopted, as is Hazard Analysis and Critical Control Points (HACCP) certification. GCMMF actively pursues development of embryo transfer and cattle breeding in order to improve cattle quality and increase milk yields. Another initiative underway is to provide farmers with access to information relating to markets, technology and best practices in the dairy industry, through Internet-enabled kiosks in the villages. GCMMF has also implemented a Geographical Information System (GIS) at both ends of the supply chain, i.e. milk collection as well as the marketing process.

Conclusions

AMUL represents a methodology of building and sustaining an economic enterprise and has ensured high levels of patronage, cohesiveness, governance and operational effectiveness (Shah, 1996). The cooperative model benefits from commitment from the farmers, and cost-efficiency in raw material production and procurement. It also extensively engages with small farmers as well as the landless rural poor, who despite their impoverished state may keep 1–2 animals, and is reported to contribute significantly to rural incomes and employment through its

three-tier organization. However, its drawbacks include its need for enlightened and committed leadership (through its governing board), and capable management, which is sometimes difficult to ensure. The board is elected and may become politicized, detracting from sound cooperative and business practices. Further, antiquated laws governing cooperatives invite government interference and prevent use of financial markets for raising equity capital, thereby constraining expansion and growth to some extent.

9.4.2 Model 2: The Nandini model

Another similar agro-industry model on cooperative lines is 'Nandini' of the Karnataka Cooperative Milk Producers' Federation Limited (KMF). KMF is the Apex Body of dairy farmers' cooperatives in Karnataka state in south India, and is the third largest dairy cooperative in the country. In south India it stands first in terms of procurement as well as sales. The brand 'Nandini' is a household name in Karnataka state for pure and fresh milk and milk products. KMF has 13 milk Unions throughout Karnataka state that procure milk from primary dairy cooperative societies, and distribute it to consumers in various cities, towns and rural markets in Karnataka. The district milk producer unions receive milk from 11 000 primary dairy cooperative societies which are at the *taluka* (sub-district) and village levels. About two million dairy farmers in Karnataka state are covered. The growth of KMF over the years is summarized in Table 9.4.

The cooperative evolved under a dairy development programme in Karnataka begun in 1974 with financial assistance from the World Bank under Operation Flood II and III national dairy development programmes. Village dairy cooperatives were promoted

TABLE 9.4
Growth of Nandini

		1976–1977	2007–2008
Dairy cooperatives	Numbers	416	11 063
Membership	Numbers	37 000	1 956 163
Milk procurement	Kgs/day	50 000	3 025 940
Milk sales	Litres/day	95 050	2 129 790
Cattle feed consumed	kg/DCS*	220	3 010
Daily payment to farmers	Rs. 100 000s	0.90	342
Turnover	Rs. billions		27.07

Source: <http://www.kmfndini.coop/>

* DCS means District Cooperative Society. There are currently 13 such unions and the statistic are average per union.

in the AMUL style, in a three-tier structure with the village level dairy cooperatives forming the base level, the district level milk unions the middle level to take care of procurement, processing and marketing, and the State milk federation as the apex body to coordinate at the State level. Coordination of activities among the Unions and developing markets for milk and milk products is the responsibility of KMF. However, unlike AMUL, the marketing of milk in the district jurisdiction is organized by the respective milk unions. The surplus or deficit of liquid milk among the member unions is monitored by the federation. All the milk and milk products are sold under a common brand name, Nandini.

The milk unions also provide the following technical inputs at subsidized rates or free of charge to their members:

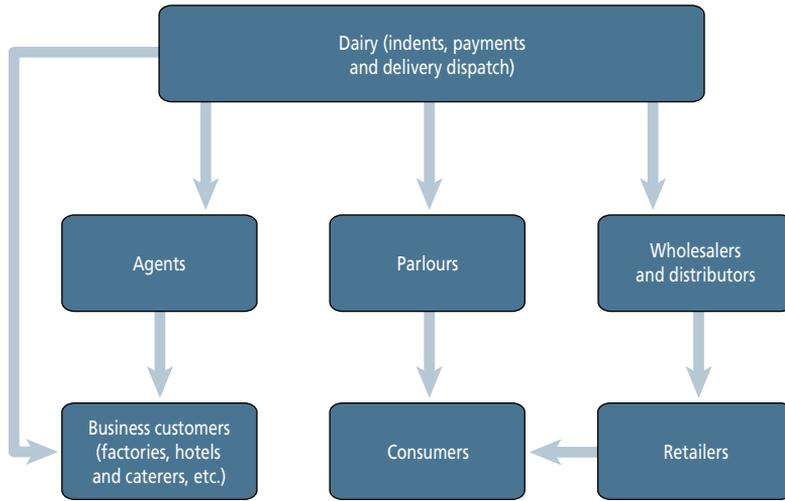
- ▶ veterinary emergency services round the clock at the milk producer's door step;
- ▶ free animal health camps conducted by veterinary staff at village level;
- ▶ provision of animal feed and planting material to grow fodder crops;
- ▶ artificial insemination (AI) services to crossbreed animals, and free infertility camps at village level;
- ▶ free vaccination to protect animals against diseases like Foot and Mouth, Theileriasis etc;
- ▶ free training for milk producers and District Cooperative Society (DCS) staff;
- ▶ empowerment programmes for women in association with the Government of India (GOI) by forming women's cooperatives governed by women;
- ▶ on the death of a milk producer, payment by the Union of Rs. 10 000 to next-of-kin through dairy farmers' welfare trusts, providing scholarships and fellowships for the education of the milk producer's children.

KMF supports the livelihoods of around 1.95 million dairy cooperative members through over 11 000 dairy cooperative societies. KMF has become the second largest milk-procuring organization in the cooperative sector, with daily milk procurement of 3.02 million litres. This has resulted in a 'white revolution' in Karnataka: milk procurement has increased 2.5 times in the last 10 years; the sale of milk per day has reached 1.7 million litres, increasing by 1.4 times; milk procurement is growing at 9.65 percent annually against the national average growth of 4.8 percent. Improved technical inputs such as animal health care, artificial insemination services and cattle feed supply have made a significant contribution to this trend. The surplus milk is sold to neighbouring milk deficit states such as Kerala, Andhra Pradesh, Goa, Maharashtra and Pondicherry, and the rest is converted into products. The Nandini product family consists of 35 products and new products are frequently added after market research. The marketing system and network are outlined in Figure 9.2(a).

The major challenges facing the Nandini model are:

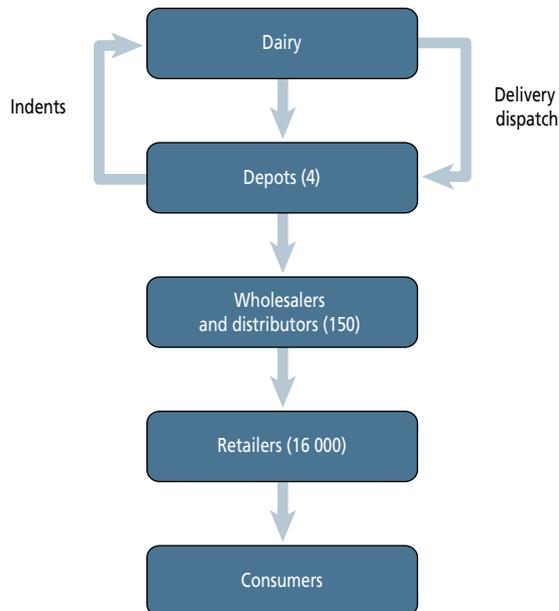
- ▶ inadequate processing facilities;
- ▶ difficulties in maintaining the quality of raw milk under the prevailing conditions;

FIGURE 9.2(a) Milk distribution network of Nandini



Source: Based on Revanna (2006).

FIGURE 9.2(b) Milk products supply chain of Nandini



Source: Based on Revanna (2006).

- ▶ increasing costs of transportation and processing;
- ▶ unhealthy competition from private dairies in procurement;
- ▶ inadequate roads and power infrastructure.

Some of these problems seem to stem from a relatively limited role of the Federation (compared with AMUL), and as a result, inadequate scale economies and lack of support in larger roles such as marketing, investment and logistics.

9.4.3 Model 3: The Nestlé model

Nestlé is the largest food and beverages company in the world. The company uses the milk district model for its agro-industrial activity in India. Nestlé India started its operation in the Moga district of Punjab in 1961 by setting up its first milk factory in India. The factory produces milk powders, infant products and condensed milk. The annual fresh milk intake of the Moga factory rose from less than 12 000 tonnes in 1970 to 240 000 tonnes in 2003, obtained from 85 000 farmers. By 2008, it covered 100 000 farmers and had an intake of 1.25 million litres milk/day. Nestlé India states that it supports a system of sustainable dairy farming with regular milk payments and sustainable methods, and claims that it has a positive impact on the community and rural economy of Moga as a whole.

Setting up a milk district involved:

- ▶ negotiating agreements with farmers for twice-daily collection of their milk;
- ▶ installing chilling centres at larger community and collection points or adapting existing collection infrastructure;
- ▶ arranging transportation from collection centres to the district's factory;
- ▶ implementing a programme to improve milk quality.

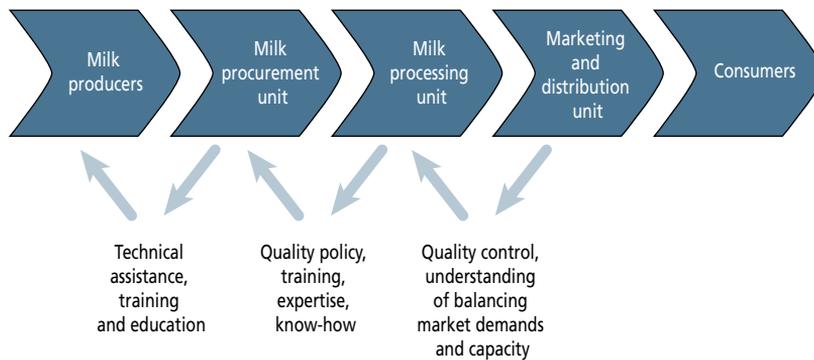
Nestlé India has its milk processing factory in the town of Moga and sources raw milk from the districts of Moga, Ludhiana, Sangrur, Mukatsar, Ferozepur and Faridkot. These districts have been collectively referred to as 'Moga Milk District'.

Selecting a location for collection points is based on several factors:

- ▶ present milk production and the potential of the area based on available fodder resources, agricultural land, and farmers' interest in dairying;
- ▶ present milk production costs and milk prices in the area;
- ▶ the income farmers could earn from fresh milk versus the income from alternative (i.e. not supplementary) crops;
- ▶ present milk collection systems (if any), the presence of competitors, present milk quality and the potential to achieve the required quality.

To ensure quality, Nestlé undertakes training and has manuals detailing good farm practices for each district. The farms are audited regularly to make sure the right practices are followed. The company provides technical support to farmers to guide them in reaching the quality standards. Testing is done at the collection centres and cooling centres (Goldberg, 2006). Surpluses present a challenge for Nestlé and the farmer: the company tries to offset the expense of buying up surplus in the spring season against the security of a steady supply at a stable price throughout the entire year. The chain structure is outlined in Figure 9.3.

FIGURE 9.3 Nestlé's milk value chain



Source: Nestlé.

Some 64 320 dairy farmers supply milk under contract and the company maintains their records. The company has stringent quality specifications. Nestlé staff members regularly monitor milk quality and performance *vis-à-vis* contractual obligations, and the farmers obtain feedback on milk quality at the collection points. Company technologists determine quality in laboratories with samples being taken in the presence both of the farmers and the company representatives. Nestlé is not obliged to collect milk that does not meet the quality standards specified in the contract. The contract also allows the technologists to penalise the producer with a 30-day ban; if antibiotics are found, the price of milk is reduced by 15 percent. Repetition of any discrepancy is considered a serious breach of contract. Farmers have the right to complain through registers located at each collection point if they believe there is a problem. The system still works because it provides an assured market for the farmers at remunerative prices for the milk.

Nestlé states that the milk district model has changed the lives of farmers and also boosted the company's bottomline. The small township of Moga in Punjab is today on the world dairy map. Moga processes over 1 million litres of milk every day, twice the amount processed in the rest of Punjab. The company procures over 1.1 million kg of milk per day from the states of Punjab and Haryana during the peak season, covering 14 000 square kilometres and 98 000 dairy farmers through an efficient milk collection system, with a network of 2 240 milk agencies, and 698 milk cooling centres. It also provides farmers with training and advice on correct dairy farming practices. A news report indicates that covering even 90 000 farmers and ensuring timely payment, linked to both quantity as well as quality for the milk supplied, is no small task. It is certainly something that very few private corporates have attempted and actually succeeded in doing (*Business Line*, 9 December, 2001).

Comparison of the Nestlé model with the AMUL model

In the 'Anand model' run by AMUL, the primary milk collection centre is the village cooperative society, an elected body that is owned and directly accountable to the dairy farmers themselves. In the 'Moga model', the job of sourcing milk from farmers is carried out not by a cooperative society, but a private commission agent appointed by the company. Nestlé operates a network of 1 100 agents who receive a 2.3 percent commission on the value of the milk supplied to the dairy. The agent and the farmers are paid on a consolidated fortnightly basis, unlike the system of daily milk payments to farmers used by AMUL.

In terms of scale and reach, Nestlé's milk procurement pales in comparison with that of AMUL. During 2000–2001, AMUL's unions procured an average of 4 576 million kg of milk per day from over 2 million farmer-members in Gujarat. The unions procured 31.4 percent of Gujarat's estimated milk production of 5 313 million tonnes in that year, implying that almost every third litre leaving a milch animal's udders in the State ended up being collected by societies affiliated to AMUL. Meanwhile Nestlé's operations are much smaller and confined to districts around Moga. The company's average procurement of 0.65 million kg per day covers barely 3 percent of Punjab's annual milk output of 8 million tonnes. The average Nestlé farmer pours about 7.25 kg of milk per day, whereas the corresponding figure for AMUL is slightly over 2 kg per day, indicating that the latter's reach perhaps extends to small/marginal farmers and landless farm labourers who may own only 1–2 milch animals (*Business Line*, op. cit.).

With respect to price, Nestlé in 2000–2001 paid an average price of Rs. 9.84 per kg, lower than the Rs. 13–14 per kg that AMUL paid to its farmers. However, about 45 percent of Nestlé's procurement is cow milk with fat content of about 3.5 percent, as against the bulk of AMUL's procurement being buffalo milk with a fat content of about 6.5 percent or more. Adjusting for this, there is little difference between the farm gate prices paid by Nestlé and AMUL. This would be also be offset by the higher productivity of the animals – especially cross-bred cows – that enables the Nestlé farmer to deliver more than three times the quantity of milk that an average AMUL farmer pours (*Business Line*, op. cit.).

In 2000–2001, Nestlé’s payments to Moga’s farmers for procurement of milk amounted to nearly Rs. 1 950 million. If one adds to this the value of various developmental inputs provided by the company – free veterinary aid, breed improvement and extension services, subsidies on installation of farm cooling tanks, etc – the amount paid to farmers would be around Rs. 2 040 million. This amounts to almost 47 percent of the value of the company’s sales of milk products. In comparison, this proportion for AMUL and its unions is over 80 percent. As part of the equation it must be noted that Nestlé is a company accountable to its shareholders and investors, while AMUL is an entity accountable to and owned by the farmers themselves (*Business Line*, op. cit.).

9.4.4 Model 4: Heritage Foods

The Heritage Group based in Andhra Pradesh was founded in 1992 by Chandra Babu Naidu, the former Chief Minister of Andhra Pradesh. It is a fast-growing private enterprise with three business divisions, dairy, retail and agri, under its flagship company Heritage Foods (India) Limited (HFIL). Heritage’s milk products have a market presence in the states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Maharashtra, and it has retail stores in the cities of Hyderabad, Bangalore, and Chennai. Integrated operations in Chittoor and Medak districts form the backbone of the retail operations. Heritage is considered a successful dairy enterprise and is known for its high quality standards and premium range of milk and milk products. It follows international standards in manufacturing, packing and distribution practices and has become an ISO 22000 certified company. Heritage has 12 packing stations and 74 chilling centres/bulk coolers with operationally-safe processing equipment. The products are sold under the brand ‘Heritage’.

The company covers about 200 000 farmers and has the capacity to process 1.5 million litres of milk per day. Products include full cream milk, toned milk, double-toned milk, cow milk, UHT milk (tetra pack), cow ghee, buffalo ghee, cooking butter, fresh cream, skimmed milk powder, curd (cup and pouch), flavoured milk in bottles and tetra packs of butter, milk lassi, paneer doodh peda, ice cream and bread cookies. The annual turnover reached Rs. 34.7 million in 2006–2007.

Heritage has established a supply chain which procures milk from farmers in rural areas, mainly in Andhra Pradesh and some parts of Karnataka, Maharashtra and Tamil Nadu. The Heritage model’s starting point involves harnessing the current milk collection centres – which are also rural retail points – and thus use them to penetrate the rural market. Two-way or reverse logistics are used to transfer and sell goods from the urban markets to rural markets, and through this direct retail presence also mobilize milk procurement. This enables economies of scale in supply chain costs, serves both the rural customer and producer, and improves penetration in the rural areas.

It connects to consumers through representatives – who are also milk collection representatives of Heritage – that sell consumer goods. This provides opportunities

for Heritage to launch its private labels in rural markets. The company's rural retail network has increased to 1 515 stores with 13 distribution centres. A typical rural store is about 10 square metres in size and is based on a franchise model to cater to villages with a population of less than 5 000. The objective is to deliver popular fast-moving consumer goods (FMCG) products and quality groceries at affordable prices to interior villages across South India, leveraging the milk procurement network. Apart from milk, vegetables and seasonal fruits are also produced and procured through contract farmers and reach pack houses via collection centres strategically located in identified villages. The collection centres undertake washing, sorting, grading and packing and dispatch to retail stores through distribution centres. Other features of the model include:

- ▶ promotion of an annual crop calendar of sourcing that seeks to ensure higher annual income per unit area;
- ▶ technical guidance – agri-advisory services, regular training of farmers, credit linkage and input supply;
- ▶ a package of improved farm practices for better productivity and quality;
- ▶ an assured market at the doorstep;
- ▶ assured timely payments;
- ▶ transparency in operations.

The Heritage model provides an example of using the existing marketing points and chains for the purpose of agro-industry rather than building new/dedicated chains. This may achieve faster roll-out and reach. It also provides an example of using two-way or reverse logistics for improving the efficiency and economics of the supply chain. Both these methods are not seen in the AMUL, Nandini or Nestlé models.

9.4.5 Model 5: Mother Dairy

Mother Dairy (Delhi) was set up by the National Dairy Development Board (NDDB) under the first phase of the Operation Flood Programme in 1974, with the objective of improving the availability of liquid milk to city consumers. Mother Dairy is a subsidiary of the NDDB. Even though Mother Dairy is not owned by the farmers, it is associated with the Anand Model cooperative set-up. Given the potential markets for liquid milk in the big cities, entities like Mother Dairy were established in all the four major Indian metros – Mumbai, Kolkata, Chennai and Delhi – and were also set up in all state capitals. The objective was to help those cooperatives who needed help to process and market the milk.

It is estimated that Mother Dairy Delhi commands 40 percent market share in the organized liquid milk sector in and around Delhi. The Mother Dairy brand name is used for distributing milk in the Delhi national capital region. In Delhi and at national level, Mother Dairy also markets dairy products such as ice creams, flavoured milk, dahi, lassi, mishti doi, ghee, butter, cheese, dairy whitener, the Dhara range of edible oils, the Safal range of fresh fruit and vegetables, frozen vegetables and fruit juices.

Mother Dairy sources its entire requirement of liquid milk from dairy cooperatives – it buys the liquid milk from state federations. Because it runs on the principle that the landed price of milk at Delhi should be the same for all, only state federations near Delhi supply milk to Mother Dairy. Profitability is not the core motive and procurement is done more or less at the market price. Marketing is mainly carried out through bulk vending machines, apart from 12 packaging stations for polypack preparation that are outsourced from the state federations. The costs of the processing units are borne by the federations whereas those of the distribution centres are borne by Mother Dairy.

Mother Dairy pays almost 70 percent of the market price to the milk suppliers. The payment is made through cheques and the milk suppliers receive the payment within 10 days. The surplus from the remaining amount is shared among Mother Dairy, state federations, district unions, and the village-level societies. For the procurement of fruit and vegetables, the grower associations are paid a commission of 1.75 percent to meet the expenses of running the association.

The annual turnover of liquid milk distribution is about Rs. 12–13 billion and the total turnover of Mother Dairy is Rs. 27 billion. Bulk vending milk sales are growing at 3–4 percent per annum, whereas polypack milk sales are growing at 12–13 percent.

Mother Dairy brought significant benefits to the farmers by assisting in the marketing of the dairy cooperative's milk. Recently, Mother Dairy has been facing competition from other organized retailers, and maintaining quality is also a major challenge. The reach of the Mother Dairy model to farmers depends substantially on the efficiency and the effectiveness of the cooperatives, given that it does not connect with the farmers directly. On the other hand it assists the farmer bodies to market the milk in the vast markets of the major urban areas – a capability many of them lack. It also undertakes the necessary investments for processing and distribution which are difficult for some of the farmer bodies to carry out.

TABLE 9.5

Mother Dairy daily milk sales – July 2007 (litres)

Variant	Milk shop	Retail	Total
Bulk vending milk	646 854	189 849	836 703
Polypack milk	333 781	1 075 149	1 408 930
Total	980 635	1 264 998	2 245 633

Source: <http://www.motherdairy.com/>

9.4.6 Model 6: Suguna Poultry

India has a rapidly growing poultry market and its size is now estimated to be around Rs. 12 billion (Business Standard, July 2008). However, the poultry industry is highly fragmented and disorganized. In this sector, Suguna Poultry is one of the largest organized players and is believed to rank among the top ten poultry companies worldwide. The company is based in Coimbatore, Tamil Nadu state, and has operations in 11 states in India, offering a range of poultry products and services. Suguna Poultry started its operations in 1984. The company pioneered contract farming in the poultry industry in India and sources its products through 12 000 contract farmers across different states.

In the Indian market, consumers used to prefer live birds to frozen chicken. Suguna came into the unorganized market with the concept of branding chicken. It has been able to create a space for itself and was able to make its brand prominent in this market, becoming a part of the growing frozen poultry sector. Suguna had a turnover of Rs. 11 billion in 2005–2006 and a 14 percent share in the Rs. 80 billion broiler market. By 2010, Suguna had risen to be a leader in the broiler market in India and among the top ten poultry companies worldwide. By 2010–11, it had a sales turnover of Rs. 32 billion with over 20 percent market share in India. Interestingly, it did so without owning a single poultry farm: by 2007, the company had sold live birds and eggs worth Rs. 20.2 billion without owning a single farm. Its fully integrated operations extend from broiler and layer farming to hatcheries, feed mills, processing plants, vaccines and exports. Suguna sells live broiler chicken, value added eggs and frozen chicken, and has set up a chain of modern retail outlets aiming to provide consumers with fresh, clean and hygienic packed chicken.

In 1993 Suguna set up a 'parent farm' where the parent breed was reared. Day-old chicks hatched by these birds are sent to the contract farmers. In 2000, the company began to directly import 'grandparent chicks' from the UK – these have the best genetic make-up for breeding broilers – and set up a 'grandparent farm'. The company also forayed into the layer (egg) segment of the poultry business in 2007, and grabbed a 6.6 percent market share in the first year. Venkateshwara Hatcheries (90 percent market share) is the dominant player in the layer segment.

Suguna's operations are divided into 13 regions, each under the charge of a manager who has independence to decide on issues in his region. Products include Suguna Chicken, Suguna Anytime (frozen chicken), Suguna Daily Fresh, Suguna Home Bites, Suguna Value Added Eggs. The company collaborates with leading international companies to bring the latest technology and practices to service its massive base of 15 000 farms and has invested in sophisticated technology and infrastructure. This includes:

- ▶ state-of-the-art hatcheries
- ▶ an advanced R and D centre
- ▶ feedmills

- ▶ veterinarians
- ▶ scientists
- ▶ other professionals.

Through this set-up, quality end products are assured through a production chain that can count on the best quality chicks, feed and professional care. Suguna's scientists and employees train the farmers in GMP (Good Management Practices). Through these, Suguna brings substantial value to the industry as well as its farmers, who on their own may not have been able to gain access to these technologies and services. Quality products result from stringent processes and ultra-hygienic rearing methods that are accepted worldwide. Suguna's presence is now established in 11 states across the country and it has obtained ISO certification, further proof of its commitment to quality. It has also implemented the Hazard Analysis and Critical Control Points (HACCP) system and is well prepared with its state-of-the-art processing plant to meet growing demand.

Suguna's business model can be called 'contract broiler farming', a form of franchise farming, and was introduced in 1991. Farmers who own land and have access to resources such as water, electricity and labour can become growers of Suguna's Ross breed of chicks. All the required inputs – day old chicks (DOCs), feed, medicines and expertise – are provided by Suguna, which has successfully reduced middlemen in the poultry chain from 14 to 4. The process of growing the chicks is standardized and must conform to the exacting standards laid down by the company; quality control checks are carried out by company staff to ensure the norms are being met. The broilers are procured by Suguna as long as they comply with established quality norms, and the farmer is paid a 'growing' commission or charge. On average, a typical farmer franchisee can earn Rs. 10 000 monthly for breeding broiler chickens on their farm.

If a farmer does not comply with procedures as laid down in the breeding manual, or sells chickens to another party, this is considered a breach of trust and the contract is unlikely to be renewed. Suguna also provides farmer franchisees with a safety net: not only does the company bear production and market risks, it also shoulders the responsibility for any damage from a change in the market environment. For instance, a rise in feed prices would not affect contract farmers because they are supplied with feed directly by Suguna. Similarly, when an attack of bird flu occurred, Suguna took on the financial losses suffered by the farmers. Farmers deal only with the company and receive assured returns. Regardless of the market price, the farmers still receive the assured growing charge/cost, and incentives.

Suguna has been able to prove that every state in India is fit for poultry operations with its presence in 11 states. It has benefited large numbers of rural households, improving their lives with its innovative business model. Seeing the impact of Suguna's initiatives on rural development, Chief Ministers of other States such as Andhra Pradesh, West Bengal, Punjab and Jharkand have invited the company to set up operations in their States. The model has also attracted visitors from across

borders that are keen to learn from Suguna's initiatives and success and to adopt the same model in their countries.

This model protects the interests both of the farmer and the integrator (Suguna). The integrator takes responsibility for providing day old chicks, feed, medicines and supervision to the farmers. In addition, the integrator brings GMPs and technical know-how that leads to higher productivity. In the absence of these, independent farmers required heavy investments, multiple interactions, and had poor yields overall. Farmers who follow the practices are assured of good earnings in the integrated/contract farming model. The Suguna model offers fast scalability because the company does not have to buy or lease farms. It keeps costs low, and offers economies of scale including in buying raw materials, feed and medicines.

9.4.7 Model 7: The NDDB Safal Auction Market

The NDDB's Safal Auction Market was set up in Bangalore in 2003 as a highly modern market for the marketing of fruits and vegetables. To enable the National Dairy Development Board (NDDB) to set up this market outside the market yards governed by the Agricultural Produce Market Committee (APMC), the Karnataka state government passed a special amendment to the APMC Act. This Rs. 1 500 million auction market is on the outskirts of Bangalore on 60 acres of land, and has a state-of-the-art marketing infrastructure:

- ▶ It has separate auction rooms for fruits and for vegetables which have electronic display boards and electronic auction equipment.
- ▶ The auction is conducted by the staff and there is a viewing gallery for farmers witnessing it.
- ▶ There are no commission agents, and no commission is required to be paid by the farmers, although there is a service charge that they need to pay.
- ▶ There are storage facilities for farmers and traders including cold storage and ripening chambers.

The supply chain is simple and direct. The farmers may either bring the produce directly to the Safal Auction Market with their own or hired transport, or take the produce to the closest Safal Growers' Association. In the latter case, a round of grading is carried out before the produce is sent to the market in the Association's transport. If the produce is brought directly by the farmers, grading takes place at the auction centre before the auction. The produce usually arrives in the evening of the day before. Farmers may come along with their produce to view the auction. Buyers are required to pay a deposit to participate in the auction; afterwards, the produce is transported out by the buyer/trader, including to markets in other States.

Despite the world-class facilities that indicate efficiency and hygiene, the Safal Auction Market, even after five years, is operating at only 15–20 percent capacity. Officials hope

the market will operate at full capacity after another five years or so. The main reason they cite for the current situation is the boycott of the facilities by the wholesalers; these and also some retailers indicate that the main drawback is the lack of product choice. Officials also state that the dependence of farmers on the commission agent for credit discourages them from coming to this facility. Nevertheless, some farmers and consolidators make use of the cold storage and ripening chambers available at the market, even if they do not sell their produce at the auction.

9.4.8 Model 8: HPMC

Himachal Pradesh Horticultural Produce Marketing and Processing Corporation (HPMC) is a government owned and managed organization for the processing and marketing of horticultural produce, especially apples, grown in the State of Himachal Pradesh. The produce is purchased by HPMC from the farmers at announced prices. It is then stored, processed and marketed nationally by the corporation. HPMC has set up processing facilities and infrastructure including produce collection centres, warehouses, cold storage facilities and processing plants in Himachal Pradesh, principally for apples: two collection centres, ten packing/grading houses, three warehouses, and five cold storages. It has also set up cold storage in the metropolitan cities of Delhi, Mumbai, and Chennai.

HPMC was established in 1974 as a government undertaking with the objective of marketing fresh fruits and processing surplus fruits. HPMC provides various services to the State's fruit growers for the processing and marketing of fruits. The corporation has set up two modern fruit processing plants that can make a range of processed products. Between 1974 and 1982, HPMC established pre- and post-harvest infrastructure, comprising a network of mechanically-operated pack houses, cold storage facilities, trans-shipment centres and fruit processing plants, besides a network of sales offices in the terminal markets. The infrastructure for grading/packing, pre-cooling and cold storage was established in rural areas to provide pre- and post-harvest facilities to farmers close to their farms. HPMC produces a variety of processed products including apple juice concentrate, concentrate of orange, pear, plum, and strawberry, and pulps of all the above fruits. It also produces fruit juices in tetra packs, natural and blended juices, squashes, jams, canned products, apple cider, cider vinegar, apple and plum wine, baby corn, mushroom in brine and varieties of pickles.

HPMC seeks to bring remunerative returns to fruit growers and nutritive quality products at a reasonable price to consumers. During the year 2005–2006, HPMC sold processed products worth Rs. 117.7 million in markets across the country. It signed a memorandum of understanding with the Agri-Business Information Centre of the Federation of Indian Chambers of Commerce and Industry (FICCI), which now provides services and information to HPMC for marketing its products in the domestic and international markets. HPMC is supplying its products to

Indian Airlines, Alliance Air India and Indian Railways, earning Rs. 2.1 billion revenue annually. It also supplied products, worth Rs. 13.7 million in 2005–2006, to private companies such as Heinz, Parle, Mohan Meakin and Britannia. To export apples, HPMC has signed a memorandum of understanding with the private company India Tobacco Company Limited (ITC), under which HPMC helped ITC procure 10 000 boxes of apples worth Rs. 4.7 million and HPMC extended its storage and packing facilities to ITC in 2008. Under the Market Intervention Scheme (MIS) of the government, the corporation procured 0.4 million metric tonnes of apples in 2010–11.

HPMC procures some fruits such as apples under the government's MIS, which helps support prices, preventing them from crashing. The efforts made by the corporation have resulted in a stabilization of the prices of fruits in the market. Apart from procuring under MIS, HPMC also directly procures other fruits such as peaches, pears, plums, lychee and almonds grown in the State, for marketing and processing under hygienic conditions in its processing plants. This helps increase the capacity utilization of the plants and assists farmers in receiving additional returns for their produce.

HPMC did well in the beginning but subsequently could not perform in the active market. Producers did not bring apples in sufficient quantities to HPMC on account of their scattered, hilly and distant producing locations, which made transportation from the producing areas expensive. Bringing produce from a producing area to the grading and packing centres was time consuming and they had to wait a long time for their turn to get the produce graded. Because the apple season is very short, the producers preferred to send the produce immediately to the terminal markets to avoid losses and get better returns. Cold storage facilities were often not fully utilized and HPMC therefore needed to divert its utilization to mushroom cultivation, after modifications (Dhankar and Rai, 2002).

When HPMC found it difficult to process the fruit procured, it sent it to markets for sale in fresh form. This affected the market and prices for fresh fruits: for example, good quality apple prices crashed when HPMC took such steps. Though the corporation has experience in the post-harvest management of fruits, it lacks in business skills and capabilities. There has been a gradual decrease in its activities and an increase in its losses. The capacity utilization of grading and packing houses has become very low. HPMC attributes this low utilization to the removal of free transport facilities that were previously available to growers through HPMC (Dhankar and Rai, 2002).

As indicated, even though HPMC was fairly successful at one time, reports show that it has not been able to sustain the performance (Vaidya, 1996; Gandhi *et al.*, 2001). It has been unable either to attract enough farmer suppliers or expand distribution beyond its own outlets. While government-owned agro-industries are well funded as far as investment in infrastructure and technology are concerned, they also depend on bureaucrats for management, and these individuals often have limited business skills. Managers are frequently transferred to other areas at the

whim of changing governments and are accountable primarily to their superiors, not to the farmers or consumers. They are unable to sustain a commitment to procure from small farmers on the one hand, and to meet dynamic marketing demands on the other, thwarting the long-term performance of the enterprise.

9.4.9 Model 9: PepsiCo India

PepsiCo has been working with farmers in Punjab since the 1980s, starting with procuring tomatoes from farmers and producing tomato pulp, as an initial pre-condition for obtaining government permission to produce and sell its soft drinks in India. In the operation, PepsiCo introduced new tomato varieties that helped boost the state's tomato crop from 18 000 tonnes in 1988 to 300 000 tonnes in 2006–07. PepsiCo's involvement in Indian agriculture also stems from its aim of creating a cost-effective, localized agri-base in India, and in return for this, providing farmers with exposure and access to world class agricultural practices. The company has worked with farmers and State Governments to improve agricultural sustainability, crop diversification and raise farmer incomes. PepsiCo helped farmers refine their techniques and increase productivity by offering customized solutions to suit specific geographies and locations.

In 1989 PepsiCo had launched a joint initiative with Punjab Agriculture University (PAU), Ludhiana and Punjab Agro Industries Corporation (PAIC), Chandigarh, for the production, procurement and processing of tomato. This model involved backward integration by a private company with strong marketing capabilities and established products and brands. The initiative led to Pepsi Foods setting up a tomato processing plant at Zahura in Hoshiarpur district, Punjab, in 1989. By 1994, 350 farmers over an area of 2 700 acres were covered and 650 tonnes of tomato were processed every day (Gulati *et al.*, 1994). Under this model contracts for production and procurement of tomatoes were made with small farmers – the contracts were moral in reality, rather than legal. The company invested in building relationships of trust with farmers through their commitment to providing extension services and production inputs. PepsiCo brought in experts and promoted the use of appropriate farm technology and varieties, bringing to bear research and know-how available worldwide. Seedlings were provided to the farmers and planting was scheduled and programmed using computers. The best available technology was used in processing and the company applied its strong marketing capabilities and networks in selling the quality end products.

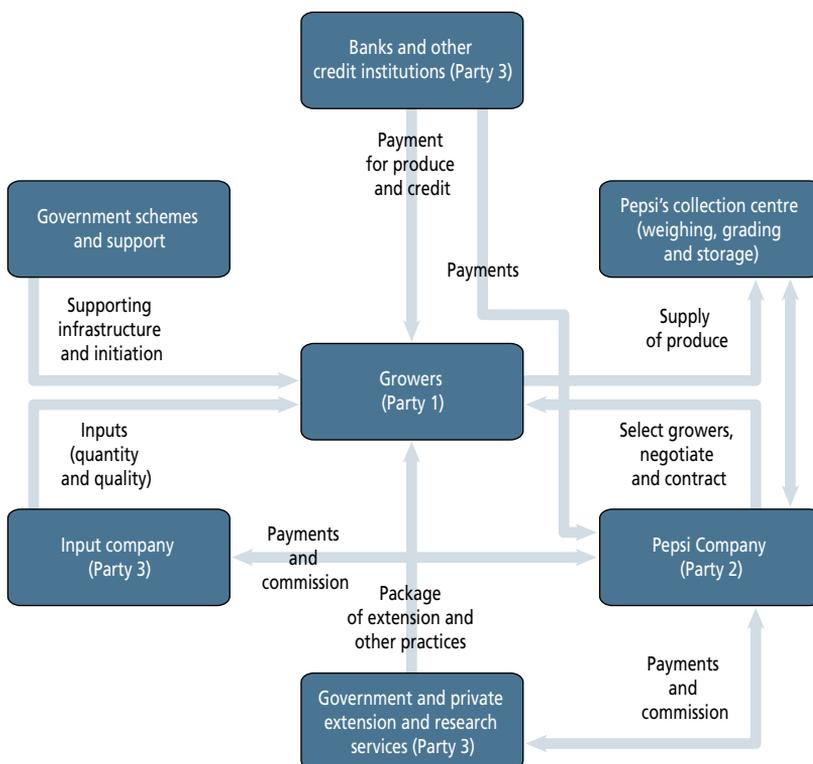
More recently, a similar initiative has been launched for potato. The initiative has sought to improving agricultural practices substantially and help Punjab farmers produce internationally competitive products. PepsiCo used contract farming under which the company transferred agricultural best practices and technologies, and procured the produce at a guaranteed price – see Figure 9.4.

To support the initiative, PepsiCo also set up a 27-acre research and demonstration farm in Punjab to conduct farm trials for new varieties of tomato, potato and other crops. They have evaluated more than 100 varieties and hybrids of tomato, more than 200 varieties and hybrids of chilli, 25 varieties and hybrids of corn, more than 60 varieties of peanut and several varieties of basmati rice.

The quality parameters put in place through the chain are driven by the specific needs of processing, and buyer requirements. Processing requires potatoes with low sugar content (0 percent) and high solids content (between 15 to 20 percent). Apart from this, because the company is also HACCP and ISO certified, stringent quality control is required at all levels in the chain. Specific requirements are met by ensuring quality compliance at every stage: RandD, farming, storing, processing, and packaging (Punjabi, 2008).

Before introducing the varieties to farmers, extensive trials are undertaken and a package of agronomic practices suitable to the local agro-climatic conditions are developed by

FIGURE 9.4 Tripartite model of PepsiCo India



Source: Based on Singh, 2007.

PepsiCo in collaboration with Central Potato Research Institute (CPRI). The package includes specific fertilizer recommendations and spraying schedules (Punjabi, 2008). The company ensures availability of inputs to farmers working in the area, and seed potatoes of specific varieties for processing are also provided by the company. The 'vendor' in the region ensures that farmers falling under their supervision have all the required inputs at the right time. If the company is providing inputs, the costs are deducted during buy back of potatoes. Apart from ensuring inputs, the company had also introduced crop insurance under the auspices of the Agricultural Insurance Company (AIC), and weather insurance from ICICI Lombard. In Karnataka, PepsiCo created an institutional framework roping in the Central Potato Research Institute (CPRI), agrochemical giant Du Pont and the ICICI Lombard General Insurance company.

For producing specific varieties and enhancing productivity, PepsiCo is very closely involved with its contract farmers in potato production. The company has employed teams of agricultural graduates who work with the farmers to provide technical input and to monitor production in their specified area. One technical expert deals with approximately 100 farmers. As a result, farmers reported that because of the technical information provided by company agronomists, the use of chemicals and fertilizers is much more timely and effective (Punjabi, 2008). The agronomists regularly monitor the fields at the time of planting, spraying, harvesting etc; if there is expectation of an outbreak of any disease or pest, they inform the farmers about timely spraying. Any major problems are attended to in consultation with the company researchers if necessary. Apart from PepsiCo's contract farmers, all potato growers benefit from early detection of diseases as a 'positive externality' of the company's operations (Punjabi, 2008).

To emphasize the care required in post-harvest management, the company agronomists often transmit messages such as 'Handle potatoes like eggs not like stones' (Punjabi, 2008). Traditionally, jute bags have been used for packaging potatoes. Instead of these the company has propagated the use of plastic bags for packaging because this ensures better storage. At the company's unloading dock, the potatoes are mechanically graded for size and potatoes that are too small for processing are separated. A visual inspection for damaged potatoes is also carried out, and a test for sugar content is undertaken by frying a small sample from the lot. Sample tests are also undertaken for solid content; potatoes that do not meet all the requirements are rejected. The potatoes are stored at 12 degrees to regulate conversion of sugar to starch; at this temperature they can be stored for up to 4 months. They are also treated to limit sprouting.

Selected potatoes are taken to the processing plant. They are washed and peeled and inspected for physical damage and discolouration, are run through rotating slicers, and are deep fried. Rice bran oil is used for frying because it has a low saturated fat content, and the fried chips are optically tested for colour. Finally, the chips are mixed with spices and packed. The plant has a well-equipped quality testing lab and thorough testing of inputs and packaging materials is also conducted.

New tomato varieties are said to have contributed to an increase in annual tomato production from 28 000 tonnes to over 200 000 tonnes in Punjab (Punjabi, 2008), and yields have increased from 16 tonnes to 54 tonnes per hectare. Many high quality, high yield potato varieties have also been introduced; these have helped increase farm incomes and have enabled PepsiCo to procure world class chip-grade potatoes for its Frito Lay snacks division. The company has partnered with more than 10 000 farmers working over 10 000 acres of potato across Punjab, Uttar Pradesh, Karnataka, Jharkhand West Bengal, Kashmir and Maharashtra.

This model involves more than simple procurement or contract farming, by developing a mutually beneficial partnership between the agro-industry and the farmers. The process may entail substantial financial losses in the initial years, but is expected to be followed by profitability thereafter. The model can result in excellent benefits for small farmers perhaps in a limited area, but it requires a long-term view and commitment from the company and a willingness by the enterprise to absorb substantial start-up costs and initial losses (Gandhi *et al.*, 2001).

Singh and Bhagat (2004) analysed the PepsiCo model and concluded that, though it is a better model of contract farming as compared with Hindustan Lever Limited (HLL) and Nijjer, there are various operational problems in the functioning of contract farming practices. The authors indicate that many farmers rate the PepsiCo experiment with contract farming as a better model. But in the larger sense, PepsiCo has treated farmers as their supply base and had worked only with the intention of creating sustainable supply bases. As the acreage under tomato crop increases, production also increases and the open market prices may fall. The company then may base its price paid or contract price on this low open market price. Farmers in Sangrur, as well as Ganganagar, indicated that PepsiCo had started paying them as low a price as Rs. 1.50 per kg (Singh and Bhagat, 2004). At times, as reported in *Dainik Bhaskar* (2nd September, 2000), they have also failed to fulfil their contract.

The same authors indicate that such a wonderful agreement can go haywire if PepsiCo does not learn to care for the farmers. PepsiCo must fulfil commitments and should enter into an option contract with farmers group, i.e. when open market prices are higher than the contract price they should pay open market prices, and vice versa. They should learn from the experiences of HLL that contract farming without building mutual trust with supply chain partners might be problematic for the company itself. PepsiCo should treat farmers as partners and pass on benefits to them, thereby creating a long-term and sustainable relationship for a sustainable business. Singh and Bhagat (2004) indicate that PepsiCo needs to share its benefits to gain the trust of the farmers. Indian firms need to partner with Indian farmers to bring about an agricultural revolution that will lead to a win-win situation for both the farmers and corporates.

9.4.10 Model 10: ITC *e-Choupal*

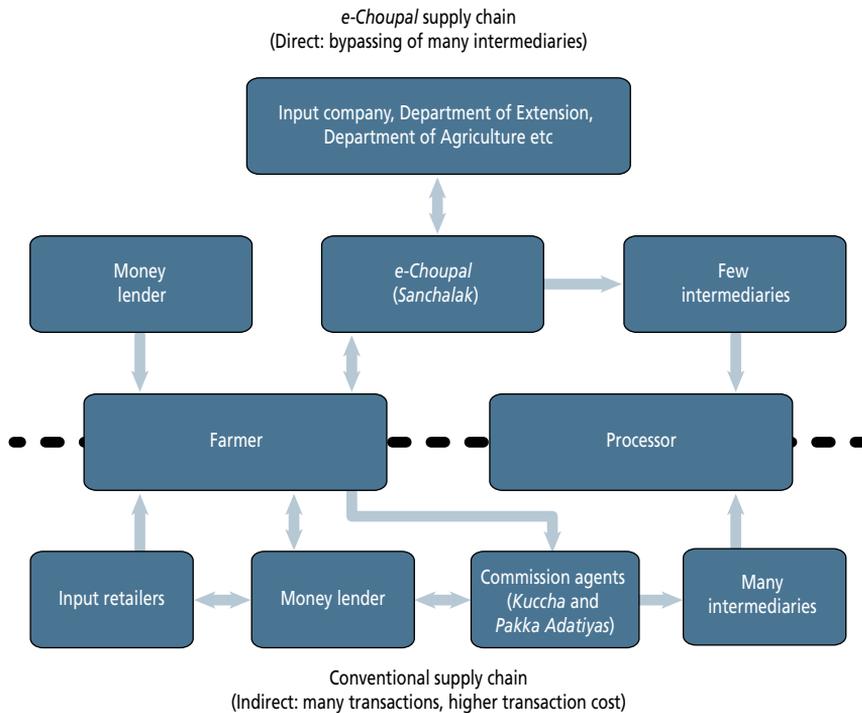
ITC is a large corporate group in India. Through its International Business Division (IBD) it undertakes procurement, processing and export of agricultural commodities such as soybean, wheat, shrimp and coffee. Over the past few years ITC-IBD has developed a unique IT-enabled procurement, information and marketing channel in rural areas, through village centres called *e-Choupals* that cover a huge number of villages. This model has been used to increase efficiency in the procurement of agricultural commodities, resulting in value creation for both the company and the farmer. In addition, the model has created value by taking Internet penetration to remote villages, making global commercial contact possible where infrastructural, economic and social limitations had previously rendered this impossible.

The project was launched in June 2000 in the villages of Madhya Pradesh (see, for example, <http://www.soyachoupal.com>). ITC had opened three soya processing and collection centres and then started the first six village *e-Choupals* in June 2000. Soon, this model became rural India's largest Internet-based initiative. The re-engineered supply chain of *e-Choupal* looks very different from the existing marketing system and has several components (Bowonder, Gupta and Singh, 2002). The company first looked for a farmer from each village around the collection centre to head the village *e-Choupal*. This person was called the *sanchalak* and would become the trained village individual in operating and coordinating the activities in the *e-Choupal*. After selection of the *sanchalak*, a personal computer was installed in his house and he was given training in using it (Bowonder, Gupta and Singh, 2002). The computer had back-up power and was connected to the Internet via telephone as well as satellite. The *sanchalak* helps the farmer in using the system by guiding him in seeing the prevailing prices and other related information on the PC. The *sanchalaks* is paid 0.5 percent of the procurement price for each tonne of soya procured by ITC from their *e-Choupal*. Before implementing any new initiatives, ITC consults its *sanchalaks*, and regular *e-Choupal* meets are held. This not only provides the company with feedback from the farmer but also generates new ideas.

By May 2007, *e-Choupal* services reached more than four million farmers in about 40 000 villages through more than 6 500 *e-Choupals* in Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharashtra, Karnataka, Andhra Pradesh and Kerala. ITC is extending its business model to other Indian States including West Bengal, Himachal Pradesh, Punjab and Haryana. The digital infrastructure at the village is complemented and completed with a physical infrastructure in the form of choupal saagars. These choupal saagars offer multiple services under one roof: a marketing platform, a shop for agri-equipment and personal consumer products, insurance counters, a pharmacy and health centre, an agri-extension clinic, a fuel station and a food court. The ITC *e-Choupal* model is shown in Figure 9.5.

For smooth functioning of its project, ITC could not totally ignore the commission agents, who naturally would resist any change. Therefore, the company devised a new role for them and called them *samyojkas*. The *samyojkas* were responsible for

FIGURE 9.5 Model of ITC e-Choupal supply chain



Source: Based on Bowonder, Gupta and Singh (2002).

collecting the produce from villages that were located far away from the processing centres and bringing it to the ITC centres. The *samyojka* was paid a 1 percent commission for his service.

According to Bowonder, Gupta and Singh (2002), the previous day's *mandi* closing price is used to determine the benchmark Fair Average Quality (FAQ) price at the *e-Choupal*. The benchmark price is fixed for a given day. This information and the previous day's *mandi* prices are communicated to the *sanchalak* through the *e-Choupal* portal, i.e. <http://www.itcibd.com>. The commission agents at the *mandis* are responsible for entering daily *mandi* prices into the *e-Choupal* system. If and when the Internet connection fails, the *sanchalak* calls an ITC field representative to obtain the information.

To initiate a sale, the farmer brings a sample of his produce to the *e-Choupal*. The *sanchalak* inspects the produce and based on his assessment of the quality, makes

appropriate deductions (if any) to the benchmark price and gives the farmer a conditional quote. The *sanchalak* performs the quality tests in the farmer's presence and must justify any deductions to the farmer. If the farmer chooses to sell his soy to ITC, the *sanchalak* gives him a note with his name, his village, particulars about the quality tests (foreign matter and moisture content), approximate quantity and conditional price.

The farmer takes the note from the *sanchalak* and proceeds with his produce to the nearest ITC procurement hub, ITC's point for collection of produce and distribution of inputs. At the ITC procurement hub, a sample of the farmer's produce is taken and set aside for laboratory tests. A chemist visually inspects the soybean and verifies the assessment of the *sanchalak*. Laboratory testing of the sample for oil content is performed after the sale and does not alter the price. Therefore pricing is based solely upon tests that can be understood by the farmer. The farmer accepts foreign matter deductions for the presence of stones or hay, based upon the visual comparison of his produce with his neighbour's. After the inspection, the farmer's produce is weighed on an electronic weighbridge. When the inspection and weighing are complete, the farmer then collects his payment in full at the payment counter. The farmer is also reimbursed for transporting his crop to the procurement hub. Every stage of the process is accompanied by appropriate documentation. The farmer is given a copy of lab reports, agreed rates, and receipts for his records. At the end of the year, farmers can redeem their accumulated bonus points through the *e-Choupal* for farm inputs, or contributions toward insurance premiums.

The transaction at the ITC hub is faster than at the *mandi*, usually taking no more than two or three hours. ITC's electronic weighing scales are accurate and not susceptible to sleight of hand like the manual weighing system at the *mandi*. The system also does not require produce to be bagged; this avoids the associated loss of produce. The *e-Choupal* allows the farmer daily access to prices at several nearby *mandis* and can make better decisions about when and where to sell his crop. Thus, *e-Choupal* attempts to provide farmers with a better price for their crops. The incremental income from a more efficient marketing system is estimated to be US\$6 per tonne on average, or an increase of about 2.5 percent over the *mandi* system.

Farmers can also make use of the information available to them through the *e-Choupal* to improve yields. Seed, fertilizer and consumer products are offered to them through *e-Choupals* cost less than through other local sources such as village traders. Thus there are other economic benefits to farmers. It is reported that in areas covered by *e-Choupals*, the percentage of farmers planting soy has increased dramatically, from 50 to 90 percent in some regions, while the volume of soy marketed through *mandis* has dropped by as much as 50 percent.

A major impact of the *e-Choupal* system is in bridging the information and service gap of rural India. Information and services provided by the *e-Choupal* Web site and e-commerce system include:

- ▶ *weather* – The availability of accurate rain information may cut losses due to weather by more than half.
- ▶ *agricultural best practices* – Information on scientific practices is available on the Web site. Additional questions can be answered through FAQs and access to experts by e-mail.
- ▶ *customized quality solutions* – Farmers are given customized feedback on how they can improve crop quality and yield.
- ▶ *product deployment* – Inputs such as fertilizers and pesticides are supplied along with recommendations and services such as soil testing.

Singh and Bhagat (2004) find that most farmers did not agree with the ITC claim that farmers have been getting better prices for their produce, and that in reality there are only minor benefits like de-bagging expenses etc. Farmers also indicated that the company does not pay the price agreed by the *sanchalaks*. Sometimes, quality is downgraded and farmer income is reduced. One significant advantage however is correct weight, which had been a major worry in traditional *mandi*.

The authors found that the portal did not have the requisite richness for it to become an information and knowledge dissemination kiosk. The information as regards best practices, integrated crop production, inputs, fertilizer and seeds, was of poor quality. Information was not customized to the farming needs of these agroclimatic regions. In all these villages, the only information disseminated was the prices and weather conditions.

The authors find that as regards selling pesticides and fertilizers and seeds, ITC has not taken care to see that there is acceptability of input trading by its *e-Choupals*. Selling the inputs of another company does not take the business relationships into account, and proper partnerships with these companies are often absent.

9.4.11 Model 11: McCain India

The McCain Foods subsidiary, Canada-McCain Foods India (Private) Ltd, was established in 1997 and its potato processing plant in Gujarat (Mehsana) became operational in 2007, with a processing capacity of 30 000 metric tonnes per annum or 4 metric tonnes per hour. The plant aims to produce french fries and other potato products such as flakes, patties, mashed potatoes, *aloo tikki* and wedges for retail and food service businesses across the Indian subcontinent. It will employ 100 and 125 people at full capacity. It will also create indirect employment in storage, supply chains and outsourced services.

McCain has been buying its potato stock for processing via contracts, of which 85 percent were in Gujarat and 15 percent in Punjab. McCain has a choice of three types of contracts with the farmers: fixed, flexible and open. In fixed contracts the price is fixed and the transaction at harvest at that price is guaranteed, irrespective

of the market price. In a flexible contract a range is fixed within which the deal will be settled finally. If prices at the time of harvesting are more than the upper boundary then the farmer is bound by the upper price. In case prices are below the lower boundary, the company is obliged to pay the lower price. In the open contract, both parties are free to transact or not too. Another type of contract may involve a mix of two of the three kinds just described, in some agreed monetary proportion.

Comparison of McCain and PepsiCo (Frito Lay)

Both McCain and Frito Lay contract directly from the growers, specifying clear quality parameters. Both shifted from acreage contracts to combination acreage/quantity contracts that specified the minimum quantity to be delivered per unit area. The firms require delivery at a specified place, with growers bearing the delivery costs. However, there are differences: McCain had a smaller area of operation and a more specialized market for its products. While Frito Lay paid market prices, McCain offered a range of pricing options to its growers.

Frito Lay contracts offered only one price for all rejected chip-grade potatoes and could reject produce at its own discretion, buying it at the lower price stipulated for rejected produce. The final quality tests were carried out at the factory at Channo and undersized potatoes were not returned to the farmer (Singh, 2007). The McCain contract specified that if there was a deviation of more than 2 percent in some quality parameters (size, machine damage, mixing of varieties, presence of solid matter), the company could reduce the prices paid by an unspecified amount. Thus, there was uncertainty and risk for growers resulting from information asymmetry and lower bargaining power.

Both company's contract documents were replete with various obligations on the part of the farmer as regards quality maintenance, quantity, cultivation practices, post-harvest care of the produce, etc, but with very little obligation on the part of the company. All production risks were borne by the farmers and neither firm provided any reprieve to a contract farmer in case of crop failure. Even having entered into a contract and followed all instructions, there was uncertainty about whether the producer would have a market, because neither firm's contract obliged the company to buy the produce (Singh, 2007).

The cost of production for McCain potato contract growers was found to be slightly lower than the McCain non-contract growers, but much higher than those selling at the APMC (Agricultural Product Market Committee) or at farm-gate. The yield and marketing costs for McCain contract growers were higher than any other channel. Marketing costs were higher for growers involved with McCain than they were for the APMC alternative, while net income from McCain was higher compared with income from alternative channels. Variation in net income between growers in the same category was much lower in the case of contract growers because of set prices. The McCain growers found that the

use of sprinklers rather than flood irrigation reduced their labour requirements, improved soil quality, increased potato yields and quality, and also saved water and extraction costs (Singh, 2007).

In the case of Frito Lay, the cost of production was higher and transaction costs somewhat lower than for APMC and farm-gate growers, despite the fact that contract growers had to deliver to the factory. Gross and net income was lower than that of growers using other channels due to lower yields; contract prices for high quality produce and rejected produce were lower than post-harvest and off-season prices. The trend was for farmers directly supplying the companies to have higher production costs, regardless of whether a contract was involved, than those selling to other market outlets.

9.4.12 Model 12: Desai Fruits and Vegetables (Desai Cold Storage)

The large scale production of fruits and vegetables in the south Gujarat area gave two families the idea of starting a cold storage facility, in 2001. There were two partners in this venture. Mr Ajitbhai Desai was the active partner while the other partner was associated with a sugar mill in the area. The construction of the cold storage was begun in 2001 and was completed in 2002. In venturing into this business the main intention was to help other traders and farmers to keep their produce for a longer time. But no suitable enquiry was carried out as to the extent the facility would be used; in the end, no such service was provided to any customer. The facility is now used only by the partners themselves, and they do not keep any of their products in cold storage for very long. Nevertheless, they have developed a highly-successful business mainly trading in fruits and vegetables, not only locally but also nationally and internationally. It is this business, initially named Desai Cold Storage, that we will assess in this section.

The major problem the partners encountered at the outset was convincing farmers to sell their produce to them. To overcome this, they devised a number of activities to create awareness among farmers in their area about the facilities they were offering. In 2001 Desai organized a number of face-to-face meetings with farmers in different villages. To attract farmers they offered integrated pest management (IPM) without any charge. They also offered the harvesting and handling technology through which farmers could save labour and obtain higher quality produce. Some of the other benefits offered were:

- ❶ waiver of any commission on the transactions (normal market charges amount to about 10 percent)
- ❷ assurance of 100 percent buying
- ❸ quality based pricing – higher than the prevailing market price
- ❹ direct buying from the farm gate
- ❺ an assured minimum price. The minimum price would be calculated on the

basis of the production cost and harvest labour cost, with a margin for the farmers added in. Through this mechanism, even if the market price crashed the farmers would receive the pre-determined minimum price agreed upon. If market prices increased, then the transactions would be carried out at the prevailing market price.

Desai began trading only in mangoes. During the first year of operation in 2002, with the help of traders from Canada, France, the Netherlands and other countries, they exported 600 tonnes of the fruit; in 2003 this increased to 1 200 tonnes, again with the help of merchant traders. In 2002 they also tried to sell in the domestic market through some super market chains in major cities, and to the system run by NDDDB Mother Dairy. But this experience was disappointing: the response from consumers was not as expected and the venture did not work. By 2004 they were exporting 17 000 tonnes of mangoes. The main destinations for these were the Middle East and the UK. They also continued to sell locally on a minor scale through merchants and Mother Dairy on a demand basis. Though the mangoes business is its major one, Desai also exports banana, papaya and pomegranate. It has now succeeded in expanding its export destinations to include China and Australia; the required approvals/contracts have already been signed.

The mango season in India is spread over a period of about eight months. It can start as early as January or February in Kerala, moving up to Andhra Pradesh and the Konkan region of Karnataka as the year progresses, then further north to Maharashtra, Valsad and the Saurashtra region in Gujarat, ending during August in Uttar Pradesh and Bihar. As such, Desai can expect to have a viable mango business for about eight months per year. To meet the requirements of expanding the business into an eight-month operation, Desai are buying in local markets in Gujarat and are carrying out improvements and value additions to the produce at their present unit. In the future the company plans to implement the procurement system it has already developed at Gujarat in other states and areas. Desai has already contacted with farmers in some of the above mentioned regions, who have been guaranteed the benefits and facilities offered to producers in Gujarat. The state governments of Andhra Pradesh and Maharashtra have also started some processing units to help the farmers.

Desai has noticed that during the initial 2–3 months of the season they will not have any competitors from any Asia region countries; hence their business can have a major competitive advantage during this period. Major competition comes from Pakistan but only towards the end of the season (July–August), when the *Chosa* varieties of mango from Uttar Pradesh and Bihar are available.

To improve and maintain quality and prevent deterioration in exports, certain processing and handling measures are followed stringently in the cold storage premises. These include:

- ▶ *deshaping*: The raw mangoes brought from the farm first undergo deshaping. In this process the extra length of the stem is cut uniformly (to about one inch length) to avoid damage that may result from the acidic discharge;
- ▶ *hot water treatment*: After deshaping the mangoes are put through an automatic hot water treatment plant to remove and destroy fruit fly eggs;
- ▶ *fungicide treatment*: After the hot water treatment, the lot goes for fungicide treatment, which extends the shelf life of the product;
- ▶ *grading*: The produce is then passed through an automatic grading machine. In this process the mangoes are sorted into different lots according to the weight of each fruit;
- ▶ *washing/waxing*: As per the requirements of the buyers, washing and waxing services are carried out on selected lots;
- ▶ *packing*: This is carried out according to weight of fruits and the buyer's requirements *vis-à-vis* the number of mangoes in a carton;
- ▶ *pre-cooling*: The entire lot is then moved to a pre-cooling treatment plant. Pre-cooling brings the fruits at a uniform temperature before they move to the cold storage shelves;
- ▶ *storing*: After pre-cooling the packages are moved to specified locations in the cold storage facility;
- ▶ *loading*: When an export or domestic order is received the lots are loaded into containers for transportation to their destinations.

To expand into the banana business, Desai is planning to import modern technology in all aspects of its operation, including farming, handling and processing; the company plans to spend about Rs. 5 million for this purpose. Large-scale banana farmers around Navsari and in nearby areas of Gujarat have already been contacted and offered the same benefits and guarantees as the mango farmers. Contact meetings with these farmers have already taken place at different locations.

Since inception Desai has also been dealing in green vegetables, the main ones being lady finger (okra), bitter gourd, bottle gourd, and other minor interests such as chilly and lemon. During the first year of this operation (2002) the company bought this produce on the market but also purchased from farmers around the cold storage facility. As with the mangoes, vegetable exports were also initially distributed via merchant traders. Desai exported about 40 percent of its procured produce through these traders and sold the remainder in the domestic market. Here Mother Dairy was the major purchaser.

In this initial period the company convinced farmers to tie-up directly with them on the same lines as with the mango farmers. Slowly, direct input arrivals have picked up. Farmers are required to sort their produce into A, B and C quality categories before delivery, and this is taken into consideration in deciding prices. The purchase prices of vegetables are fixed slightly higher than the Surat APMC daily market price. The payment is made to farmers the next day, after the exact market prices of Surat APMC have been ascertained. In 2003 Desai started direct export of vegetables to the UK and Middle Eastern countries. In addition to this they are still keeping up their export business through merchant traders and in the domestic market through Mother Dairy.

To maintain the quality of the produce, Desai has devised a plan that also benefits the farmers significantly. Typically, small and marginal farmers had been exploited by retailers in the supply of inputs such as seeds, pesticides and fertilizers. These farmers had also been exploited in selling their output to traders and commission agents. To liberate farmers who agreed to supply the company with produce, Desai devised an innovative idea. Inputs such as seeds, pesticides and fertilizers are procured in bulk and are supplied to farmers without any margin and on credit, free of any interest. The cost is then taken into account against payment for supply of the output.

In 2004 Desai distributed about 3 000 kg of lady's finger seeds (okra). By supplying this to its farmers, as well as bottle gourd and bitter gourd, the company ensured that the output would be of the same good variety and quality. For lemon, chilly, beans and other vegetables, Desai did not provide seeds but a bulk purchase agreement was signed. In chilly alone, the 2004 business amounted to more than 500 tonnes, while the weekly procurement of lemon was as much as 15 tonnes.

Contract Farming India (CFI) AG, a company based in Zug, Switzerland, has made significant investments in Desai Fruits and Vegetables (DFV) – the new name for Desai Cold Storage since April 2006 – to enhance its financial, operational and management capabilities. DFV has since created multiple integrated pack houses for bananas and continues to invest in creating facilities at the farm and village levels. Since its inception the company has invested in RandD for agricultural practices and in developing long-distance transport protocols. These initiatives have helped Desai emerge as one of the leading exporters of high quality fruits and vegetables in India. It now supplies a wide range of high quality tropical products: the portfolio includes over 10 types of fruits and 30 types of vegetables. However, the key focus over the years has been on four fruits – mangoes, bananas, pomegranates and grapes. This flagship produce makes up over 90 percent of total sales.

Over 2 500 small and medium-sized farmers supply to Desai. The company has a unique contract farming mechanism by which it controls the inorganic inputs,

technology and work practices at the farm level to ensure that the product is absolutely natural and safe. The model has been so successful that Desai has a waiting list of over 800 farmers wishing to be included in its programme. The company works with its customers to create specialized, customized solutions in order to deliver quality at a reasonable cost. It ensures the quality of every product that it supplies by controlling every step involved in the production process, from land preparation to logistics. The quality assurance system is based on the following principles:

- ▶ *process control* – achieved through contract farming and technical control;
- ▶ *farm approval system* – extensive checks are conducted for work practices, use of chemicals and quality of products, before any farm is approved for procurement;
- ▶ *traceability* – of the farm, inputs used, processing location and transportation;
- ▶ *quality checks* – a Desai product passes through a stringent quality assurance process:
 - o quality control by a supervisor at the point of procurement from farmer;
 - o quality checks at the point of packing;
 - o random checks of consignments;
 - o random sampling at laboratories for residue analysis.

Desai has been conscious of the importance of superior infrastructure from its inception. As a result, one of the most modern and state-of-the-art packhouses has been developed, innovative trailer designs have been created for smooth transportation, reefer vans have been bought, and pre-cooling, cold storage and processing facilities have been enhanced.

9.5 Comparison and evaluation of different models

How do the different models compare *vis-à-vis* the institutional performance of agro-industries in developing countries, as discussed above? Table 9.6 provides a broad comparison; this is followed by a more in-depth discussion.

TABLE 9.6

Broad comparison of different models on institutional performance parameters

Agro-industry model	Reaching large numbers of small farmers	Ensuring adoption of suitable technology and practices by farmers	Use of modern processing technology and meeting capital costs	Delivering a strong marketing effort	Effective management and control to meet the needs of all stakeholders
AMUL	Strong	Limited	Strong	Strong	Strong
Nandini	Good	Limited	Limited	Reasonable	Reasonable
Nestlé	Limited	Strong	Strong	Strong	Limited
Heritage	Good	Limited	Good	Good	Limited
Mother Dairy	Limited	Good	Good	Good	Reasonable
Suguna	Strong	Strong	Strong	Strong	Strong
Safal Market	Limited	Limited	Good	Limited	Limited
HPMC	Limited	Limited	Good	Poor	Poor
Pepsi	Limited	Strong	Strong	Strong	Limited
ITC e-Choupal	Strong	Limited	Strong	Strong	Limited
McCain	Limited	Strong	Strong	Strong	Limited
Desai Cold Storage	Reasonable	Good	Good	Strong	Reasonable

9.6 Production and procurement from small farmers by different models

9.6.1 Do different models reach out well to large numbers of small farmers?

Access or reach to large numbers of small farmers is a major problem for most models and is very important for cost effectiveness, quality and development impact. Small farmers often do not have the ability to connect on their own with the main stream of agro-industry development initiatives. On account of its huge membership of village cooperative societies, the AMUL model is able to cover a very large number of small farmers: it is able to collect milk even from farmers who only keep a single animal. The Suguna model is also able to reach out to a large number

of small farmers, mainly because of its low capital requirements; the farmers only have to feed and rear the chicks until they grow. ITC *e-Choupal* also reaches a large number of farmers even in remote villages through the Internet, and by setting up web-linked *e-Choupals* run by local operators or *sanchalaks*. The Nandini model, another cooperative model like AMUL, also has a substantial reach but not as deep as that of AMUL. Heritage foods has developed a good presence in some rural areas by using the existing retail network for FMCG goods, but is a little constrained because it does not directly count on farmers' involvement. Desai Fruits and Vegetables has achieved good reach with small farmers in a small area of operation.

By contrast, other models such as Nestlé, Mother Dairy, Safal, HPMC, PepsiCo and McCain, though successful in other aspects, are generally unable to connect with a large number of small farmers and expand their reach, even though they may often suggest that they contribute substantially to their development. In the cases of Nestlé and McCain, this may be explained by their stringent quality requirements and limited quantity requirements.

9.6.2 Do the different models try to organize production of raw material from small farmers?

AMUL leaves milk production to the farmers but it promotes the organization of farmers into cooperatives for the collection and marketing of milk. It also helps the farmers in milk production through the supply of nutritious cattle feed, fodder seed, veterinary services, vaccination, artificial insemination services, and extension. Suguna leaves rearing of poultry birds to its farmers but provides large-scale technical inputs, including the best breeds of day-old-chicks, quality feed, veterinary care, and extension guidance. The PepsiCo model also works extensively with small farmers so that they use the best technology and achieve the quality and quantity required by the company, making good profits. McCain too follows this approach in alternative ways. PepsiCo and McCain give technological advice and offer inputs to the growers. PepsiCo has collaborative tri-party agreements with farmers and input companies as partners. McCain provides diggers, planters, advisory services and extension services to its growers. ITC has *sanchalaks* and a web portal to give advice. Desai also provides inputs and advisory services to its members. HPMC, Nandini, Heritage Foods, Mother Dairy and Nestlé provide some extension services, albeit in a limited role.

9.6.3 Is the procurement activity organized efficiently? If so, how?

Three critical aspects of performance are quantity, quality and cost. AMUL stands out in quantity and cost. This is because it uses a cooperative model to access remote sources and shares the costs with the farmers through the village

and district cooperatives. Nandini takes a similar approach but is not as efficient. Mother Dairy is not owned by the farmers and therefore is unable to fully leverage this model. However, it helps the cooperatives in distribution and marketing so that they can become more viable. Heritage achieves good efficiency in procurement by using the existing retail network for consumer goods, achieving a two way flow of goods. Suguna organizes procurement efficiently via a contracting arrangement with the farmers in which costs and risks are shared. ITC leverages the Internet to organize its procurement efficiently. PepsiCo and McCain are not able to be as efficient on this count as they have a relatively loose link with the farmers.

9.7 Adoption of appropriate technology and practices by farmers and performance on quantity and quality

9.7.1 Are the various models able to adopt appropriate technology and practices through the farmers?

Private players such as Nestlé, PepsiCo, McCain and Suguna, which are demand or market-driven, seem to do comparatively better in ensuring the adoption of good technology and practices by farmers. This appears to be because they are especially concerned about selling quality products, given the fierce competition: ensuring quality in the raw material is critical to their operations. Because of this they make special efforts to push the adoption of appropriate technology by farmers, and they enforce this discipline through strict quality control in purchasing from the farmers. Desai is also focused on adopting the right technology because it is privately run and is engaged in export, and therefore needs to comply with high international quality standards.

Farmer or supply driven models such as AMUL and Nandini are often not able to do as well in ensuring the adoption of appropriate technology and practices by farmers. This issue does not garner as much importance because the inclination is to accept the farmers' produce, given that they are ultimately the owners of the enterprise. However, to achieve success, these models cannot ignore market requirements. ITC *e-Choupal* needs to focus on the adoption of appropriate technology, but its link with farmers is more remote – for example, extension knowledge is sent through the Internet only – and hence it cannot exert the required pressure as effectively. However, the price paid and the acceptance of the produce is linked strongly to quality, and this serves as a signal of what is required from the farmers. Heritage Foods, working through retail outlets, is able to do little for adoption of technology; Safal and HPMC are also not able to play much of a role.

9.7.2 Are the models able to procure a high quantity and quality of output from the farmers?

AMUL does very well on quantity criteria; it procures 7.4 million litres of milk per day from the farmers. It also maintains basic quality through local quality testing automated by milk testers, weighing machines and computers widely distributed to the village cooperatives. The model is able to achieve high quantity output and satisfactory quality.

Nestlé on the other hand procures much less at 1.1 million kg of milk per day (1 kg is slightly more than a litre for milk) during the peak season, but pushes very strongly for high quality through various measures such as training on good farm practices, auditing of farms, technical support to farmers to help them reach quality standards, and strict testing/ acceptance policies at the collection centres. This is driven by Nestlé's high quality standards and requirements.

Suguna has achieved notable success in both quantity and quality. The company does business worth Rs. 20.2 billion (2007) in live broiler chicken, frozen chicken and eggs, by sourcing its products through 12 000 contract farmers on 15 000 farms across 11 states. It has reduced middlemen in the poultry chain from 14 to 4. It aims for a turnover of Rs. 30 billion by 2010 and a 20 percent market share in the Indian poultry industry. It maintains high quality through importation of breeds, state of the art hatcheries, an advanced RandD centre, feedmills, veterinarians, scientists and other expert professionals, assuring farmers the best quality chicks, feed and professional care. Its scientists and employees train the farmers in good management practices. The system results in the production of high quality poultry birds in the quantities demanded by the market.

For its limited quantity requirements, PepsiCo works closely with its contract farmers to produce the specific varieties of produce needed and enhance productivity. It employs a team of agricultural graduates to provide technical input and monitor the farmers in their specified area. McCain also works in a similar way to generate high productivity and quality raw materials for its processing requirements.

ITC depends on its Internet enabled *e-Choupal* network to obtain the quantities of produce it needs from the farmers. It does well on reaching out widely and achieving the volumes it desires. However, where quality issues are concerned, it only works indirectly with farmers by making available high quality agri-inputs at reasonable prices, and providing information about best agronomic practices through its web portals.

9.7.3 How cost effective are different models in procuring from the farmers?

A major strength of the AMUL model is the cost effectiveness of its procurement. AMUL has shortened the milk supply chain and has made it very financially viable. Moreover, AMUL passes on the benefits of this cost-effectiveness to the farmers, who if linked to AMUL receive about 80 percent of what the consumer pays. The ITC *e-Choupal* is also highly cost effective because it uses the Internet very effectively, thus reducing transaction costs substantially. The incremental income to ITC from the more efficient marketing process is about US\$6 per tonne, which is about 2.5 percent over the *mandi* system. Suguna is also cost effective, mainly because of its efficient contracting arrangements and achievement of scale economies in technology and technical services. The PepsiCo model and McCain models are also more efficient than alternative channels and provide more margins to farmers as compared with traditional potato growing. But their high procurement costs prevent them from expanding widely. This is also true for Nestlé. Besides, gains in procurement efficiencies would mainly go to the companies in the Nestlé, PepsiCo, McCain and ITC models. HPMC, Safal Market and Mother Dairy lack cost effective procurement processes.

9.8 Processing technology and capital requirements

9.8.1 Are the models successful in using or promoting good processing technology?

AMUL has a good record of using modern state-of-the-art processing technology and adopting it innovatively to local needs and conditions. This is mainly because its leaders have always believed in employing professional management that is highly empowered. A highly efficient procurement system and the need to find a market for the growing milk production of members has propelled the use of good technology. Private players like Nestlé, PepsiCo, McCain, ITC and Suguna all have a good record of excellent processing technology, and this has been driven largely by internal standards and markets. PepsiCo and McCain have world class processing facilities for making various products such as chips and french fries. Desai uses good processing technology because its produce must meet high export standards. HPMC and Nandini have not done so well on this count. HPMC plants work at only 15–20 percent of their capacity which perhaps prevents them from upgrading much. They are neither highly market oriented nor highly farmer oriented, and have less pressure for generating a return on investment.

9.8.2 Are the models able to meet the high capital requirements of agro-industry?

AMUL has been able to meet the high capital requirements of its dairy plants and processing technology because of its sound management, particularly its cost effective procurement and strong marketing. It has made use of credit which it could easily obtain, as well as government assistance and international aid, given that it was a cooperative of farmers serving high priority development objectives. ITC could tap the resources of its highly diversified and profitable parent businesses, PepsiCo and McCain, its multinational parent organization. The capital resources available to Nandini, Desai and Suguna were more limited. HPMC and Mother Dairy could tap government resources.

AMUL could meet part of its working capital requirements by delaying the payments for milk. The district milk unions pay the village milk societies after 10 days. In the McCain model farmers are paid for their produce 7–17 days after the procurements. This provides some working capital for the model. In the cases of ITC and PepsiCo, payments are delayed by some days and help meet the requirements of working capital. Some working capital management is built into contracts in the case of Suguna. Additional requirements in all these cases need to be met through bank credits, for which the basic soundness of business models is very important.

9.9 Marketing and product innovation

9.9.1 Are the different models able to deliver a strong marketing effort?

AMUL, Nestlé, Suguna, ITC *e-Choupal*, PepsiCo, McCain and Desai all demonstrate strong marketing performance, while Mother Dairy and Heritage foods can be rated as good. Nandini's marketing performance can be rated as reasonable while the marketing performance of NDDDB's Safal is limited. HPMC is not very effective in marketing.

The top tier of AMUL's three-tier structure, i.e. the state federation, focuses on the marketing of milk and milk products. By insisting on an umbrella brand, AMUL skilfully avoided interunion conflicts and also created an opportunity for union members to cooperate in developing products. Nandini is not so effective in this regard because much of its marketing is done by the district unions themselves and not by the state federation. AMUL products are available in over 500 000 retail outlets across India through its network of over 3 500 distributors. AMUL has used very simple but highly effective advertising campaigns as compared with the star-studded campaigns of PepsiCo and Nestlé. It is fair to conclude that AMUL, PepsiCo, ITC and Nestlé are highly successful in marketing their produce.

PepsiCo has a strong soft drinks marketing network and the agribusiness division uses the same network to market its products under the brand name Frito Lays. ITC uses marketing channels and the marketing experience of its FMCG divisions to good effect. McCain Foods India has strong institutional buyers such as McDonald's, KFC and Pizza Hut. Suguna has also developed strong marketing with substantial retail reach. HPMC's marketing, though initially successful has not been sustainable, perhaps explained by its non-market orientation.

9.9.2 Are the different models able to develop new innovative products?

AMUL initially was making only a few milk products and mainly concentrated on liquid milk, butter and milk powder. But it is now producing a whole range of products such as ice cream, srikhand, dahi, chaas, chocolates, flavoured milks and more. PepsiCo is continuously innovating and has a huge number of products. McCain, ITC, Suguna and Desai are adding to their product ranges. The private players are generally at the forefront of creating innovative products, barring exceptions such as AMUL. Private models are more proactive in creating niches and innovative products, and develop the necessary technology that goes with this. Suguna has launched a new category of home meal replacements – Suguna Home Bites and Suguna Anytime – a range of ready-to-eat chicken products. Nestlé, PepsiCo, McCain and ITC invest large sums of money on research and development to bring out innovative new ranges. Most cooperative and government-run models are less market oriented, perhaps as a result of bureaucratic and structural bottlenecks.

9.10 Ownership and control

9.10.1 Who are the major owners in the model and how does this affect performance?

AMUL and Nandini are owned by the farmers. The farmers elect the top management – managing committees or boards of directors of the village cooperatives, district unions and state federations – on a representative basis. This ensures that the concerns and needs of farmers are given high priority, and also brings loyalty and commitment on the part of the farmers to supply good produce. However, particularly in the case of AMUL, professional management is appointed below this level and empowered to handle the strategic and operational management. This helps to ensure that excellent strategic and operational decisions are made, giving a business edge to the organization. Because of farmer ownership the organization continues to reinvest in the business and offer a variety of necessary goods and services to the farmers.

In private models such as Nestlé, PepsiCo, McCain, ITC, Heritage Foods and Suguna, the ownership and control remains with the private company which reports to its shareholders. The private profit motive and generating shareholder value will naturally dominate. In the cases of PepsiCo, McCain and Suguna, a partnering approach through, for example, contract farming models has been developed with the producers, thereby recognizing their critical role in production and supply. In this way producer concerns can be taken into consideration. However, in the case of ITC and Heritage, partnering is not explicitly developed and the relationship continues to be based mainly on procurement. In the government-driven models of HPMC, Mother Dairy and Safal, the ownership and control remains with the State, which helps bring in substantial state capital and government support. But performance remains dependent on government management and commitment, with varying degrees of success.

9.10.2 Is the management of the model professionalized?

Professional management is very important to the success of most models. The top management of AMUL is largely not professional and consists of elected farmers' representatives. However, strategic and operational management have been strictly professional to date. This may be somewhat less so in the more decentralized Nandini model, and this may account for its more limited success. In the government-owned models of HPMC, Mother Dairy and Safal, administrative management is appointed by the government and may or may not consist of suitable professions, who in turn may tend to report more to the government bureaucracy rather than producers, consumers or shareholders. Private models such as Nestlé, PepsiCo, McCain and ITC do very well in hiring highly-qualified professional management and have the capacity to pay for such management. To economize, ITC also uses local non-professional *sanchalaks* and *samyojaks* after training. Other private players such as Heritage and Suguna employ professional management too, but may not be able to pay as well and therefore may not attract the best talent.

9.11 Addressing the interests of various stakeholders: producers, consumers, investors and government

9.11.1 Producers

The AMUL model, given its ownership by producers and strong professional management, is perhaps best able to meet the interests of farmers. In recent years, with significant market share and power in its hands, AMUL appears to have enhanced the bargaining power of the producers, often allowing it to raise consumer

prices in the interests of its farmers. Suguna, PepsiCo and McCain also claim to meet the interests of producers through win–win contracting models. The Nestlé, ITC and Heritage models appear to be focused more on reducing procurement and supply chain costs to the companies; they share benefits with the producers to a limited extent but claim to provide them with a better marketing channel.

9.11.2 Consumers

Nestlé, PepsiCo and McCain are focused entirely on consumers and aim to provide best quality products to their customers, who are the *raison d'être* of their business. Suguna also tries to do the same and AMUL is not far behind. These two organizations naturally seek markets for the increasing supply of produce from their farmers, and therefore need to deliver high quality to their customers, serve them well, and keep offering new products which consumers will want. Government-run models such as HPMC, Mother Dairy and Safal often lack this fundamental customer-oriented philosophy.

9.11.3 Investors

Given that cooperative shares such as AMUL are not traded and therefore do not have a market value, there is no outside investor interest in such 'shares', though of course, the farmer owners are interested parties and therefore are themselves investors of sorts. AMUL profits are often shared through their distribution as price bonuses at year-end. By contrast, private models such as Nestlé, PepsiCo, McCain and Heritage naturally try to maximize benefits to shareholder investors through increases in share value. As such, they are ideal vehicles for all kinds of investors who may, for example, see agri-industry as a 'safe bet' in difficult economic times. Government-run models such as HPMC and Safal are usually not concerned with share values; however, in the present economic environment, the Government does not tolerate loss-making enterprises either, and as such may be an active and interested investor.

9.11.4 Government

The Government gets involved in these enterprises mainly for social objectives. These are served well by AMUL because its activities substantially benefit a large number of producers, all rural people, and their well-being is a high priority for the Government. The Government is also behind other initiatives such as HPMC, Mother Dairy and Safal, given that these engage in critical activities which are ignored by the private sector. However, if they fail, they become a burden on the Government. Meanwhile if private models are successful in contributing to agricultural and rural

development, they are also doing the Government and the nation a service. In a more extensive way, ITC and Suguna seem to have demonstrated such an impact. Nestlé, PepsiCo and McCain too have contributed, but in limited areas and to limited numbers of people compared to models such as AMUL and Suguna.

9.12 Conclusions

Agro-industries have been given significant priority in the economic development of India. Mahatma Gandhi's emphasis on developing village-based agro-industries in the movement for independence marked the beginning of this strategic view. Is the priority given to agro-industries justified today? This analysis finds that the agro-industrial sector in India contributes significantly to employment in industry, as well as to value addition and income generation. Its continued role in promoting development and reducing poverty will depend on its capacity to contribute to small farm incomes and rural employment, particularly among the landless poor.

Managerially, one of the major challenges lies in organizing sustained production and procurement from large numbers of small farmers. A partnering approach appears to be most promising in overcoming multiple constraints. It can be implemented either through building cooperative organizations, or by building confidence and trust through a mutually beneficial business relationship involving private enterprise and farmers. In both cases, and with other successful models, the government must play a facilitating role through enabling policies, regulations, financing options and research and development.

If the development objectives of agro-industrial growth are to be served, small farmers must benefit from this growth, and the landless should at least benefit indirectly. However, this depends substantially on the nature of the organization and the commitment of the agro-industry to their involvement as partners. It also depends on the bargaining power of the small farmers within the models and structures that are created. Cooperatives have often done better in bringing benefits to the rural poor, sometimes with the assistance of NGOs as intermediaries. Supply contracts with small farmers are rarely formal and are therefore mostly non-enforceable in India – as elsewhere in developing countries – remaining agreements that are only morally-based. In order to make contract farming successful, much depends on the development of longer-term relationships between agro-industries and farmers through transparent contract terms, fair pricing, effective extension, and good marketing. This is possible for private agro-industry firms, as shown by the PepsiCo model.

There is a need for new indigenous models to emerge for the organization of agro-industries. Government models alone do not demonstrate a good record of performance. The AMUL cooperative model is one promising approach that brings

benefits to small farmers and gives them ownership of the enterprise. However, it needs to overcome political, legal and managerial limitations. The PepsiCo model, involving cogent backward integration with farmers by a private company based on a strong product market, offers another alternative. However, it requires long-term commitment and financial strength with limited scope for benefiting large numbers of rural poor. It is critical that alternative agro-industrial models are encouraged and receive strong government backing, especially those models which contribute positively to rural employment, poverty alleviation and sustainable development.

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CHAPTER 10

Linking farmers to market through processing: The role of agro-industry clusters with special reference to mango in south India

MYSORE SUDHA AND FROUKJE KRUIJSSEN

10.1 Introduction

In recent times, world markets have become truly globalized. World exports have increased and commercial stakeholders from across the globe are now able to participate in trade at the global level. This trend is true for agricultural/horticultural crop-based products as much as any other good. It is becoming increasingly important that all participants along agrifood value chains are effectively organized to be competitive globally. Yet, value addition in the globally competitive production process will only be effective if the final consumer price is fairly distributed to all actors along the supply chain (FAO, 1997). The effectiveness and smooth functioning of such supply chains is also dependent on access to market information, which in turn depends on factors such as technology, infrastructure, institutional policy and financial resources, as well as market forces. The goal of global competitiveness is especially challenging in supply chains involving highly perishable commodities like horticultural products. Cross border supply chains involving horticultural products have proven to be instruments that stimulate the development of local agro-industry, generate employment and improve access to technology, if the connection between producers and the different actors across the chain is well managed (Roekel *et al.*, 2002).

India, with its strong horticultural crop production base, appears to have huge untapped potential to be a global competitor for a number of horticultural products. Mango and mango-based products constitute an important segment of India's agrifood economy. The country is the world's largest producer of mango, accounting for about 40 percent of global output (Hanemann, 2006). Although less than 5 percent of this production is processed into mango pulp, this is the main export product, both in terms of value and volume (Babitha, 2009). The Chittoor district of

Andhra Pradesh is the main supply base for mango pulp (Mehta and George, 2003) in the country, followed by the Krishnagiri district of Tamil Nadu state. Both are located in Southern India, where a nascent agro-industry cluster for the supply of mango pulp has been in operation for a long time. This agro-industry cluster is rather dynamic, yet still inefficient for want of appropriate institutional support. Realizing the untapped potential of this sector for supplying processed products and generating income and employment, strong policy support for developing infrastructure and logistics support began to receive higher priority from the Government in recent years.

The creation of a separate Ministry of Food Processing Industries, as well as the enhancement of the installed capacity of the industry and the liberalization of the policy of importing modernizing technology, are a few of the recent government initiatives aimed at uplifting the processed product sector. The installed capacity of the food processing sector more than doubled within one decade, from a mere 1 108 000 million tonnes (MT) in 1993/94 to over 2 774 000 MT in 2006/07. In the 2006/07 budget, the food processing sector was declared a priority area for bank credit and a refinancing window, with an allotment of some US\$2 billion, especially for agro-processing infrastructure and market development.

One of the main objectives of this drive has been to improve the linkage of farmers with the market through value addition and processing, a goal whose accomplishment continues to be far off. This is especially so with regard to the *totapuri* mango agro-industry sector, given its persisting domination by market intermediaries such as the pre-harvest contractors and commission agents. While several models of effective linkages between farmers and markets through processing, including public-private partnerships, have been initiated successfully, they could not be sustained for long. In a highly competitive and mature market, initiating and sustaining a market linkage requires special efforts. This chapter presents an analysis of the agro-industry cluster of *totapuri* mango in Southern India, from the point of view of cluster development, distribution of margins, changing partnership patterns, government policies and initiatives and supply chain management.

The authors' analysis uses data from both primary and secondary sources. The primary data has been collected from a sample of over 50 producers, processors and other stakeholders involved in *totapuri* mango in Chittoor district of Andhra Pradesh. The secondary data has been drawn from various sources. Discussions with key stakeholders complement the information sources utilized. The data pertains to agricultural years 2006/2007 and 2007/2008.

The chapter is organized into three sections. Section 2 outlines the status and performance of the *totapuri* mango agro-industry cluster and the existing pattern of margin distribution along the supply chain. Section 3 provides a discussion on the agro-marketing clusters, including various models of linkage involving horticultural crops. Section 4 highlights the uniqueness of the *totapuri* mango cluster and makes suggestions for improving this agro-industry cluster's performance.

10.2 Status of processed mango in south India

The Indian agricultural export basket, which comprises both fresh and processed products, is traditionally dominated by mango (*Mangifera indica*) despite efforts at diversification. The processed product sector is especially dominated by the semi-processed form of mango – the mango pulp – making up around 43 percent of the export of processed fruits and vegetables and over 80 percent of all mango products (Agricultural and Processed Food Products Export Development Authority, APEDA, 2008). As the world's largest mango producer, India accounts for approximately 40 percent of world mango production and is a natural home for over 1 000 varieties of this species, with around 20 varieties being traded commercially. *Alphonso* (from the western parts of India) and *totapuri* (from the south) are the two varieties which cater to the domestic and export demand for processed mango. Nearly 80 percent of *totapuri* produced in the south is processed into mango pulp, much of which is exported, while around 20 percent is used domestically for the manufacturing of juices, jams and other mango products. The fact that semi-processed mango from the Chittoor region has been the main source of mango pulp export from India for over two decades highlights the comparative advantage this region has for the production of *totapuri* mango.

10.2.1 The *totapuri* agro-industry cluster

The South Indian state of Andhra Pradesh accounts for over 29 percent of the country's mango area and contributes around 39 percent of production, with a productivity of around 8 tonnes per ha. Chittoor district, with an area of over 59 380 ha under mango cultivation, is the main mango belt, contributing about 12 percent of the region's mango production (Government of Andhra Pradesh, 2008 – Annex 1).

A typical mango orchard in this region houses over ten varieties, each catering to a specific market demand, of which *totapuri* is the main mango variety used exclusively for processing purposes. *Totapuri* mango production in Chittoor district represents a typical agro-industry cluster for processed pulp, which emerged due to the agroclimatic suitability of the region for mango cultivation. The cluster houses a widely spread and vibrant mango production base, plus a few semi-processing units that operate for four months annually during the mango season. These have been converting *totapuri* mango into pulp for several years now. Within the last decade, the number of semi-processing units operating in this region grew to around 50, with varying levels of investment in processing infrastructure. These are spread out over a radius of 50 km around the production base, forming the main players of the agro-industry cluster in Chittoor.

Estimates indicate that the region produces around 4 157 928 tonnes of mango, within which 70–75 percent is the *totapuri* variety (Ministry of Food Processing Industries, 2008. <http://mofpi.nic.in/>). In terms of financial value, Chittoor exported around

Rupees (Rs.) 1 416.3 million (US\$29.63 million) of mango pulp from the agro-industry cluster (Department of commerce, 2007). The region also houses a wholesale market exclusively for mango trade and has good access to an international airport, about 180 km away in Bangalore. The processing units, being located close to the production centre, give the producer the option of supplying directly for processing into pulp.

10.2.2 The *totapuri* mango supply chain in Chittoor

The supply chain of *totapuri* mango is characterized by a large number of stakeholders and chain actors, who operate without any formal written supply agreements or pre-fixed price contracts. These include producers, suppliers, market intermediaries, processors and consumers. The *totapuri* mango cluster in Chittoor is one of the largest supply belts, with over 8 500 mango growers and over 1 000 pre-harvest contractors, traders and other market intermediaries.

Producers and production

Mango in Chittoor is usually produced in a mixed commercial orchard maintaining a number of varieties and trees of different ages. The orchards in this region are mainly large farms of over 10 hectares each, although farm size varies from less than one hectare to over twenty hectares. Because they constitute an important source of farm income, mango orchards in the region are usually well maintained. Annual application of farm yard manure, and occasional application of fertilizer and irrigation, are undertaken as part of regular agricultural practices. Annual average maintenance costs range from Rs. 5 000 (US\$125) to Rs. 35 000 (US\$830) per ha, depending on the bearing age of the orchard.

Mango trees come to bear from the fourth year after planting and continue to yield for up to 60 years. However, the economic benefits are most apparent in years 8 to 40. A fully grown mango tree in full bearing can yield up to 60 kg. But mango cultivation is constrained by biennial bearing, i.e. years with high and low yields alternately. This specific characteristic of mango trees requires appropriate strategies to deal with the instability in production, such as diversification in age and varieties.

Suppliers

Irrespective of the variety or orchard type, mango is mainly sold through pre-harvest contractors (PHCs), with few undertaking self-marketing. The PHC enters into a contract with a farmer three to four months prior to the harvest season, based on the flowering of the orchard. The PHC will also undertake some of the maintenance of the orchard, plus the harvest of the produce and its transfer to the market or processing unit at his cost. By entering into a contract with the PHCs, farmers transfer their production and marketing risks down the market chain. The specific characteristics of mango production and sale – such as biennial bearing of mango trees, high transaction costs and a lack of access to credit – can force producers

into distress sales to PHCs; thus the price paid by the PHC is often lower than that prevailing at the wholesale market at any given time. Since the PHC enters into such a contract with a number of producers, he undertakes the transfer function and makes his margin through bulking and economies of scale. Despite efforts at creating marketing infrastructure such as markets closer to production centres, the dominance of PHCs still persists in mango marketing.

Market intermediaries: wholesalers/commission agents and retailers

The farmer or PHC transports the harvested mango to the wholesale market, a specialized market solely trading in mango with a large number of auction lots, where it is auctioned by a wholesale or commission agent. The commission agent rents the auction lot during the period of the mango season or buys it and auctions to processors, retailers and petty vendors. For this transaction a commission is charged to both the seller and the buyer. The wholesaler or commission agent then sells the mango to retailers or processors within the same market or by transporting the produce to distant destinations. Direct sale to processors is common, especially in the case of *totapuri*, though this involves a few large-scale farmers only.

Processors

Processors form an important market intermediary in the *totapuri* mango marketing network, as much of the produce is converted to a value added intermediary product, the pulp. Chittoor hosts around 50 mango processing units that operate during the mango season for three to four months, from May through August every year. Most of these processing units are small-scale canning units, with investments of up to Rs. 2 million (US\$47 620), with a capacity of 10 tonnes per hour (India Ministry of Agriculture, 2008). There are four units with state-of-the-art technology for undertaking aseptic packaging, involving an investment of over Rs. 5 million (US\$120 000). In contrast with the typical processing plants of the region, these have a 5 tonne per hour capacity only, as aseptic packaging takes longer for processing.

The processing units undertake custom processing based on the orders from exporters. The raw material and the packing material (tin cans) are supplied by the exporter, while the semi-processing units simply convert the fruit into pulp using the available infrastructure and labour. The amount paid to the processor to conduct this activity is Rs. 3 500 (US\$85) per tonne of pulp. A few of the processing units also undertake their own processing, procuring the raw fruit from the market, involving a working capital of over Rs. 200 000 (US\$ 4 750) per export container (of 6 000 cans or 18.6 tonnes of pulp).

The final product of this processing stage is a semi-processed product, mango pulp, which is usually canned or in some cases packed in aseptic packaging. The exporter bears the costs of transporting the pulp to the port and exports to different destinations by sea. The pulp thus sold is repacked to serve the domestic and export demand for fresh juice and other mango based products, such as jams, jellies and thandra.

Exporters

Nearly 80 percent of the mango pulp is exported to different destinations based on prior orders. Mango exporters are generally the large industrial groups that are already into export business or individual entrepreneurs who act as agents for foreign buyers. Much of the mango pulp from India is exported to the Middle East, Europe and USA.

10.2.3 Value addition and margins along the supply chain

In a market chain, each market intermediary performs a specific transfer function or value addition, in anticipation of a remuneration that is directly proportional to the quality of service rendered. However, when power in the chain is not fairly distributed among the chain actors, there will be no equitable division of value added in the chain. The concentration of power with a specific market intermediary may stem from their access to market information and their ability and capacity to take higher risks (Preckel *et al.*, 2004). This can lead to differences in margins among the chain actors.

The role played by each of the market intermediaries, and the costs incurred and margins earned along the fresh and processed mango value chains, are discussed next. The market chain of processed *totapuri* is analysed up to the level of export; therefore the semi-processor's sales and margins are also calculated as a share of the export price.

In Figures 10.1 and 10.2 an overview of the costs and margins of fresh and semi-processed *totapuri* mango is presented, taking into account all the marketing channels and the most popular market channel adopted by the producer.

FIGURE 10.1 Market chain and sale price for fresh mango sale (domestic market)
(The highlighted channel is the focus of this analysis)

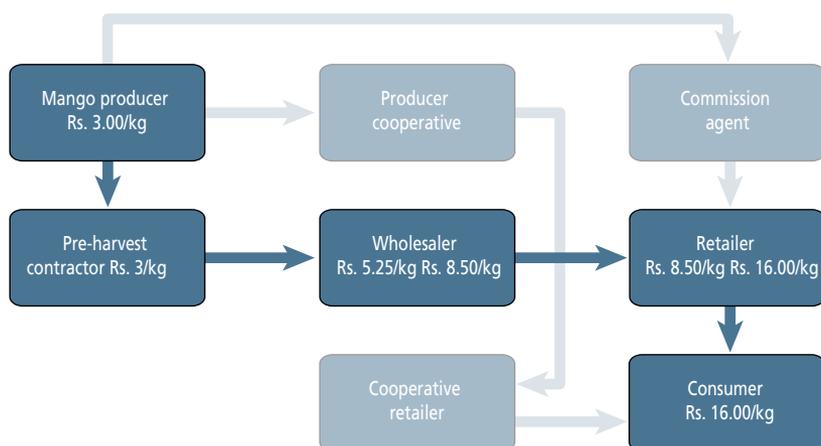
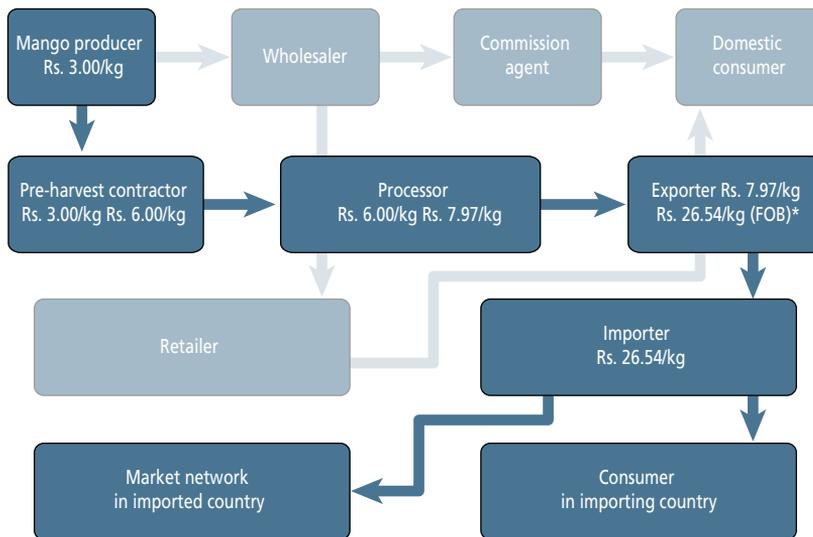


FIGURE 10.2 Market chain and sale price for processed mango sale (export market)
(The highlighted channel is the focus of this analysis)

*FOB: Free On Board.

The producer contracts to the pre-harvest contractor, who transports the produce to the nearest wholesale market and auctions it. The retailer purchases and sells to domestic consumers.

The highest margin in the fresh *totapuri* mango chain is earned by the retailer (28 percent), followed by the wholesaler (16 percent), farmer (10 percent) and lastly the PHC (9 percent). In the processed chain the exporter receives the highest share (17 percent). The PHC is better off in this chain than in the fresh one (11 percent) and is then followed by the processor (7 percent) and finally the farmer (6 percent). In real (rupee) terms, there is no price difference for the farmer; the PHC, however, is able to increase the margin in real terms because of the elimination of the commission agent from the chain. Some large-scale producers that are located in the vicinity of the processing units are able to make direct deliveries to the processing units, thereby substantially increasing the margin they receive.

The processor's margin reflects the level of risk undertaken by this chain actor. The work is contracted and own investments are therefore limited, resulting in a relatively low level of risk. Along the market chain, the material is increasingly bulked, given a concentration of the produce with a reducing number of players at each stage; this implies that income in real terms will also increase significantly along the chain.

The difference between the price paid by the ultimate consumer and the price realized by the producer is the price spread. In the case of fresh and processed *totapuri* mango this is Rs. 14.37 and Rs. 24.91 per kg respectively (Table 10.1). Although the price spread is significantly different in the two chains, because of the high differences in costs involved in processing this is not reflected in the margins earned in real terms. (Sudha and Kruijssen, 2008). The flow of market information along the chain is limited; this is shown by a lack of differentiation at farmer level in terms of *totapuri* mango production.

Further, the exact terms and conditions of the contract between the exporter and the importer are not clearly known. The price spread and market margins will reduce substantially if the final price paid by the consumer at the importing country is taken into account. In a typical export transaction of mango pulp following the standard marketing channel, the proportion of consumer's price received by the producer does not show any difference from what it is when obtained in the market for fresh product. The exporter's share is improved, but the advantage of a higher export price is not distributed to all the other players along the chain. The 'fag end' player, like the exporter who has access to market information, improves his margin from the export of mango pulp. It is here that the *totapuri* agro-industry cluster fails to coordinate a fair distribution of the market margins, unlike in the case of other export-oriented market linkages.

TABLE 10.1
Price spread along the *totapuri* mango supply chain (Rs./kg)

	Sale price	Fresh	Proportion of consumer's price (%)	Processed mango pulp	Proportion of consumer's price (%) [*]	Proportion of consumer's price (%) ^{**}
Farmer's sale price		3	18.75	3	18.75	6.67
PHC's sale price		5.25	32.81	6	37.5	13.33
Wholesaler's/processor's price		8.5	53.13	7.97	49.81	17.71
Retailer's/exporters price		16	100.00	26.54	100.00	58.98
Final consumer's price (Europe)				45		100.00
Price spread (up to exporter's price)		14.37		24.91		
Price spread (export sale price)				42		

Table based on authors' own calculations and Europe mango price.

* Proportion based on exporter's price.

** Proportion based on price paid by the final consumer in the imported country.

Source: Authors' own data, compiled from sample collected.

10.2.4 Income and employment generation along the supply chain in the *totapuri* mango agro-industry

An analysis of the *totapuri* agro-industry cluster's performance is incomplete if an assessment of the livelihood support that it provides to several stakeholders along the market chain is not carried out. Besides the prominent actors in the chain such as the PHC, the wholesaler/commission agent, the retailer, the processor and the exporter, others also play an important role in the mango supply chain. Employment is provided to a large number of people that are involved in odd jobs such as loading, unloading, sorting and grading at the market yard, and also in sorting, cleaning, cutting and packing at the processing units. Transport at all stages in the chain also provides employment for many.

During the mango season, families temporarily migrate to the market yard in the urban area or the processing units to earn a living, from as far as 200 km away. In the years when quantity is high, it is not uncommon that some of the migrants also act as small (on the spot) retailers. Nearly 150 days of employment is generated at each processing unit during the mango processing season, as each one of the transformation units processes over 500 tonnes of fresh mangoes annually. The Chittoor mango cluster could be generating employment to over 1 000 000 man days during the 3 to 4 month mango season annually. Yet, the jobs performed at the processing level are under threat from the increase in automated machinery that is required for the aseptic packing.

TABLE 10.2

Income distribution and risk borne

SI No	Name of the market intermediary	Function performed	Risk involved	Proportion of mango handled along the market chain (% share)	Proportion of value realized (% share)
1	Producer	produces	production risks – low	1	2
2	PHC	collects and transports	shares much of the producer's risk	4	7
3	Wholesaler	arbitration	moderate	27	42
4	Handler	transfers	low	53	10
5	Transporter	transfer	low	3	8
6	Processor	value addition	low	6	9
7	Exporter	exports	high	7	22

Source: Authors' own data, compiled from sample data.

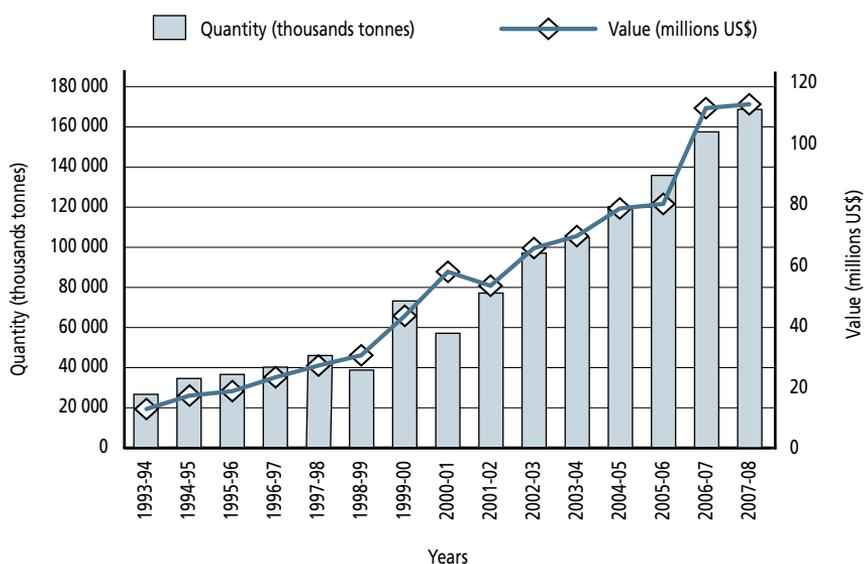
With regard to income, the proportion earned in the different supply chain echelons seems directly proportional to the risk borne at each stage. Table 10.2 outlines the role played by each of the market intermediaries, the perceived risk borne and the proportion of income earned.

While the high proportion of income earned by the exporter is justified given the level of risk borne for processed mango, the proportion of income earned and the risk taken by the wholesaler, either for fresh or for processed mango, is not justified by the amount of risk taken. The wholesaler primarily helps in arbitration and collects a market fee from both the seller and purchaser, taking away a major chunk of the margin merely from bulking products.

10.2.5 Export trade of mango pulp

Mango pulp is one of the most important commodities traded internationally in the processed fruits and vegetables market. India is the largest exporter followed by Mexico. India controls nearly 63 percent of the world market and nearly 70 percent of its exports go to the Middle East, while 12 percent are shipped to Europe and 5 percent to the USA. Estimates show that over Rs. 7 000 million (US\$54 million) are earned annually from mango pulp exports from India. Of this total, *totapuri* mango accounts for more than 50 percent (Figure 10.3). The major Indian and overseas players in the food processing industry, and especially in mango processing, are Indian Tobacco Company Limited (ITC) and Hindustan Unilever Limited (EMC, 2009). Hindustan Unilever Limited, a subsidiary of Unilever, has a

FIGURE 10.3 Export trend of mango pulp from India (1993–1994 to 2007–2008)



large market and considerable bargaining power, and has its own division for food and beverage exports (HUL, 2009). ITC Limited is the market leader in agro-exports (ITC, 2009). Besides these 'big two' are hundreds of small-scale exporters (APEDA, 2009). According to a recent study, aseptic packed *totapuri* mango pulp with 14 brix fetches around US\$850/MT, equal to Rs. 45/kg. The producer receives only about 2–5 percent of this price, suggesting inequitable distribution of margins in the export-oriented supply chains.

10.2.6 Efforts and innovations that lead to the current status of the *totapuri* mango supply chain

The *totapuri* mango agro-industry cluster is probably among the oldest market networks that have been in operation in India. The cluster as it stands today is a result of several favourable policies and innovative efforts. These include government policy and investment initiatives by the chain actors themselves.

Government export promotion initiatives

A series of policy initiatives and institutional support from the Government have impacted the *totapuri* mango market chain over the years.

- (a) **APEDA:** Setting up of the Agricultural Produce Export Promotion and Development Agency (APEDA) in 1984 provided a boost for export promotion of horticultural produce in India. Most of the export houses benefit from the services rendered by APEDA to its members, including market information services, export infrastructure credits, periodic assessment of consumer preferences from importing countries, and adjusted terms and conditions for export to different destinations. In keeping with the changes in the post World Trade Organization (WTO) period, APEDA also initiated efforts at implementation of HACCP¹ standards, with partial financial assistance from the Ministry of Food Processing Industries, covering a total of 24 mango processing units based at Chittoor and Krishnagiri districts in a phased manner. These units have also been assessed and certified by the International Standards Certification (ISC) South Asia Pvt. Ltd. in 1998/1999. The National Sanitation Foundation (NSF) has also certified the same. Compliance with the Minimum Residue Level (MRL) for several pesticides and fungicides is not a problem for mango exporters, given that mango cultivation in this region is largely organic, with very limited dosage of chemicals being used for spray and other purposes.
- (b) **AEZs:** Product-specific exclusive production regions were identified as Agricultural Export Zones (AEZs) during 2000 by the Government of India, which helped to create export and processing infrastructure specific to different crops closer to production centres. The idea was to provide focused attention on the problems faced by the growers in these specific regions.

1 Hazard Analysis Critical Control Points (HACCP).

- (c) **Liberalization of import policy:** This was one of the most important policy initiatives that enhanced private sector participation in Indian agriculture and allied sectors. Prior to 1997, imports of fresh and dried fruits were prohibited with the exception of dates and figs. Following the liberalization of trade in agricultural commodities, imports of all fresh fruit (except citrus, grapes and lychees) have been permitted generally on an Open General License (OGL) basis. In the case of countries belonging to the South Asian Association for Regional Cooperation (SAARC), an import tax of 44 percent *ad valorem* is levied, while for other countries it is set at 45.6 percent. There are no reported export duties on fruits from India. With additional facilities such as duty draw back, export market promotion concessions have helped growers gearing up for export oriented production. However, liberalized import policies helped foster the importing of state of the art technology for processing and packaging, including that for mango pulping and aseptic packaging.
- (d) **State-of-the-art aseptic packaging facility:** As a result of the increased attention given to food safety standards in the post WTO period, the demand for aseptic packaging of pulp for export markets is increasing. This type of process requires substantial investments in sterile processing and packing technology and material and lab testing facilities. Two such facilities have been set up exclusively for mango processing and packaging in south India, one of them at Chittoor and one in Bangalore. The daily requirement of raw material for these units is around 160 tonnes of fresh mango – for 24 hours after which the process is interrupted by a sterilization process required for production according to HACCP standards – hence sourcing of raw material in the appropriate quantity, maturity and price is a crucial constraint in the process. With the high level of fixed investment involved, it is essential for processors to utilize the unit at full capacity at all times during the mango season.

Initiatives for market integration

Several attempts have been made to attain and sustain vertical integration across the marketing network and supply chain of fresh and processed mango. One of the most significant attempts and by far the earliest was an intervention within the existing chain, initiated by a large private sector exporter. A state-of-the-art processing infrastructure for large-scale export was established closer to the production centres, with the primary objective of reducing transit times and post-harvest losses, thereby strengthening the link between producers and processors. With a pre-determined price, the set-up entered into contractual agreements with producers or PHC for the supply of raw material, fresh *totapuri* mangoes. Though the attempt succeeded initially, the advantage of 'price information' did not trickle down to the base level player, the producer (ITC Model)². As a counter to this attempt, soon a number of semi-processing units sprung up in the region, most of them being small-scale units

2 A model established by the Indian Tobacco Company during 1990s.

with a crushing capacity of around 10 tonnes per hour/day. These processing units started forming cartels during the season, allowing them to control the market price, nullifying the specific advantage of the processing infrastructure that was created.

In yet another attempt, an effort has been made by the State Government to promote the establishment of technology parks. These provide centralized facilities at reduced rates for processing and packing to producers or semi-processors that wish to set up a processing centre, thereby allowing them to enjoy these benefits, given that fixed investments and overheads are reduced. In addition, the central unit also provides market information on quality parameters, standards, arrivals and prices in different export destinations, in order to assist entrepreneurs to benefit from trade (TIP)³. It is important to ensure that the price advantage realized by an effective market information system is distributed along the market chain. However, this second effort also did not achieve the vertical integration that was anticipated. A few large farmers dominate the mango processing segment by acquiring the units of other small-scale players operating on job work or custom processing. In a more recent attempt under a public–private partnership model, an effort has been initiated with farmers cooperatives in order to assure the supply of mango for processing purposes⁴. Most of the efforts at creating horizontal linkages through cooperatives have not been successful in the past, given the administrative bottlenecks the cooperatives typically become entangled in.

10.3 Agro-industry clusters of horticultural crops in India

This section provides a discussion of the problems and prospects of agro-industry clusters and also considers other important Indian crops, relating the observations to the special features of the *totapuri* agro-industry cluster.

10.3.1 Efforts at linking farmers to markets

Being highly seasonal and perishable, horticultural crops are also capital and labour intensive and need care in handling and transportation. Their bulkiness makes handling and transportation a difficult task, leading to huge post-harvest losses which are estimated at around Rs. 230 billion, or nearly 35 percent of the total annual production (CII, McKinsey, 1997). Their seasonal production pattern results in

3 Technology Infrastructure Park (TIP), 1999.

4 There have been some attempts at creating horizontal linkages across the chain actors by creating cooperatives among producers with the goal of empowering them. Notable among these are the efforts initiated by AgriTerra of the Netherlands, through the Food and Agriculture Organization of the United Nations (FAO), Federation of Farmers Associations (FFA) and the Horticulture Department of Andhra Pradesh. This project, helping farmers to develop these cooperatives, has been implemented since 2007–2008.

frequent market gluts and associated price risk, thereby forcing farmers into distress sales to pre-harvest contractors and commission agents. A typical marketing channel of a horticultural crop thus involves a number of intermediaries like the pre-harvest contractor, commission agent, wholesaler and retailer, all operating between the producer and the final consumer. Each of these market intermediaries performs a specific market function that involves a cost to them, thereby yielding a share in the market margin. Some economic theories suggest that an efficient market provides for the distribution of market margins in proportion to the aggregation of utility performed by each market intermediary; however, market failures might distort the chain margin structure. In a market function, the physical movement of the produce occurs from farm to market along the chain, while the monetary and information flows happen in the reverse direction. The asymmetric access to information tends to empower market intermediaries and give them a stronger bargaining position, thus allowing them to secure higher shares in the chain's marketing margin (FAO, 1997).

Fostering coordinated linkages of farmers to traders and processors has been a recognized means to reduce seasonal gluts and associated price crashes, especially for perishables (Eaton & Shepherd, 2001; Subrahmanyam, 2000; Sudha and Gajanana, 2001). However, the linkage between producers and processors is rather weak under Indian conditions, given reasons such as high processing costs, inadequate supply of the right quantity of raw material for processing, dual taxation policies, and inconsistent demand for the processed produce. Efforts have constantly been made to link farmers to markets, so that the marketing channels and the role played by different market intermediaries are better coordinated. These efforts include the creation of alternate marketing channels that provide better pricing policies and reduce the margins, the promotion of contract farming for assured buy-back and corollary assured prices, and the development of streamlined supply chains to create and sustain value addition for some commodities (Dileep *et al.*, 2002).

Contract farming

Contract farming is one of the most accepted forms of integrating producers with industry through value addition. Several forms of contracting have been successfully implemented in horticultural crops. Some of these models, such as the one adopted by Pepsi or Hindusthan Lever for tomato and potato in India, are worth mentioning (Singh, 2000). These contracts seem to have worked well, but the inclusion of small farmers and the benefits to them are debatable (Dileep *et al.*, 2002). However, evidence points towards the positive impact of cross-border contract production of fresh vegetables for supermarkets involving a large number of small farmers. In this global supply chain, small farmers' microcontracts are combined with extensive farm assistance and supervision programmes to fulfil the complex quality requirements and phyto-sanitary standards of supermarkets. Small farmers that participate in these contracts enjoy higher welfare gains, more income stability and shorter loan periods (Minten *et al.*, 2005).

Cooperatives for domestic market linkages

The cooperative structure is the most common and rather overstressed organization model for the marketing of horticultural crops in India. Banana cooperatives from the Jalgoan region of Maharashtra have shown the way forward in accessing distant domestic markets, by pooling and thereby cutting down transport costs. Most of these cooperatives seem to work well in marketing fresh horticultural produce. One of most popular and successful cooperative marketing initiatives is that of milk and sugar rather than for horticultural crops. Having said this, successful value chain coordination through processing cooperatives has been reported for mango in Tamil Nadu. This model includes a hierarchy coordination involving 600 mango growers for *totapuri* mango (Aharam, 2009). However, the cooperative model has not been sustainable, given the administrative and legislative bottlenecks that are embedded in the cooperative legislation.

Linkages involving export-oriented production

There have been other innovative models integrating production to markets through value addition in horticultural crops, such as the export-oriented production of fresh grapes, plus the cases of coffee and tea.

Grape: One of the more recent accounts of a successful agro-industry cluster is that of a fresh grape export production group based in Narayana Gao, Pune district, Maharashtra. Popularly known as the Abhinav export group, this is a farmer's association set up in 2002 by a group of 110 grape growers, bringing about horizontal integration among the supply group for export-oriented production. Each farmer enrolls in the society as a member through a nominal payment (in the range of Rs. 5 000/farmer). The group plans the annual export-oriented production among the members. The infrastructure facilities for pre-cooling, cold storage and packing have been provided by APEDA and the State Government. The association ensures the timely supply of inputs and also provides technical expertise for export-oriented production, including clean cultivation practices and other HACCAP standards. The association invites buyers from across different destinations, provides them with information on cultivation practices and thus ensures they achieve a collective bargaining power. Within a short span of five years, the association has been able to export over 100 tonnes of fresh grape to different European countries. The model thereby helps farmers overcome the problem of distress sales to PHCs, prolonging the marketing season and creating access to alternate and distant markets where higher prices may be reaped. The benefit of higher export prices realized by farmers is distributed across the chain players equitably. The model also eliminates a number of market intermediaries and helps producers gain higher market share. Through collective action, farmers are also able to import better technical know-how for value addition on-farm. The model provides for horizontal integration and value addition through improved packaging, but is available only to a small set of grape growers.

Coffee and Tea: The export market linkage models existing for coffee and tea provide insights into a comprehensive linkage scheme, where even a small grower is able to realize the benefits of quality-based export market prices for his produce. The fact that the prices of these commodities are internationally established provides an opportunity for producers to benefit from a quality-based pricing system. These commodity groups provide an example of how an internationally-determined competitive price is effectively transmitted to the farthest upstream players along the supply chain. Effective institutional support and strong producer collectives can be identified as the most critical factors responsible for the success of these initiatives. The case of Darjeeling tea is an example of chain empowerment channeled through Mercy Corps and its local partner, Darjeeling Earth Group. This linkage arrangement gave farmers the right to sell directly to tea estates and realize higher prices than when selling to middlemen.

Most of these experiences or models do not seem to apply directly to the mango supply chain, given the sheer size of the cluster and also because of its unique characteristics. Section 4 examines these features and makes inferences and suggestions for the future.

10.4 Feasibility of standardizing supply chains for *totapuri* mango pulp

Taking on board the lessons from the examples of other crops, this section aims to assess the feasibility of emulating a similar effort for *totapuri* mango pulp from Chittoor. At the outset, it is important to understand the unique characteristics of the *totapuri* mango agro-industry cluster in comparison with other crops and clusters.

The *totapuri* mango agro-industry cluster is one of the oldest naturally-formed clusters that emerged from the comparative advantage of *totapuri* production in the region. It also represents a highly dynamic market network that is mature yet fiercely competitive. In a typical agro-industry cluster of this nature there are no written agreements nor pre-determined price supports. Entry barriers are low, competition is fierce and the market is mature. The *totapuri* mango cluster focuses on a processed product, distinct from others such as grape which is for fresh consumption. Though both are seasonal crops they differ with regard to capital and labour requirements. Its capital-intensive nature makes grape a highly commercial crop through which producers are keen to gain high returns.

In the case of *totapuri* mango the crop is the most convenient farm enterprise option available to the producer, given the limited rainfall and other agro-climatic conditions in the region. The area's hilly landscape actually saves the producers several costs, such as those stemming from watch-and-ward needs and from

wind-induced damage to the mango crop. This comparative advantage and low cost of establishment and maintenance makes the production base highly differentiated in terms of holding size; this is not the case with other perennial fruits.

Another feature unique to mango is the biennial nature of its cultivation cycle, which means that not all the trees in an orchard will bear fruit every year. Growers therefore maintain orchards involving different varieties and different age groups, such that overall, the orchard sustains itself through income from one or other variety every year. These unique features of mango differentiate it from other fruit trees and make it difficult to maintain any regular farmer group. The grape model highlights the scope for organising growers into fewer and smaller groups of farmers sharing common interests. Such associations develop uniform practices and allow the formation of a regular supply base.

Since the mango industry is based on a highly-differentiated production base, any effort aimed at market intervention seems to have sparked off market expansion through additional processing infrastructure. The fact that the *totapuri* mango cluster has been expanding continuously is an indication of the growing and sustainable profitability of the commodity in domestic and export markets. Most of the earlier efforts initiated by the Government to create infrastructure and facilitate smooth functioning of the value addition chain have been successfully countered by alternate efforts from private owners and growers themselves. Despite this there has not been a decline in the revenues earned or quantity traded.

The impact of Government policy in terms of dissemination of market information by APEDA, infrastructure creation through the National Bank for Agriculture and Rural Development (NABARD), and a drive towards refinancing and promotion of liberalized exports, can be seen in the expansion of the agro-industry cluster and the subsequent enhanced exports of mango pulp from the region. Now that mango pulp has been standardized as an internationally-traded commodity, there is a need to put in place a mechanism for price determination in the free market that can be passed along the chain to the lowest level player. The most critical point in the mango pulp cluster is that the margin involved in converting fresh mango into pulp is rather small. A number of players along the chain, including the processor, earn their profits from bulking. It is here that supply chain management needs to pay special attention to avoid the smallest player in the chain, the grower, suffering the consequences of unfair trade practices. The chain model needs to be developed so that the cluster incorporates a safety mechanism to safeguard the interests of the smallest link in the supply chain. The model adopted by Darjeeling tea, discussed earlier, seems to offer a suitable approach in this respect.

Furthermore, there is a need to address the problem of non-competitive behaviour, which appears to characterize the actions of market chain players such as wholesalers or commission agents. While these market intermediaries retain nearly half of the producers' share from the consumers' rupee, there are no indications that the

functions they perform would justify the margins observed. Indeed, there is evidence that suggests the failure of markets to disseminate price information effectively across the different players in the chain, thus creating asymmetries to the detriment of the growers. As such, a key function of any attempt at market organization for the cluster should ensure that market price information is effectively disseminated along the chain. Similarly, redundant and non-essential market intermediation should be minimized. Being a processed commodity, *totapuri* mango could be marketed through direct links set up between growers and processing companies. Since *totapuri* mango pulp is an internationally-recognized commodity that can be measured on standard brix and the international price is directly proportional to the brix, there is scope for setting up an efficient price information system.

10.5 Suggestions and policy implications

Creating a commodity board, or a similar chain coordination mechanism exclusively for mango pulp, appears to be a tangible solution for linking producers to markets. The primary objective of the board or association would be to facilitate a process through which mango producers are empowered to participate in the market and benefit from the international trade of the processed product. As has been discussed earlier, ample examples are available for creating and sustaining such commodity boards or associations. An effort of this nature would require the creation of a 'brand name', bringing all the producers and processors under one banner, ensuring uniform quality of the finished product from the region, and guaranteeing a more uniform benefit-sharing mechanism, irrespective of the size of the operating unit. Because the product from the region is unique, it is also possible to obtain a 'geographic indication' for the produce, create a brand name, trademark the logo, and bring all the producers and processors under one umbrella through a franchise scheme. One of the prerequisites for this is the standardization of the end product, the mango pulp. Since mango pulp and the specific case of *totapuri* mango pulp are already standardized and internationally traded, all these steps are feasible with appropriate institutional support.

At this juncture, it is imperative that the requisite interventions are actioned at international level. Since mango pulp is a homogenous, standardized commodity that can be traded internationally, an organization of international repute such as FAO could play a significant role in initiating and sustaining such an initiative. The primary objective of such an initiative would be to assist the process of 'price discovery' and dissemination to the lowest players along the supply chain.

Apart from the interventions required at processing level to ensure uniform quality, efforts are also needed to increase competition at the wholesaler level of the chain. This would require collective action in a three-tier structure, grouping farmers at community level into self-help groups, identifying processors at district level who procure fresh material directly from these groups, and who in turn are integrated with exporters to export the semi-processed pulp under one brand name. Obstacles that have to be overcome for such an intervention to succeed are manifold and include: inconsistencies in export demand; lack of transparency and information sharing in the market in terms of price, quantity and quality; a lack of trust among the chain actors; difficult and cumbersome taxation policies; the absence of initiatives to build brand names. The commodity board or association would be expected to address most of these issues.

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Annex 1:

Trend of mango area and production in Chittoor, Andhra Pradesh

Table 10.3
Trend of mango area and production in Chittoor, Andhra Pradesh

	Chittoor Area (ha)	State total area (ha)	% of total State area	Chittoor production (tonnes)	State total production (tonnes)	% of total State production
1998-99	33 032	281 914	11.72	106 785	2 269 571	4.71
1999-00	42 766	297 449	14.38	342 128	2 379 592	14.38
2000-01	45 077	306 192	14.72	360 161	2 449 536	14.70
2001-02	45 559	341 191	13.35	368 912	2 445 824	15.08
2002-03	47 834	370 267	12.92	382 672	2 962 136	12.92
2003-04	52 721	402 154	13.11	421 768	3 217 232	13.11
2004-05	48 913	391 896	12.48	391 304	3 135 168	12.48
2005-06	59 155	459 713	12.87	391 304	3 306 032	11.84
2006-07	59 380	471 367	12.60	486 916	3 865 209	12.60
2007-08	59 380	483 480	12.28	510 668	4 157 928	12.28

Source: Statistical data of Government of Andhra Pradesh.

Annex 2: Marketing margins and price spread along the supply chain for *totapuri* mango

Table 10.4

Marketing margins and price spread along the supply chain for *totapuri* mango

	Fresh			Processed	
	Value (Rs./tonne)	% of total		Value (Rs./tonne)	% of total
Farmer			Farmer		
Net price	1 630	10.19	Net price	1 630	6.14
PHC			PHC		
Buying price	3 000	18.75	Buying price	3 000	11.30
Costs			Costs		
<i>Transport</i>	120	0.75	<i>Transport</i>	10	0.04
<i>Handling</i>			<i>Handling</i>		
<i>Commission</i>	420	2.63	<i>Commission</i>	10	0.04
Margin	1 410	8.81	Margin	2 970	11.19
Wholesaler			Processor		
Buying price	5 250	32.81	Buying price	6 000	22.61
Costs	650	4.06	Costs	60	0.23
Margin	2 600	16.25	Margin	1 910	7.20

Annex 10.4 (Continued)

 Marketing margins and price spread along the supply chain for *totapuri* mango

	Fresh			Processed	
	Value (Rs./tonne)	% of total		Value (Rs./tonne)	% of total
Retailer			Exporter		
Buying price	8 500	53.13	Buying price	7 970	30.03
Costs			Costs		
<i>Transport</i>	2 500	15.63	<i>Cans</i>	3 330	12.55
<i>Handling</i>	500	3.13	<i>Reforming and filling</i>	1 670	6.29
Margin	4 500	28.13	<i>Packing</i>	20	0.08
			<i>Transport to port</i>	250	0.94
			<i>Sea freight</i>	2 530	9.53
			<i>Commission</i>	640	2.41
			<i>License</i>	5 560	20.95
			Margin	4 570	17.22
Consumer price	16 000	100.00	Export price	26 540	100.00
Price spread	14 370		Price spread	24 910	

Source: Author's own calculations based on sample data.

CHAPTER 11

Process and product innovations in the cassava agro-industrial sectors in Africa: The stimulating effect of presidential initiatives

LATEEF O. SANNI

11.1 Introduction

The production, processing and marketing of cassava provides a major source of income for about 450 million people, often women and low-income earners, in sub-Saharan Africa (FAO, 2004). Cassava is not only strategically important as a food source and famine reserve. Combining high calorific efficiency with versatile/low cost input and reliable and flexible production, it is now seen as a pro-poor vehicle for economic development (NEPAD, 2004). The New Partnership for African Development (NEPAD) hence adopted the slogan 'Cassava: A Powerful Poverty Fighter in Africa' for its Pan African Cassava Initiative (Whingwiri, 2004).

Nweke *et al.* (2002) classified cassava development in Africa into five stages. In the first stage, cassava is considered a famine reserve crop, especially in areas where rural consumption is based on cereals. In such dry regions of Kenya, Malawi, Tanzania, Mozambique, and Zambia, as well as in the northern Saharan zones of most countries in West Africa, cassava is a famine reserve crop during periods of scarcity and drought.

In the second stage, cassava is considered a rural food crop because it is the main source of calories in the diets of rural consumers. Although cassava has this important role, farmers only use local varieties and traditional technology, largely because of the limited market incentives to adopt new varieties and improved technology. As a result, farm output is relatively low and cassava is mainly consumed on the farm. This type of production is often found in remote areas of the cassava belt in sub-Saharan Africa (SSA).

In the third stage, cassava is considered a food and cash crop, based on traditional technology and traditional low-yield varieties. Average yields are 7–10 tonnes/ha and manual processing is very common. Cassava is a basic rural and urban food staple; a significant part of the harvest is sold in processed form. This type of production is found in regions with market access in the coastal, forest and savannah zones of some countries in western and central Africa: examples include Nigeria, Democratic Republic of Congo, Cameroon, Guinea.

The fourth stage is when cassava is considered a food and cash crop based on improved technology, involving a broad adoption of high yielding varieties and mechanization of certain processing stages (grating, pressing, frying and milling). At this stage cassava is both a rural and urban food crop. Examples abound in Nigeria and Ghana as a consequence of presidential initiatives.

At the fifth stage cassava also becomes an industrial crop, providing raw material for starch, ethanol, flour, and the livestock feed industries. At this stage, less than 75 percent of the total cassava output is devoted to direct human consumption in both rural and urban areas. A significant number of cassava growers in Nigeria have made the transition to the fourth stage (high yielding varieties and mechanized processing), even though farmers have not yet attained the desired technical efficiency in cassava production. This low efficiency results from a lack of knowledge of the latest available technology in cassava cultivation and other improved inputs such as fertilizers and herbicides. However, the wide-scale adoption of high yielding varieties and the resulting increase in yields from 11 tonnes/ha to 40 tonnes/ha have shifted the problem of the cassava sector from supply issues (production) to demand issues, such as finding new uses and markets for cassava.

11.2 Presidential Initiatives on Cassava (PIC)

According to Tonah (2006), the development of the cassava sub-sector is emerging as a key component of a regionally strong and diversified economy able to generate employment, contribute to food security, and sustain incomes for the populations of sub-Saharan Africa. To achieve these potentials, however, it is necessary to put in place mechanisms and policies that guarantee a regular supply of good quality cassava.

To this end a number of SSA countries, especially Ghana and Nigeria in West Africa, have launched Presidential Initiatives on Cassava (PICs) as part of elaborate economic reform programmes aimed at promoting the diversification of the foreign exchange earnings base for these countries. The PIC policies were expected to encourage public–private partnership by creating, through well-designed intervention mechanisms, a practical enabling environment for

competitively advantageous industries identified as having the potential for fast growth and demand from export markets.

The Ghanaian Presidential Special Initiative (PSI) on cassava began in 2001, as part of the Government's policy of transforming cassava production from its subsistence nature into a commercially viable agribusiness that can generate substantial revenue locally and through exports. The specific objectives of the PSI on cassava were to: (1) transform the cassava industry into a major growth area; (2) establish 10 cassava starch processing plants; and (3) generate annual export revenues of US\$100 million by the end of 2006. In addition the initiative aimed to ensure that 50 percent of farmers participating in the project should be women.

Although the Ghanaian Government is the main sponsor of the PSI, the project was to be executed through a farmer-ownership scheme called the Corporate Village Enterprise (COVE). The COVE model seeks to bring rural communities into mainstream economic activity by establishing large-scale export-oriented enterprises, which will be owned by farmers themselves but managed by professionals with industrial experience who are engaged on performance contracts. In line with this policy, farmers were encouraged to form cooperatives. Members of the cooperatives were expected to grow the crop on their individually-owned farms and then be assisted by the Government to own a starch processing plant collectively, established by the government to process cassava into starch (Tonah, 2006).

The Government and its development partners were expected to complement the efforts of the private entrepreneurs by supporting the project with infrastructure facilities: construction and upgrading of access roads, provision of communication facilities, adequate power for the processing plant, and potable water for the factory as well as the surrounding communities. Advocacy structures were also set up using project field staff (with the assistance of the Ministry of Food and Agriculture) to inform the farmers about the impending project and the roles expected of farmers and the Government in the project. They also needed to convince rural farmers about the benefits of cassava production and the readiness of the produce market to receive their output.

In July 2002, a year and a half after the launch of the PSI in Ghana, the President of the Federal Republic of Nigeria announced a similar initiative. This aimed to create awareness among farmers about the opportunities that exist in the cassava market through expanded cassava utilization and primary processing. To this end, actions were taken to increase productivity and expand annual cassava production in order to achieve global competitiveness, while integrating the rural poor (especially women and young people) into the mainstream of Nigeria's national economic development. Furthermore, new market opportunities were identified and developed to stimulate increased private sector investment in the establishment of export-oriented cassava industries (FNG and UNIDO, 2006; Knipscheer *et al.*, 2007; Ezedinma *et al.*, 2007).

The specific objectives of the Nigerian presidential initiative on cassava (PIC), which was to be achieved by 2007, included:

1. Enhance the productivity and production of cassava by increasing the area cultivated to 5 million ha, with the hope of harvesting 150 million tonnes of fresh cassava tuber annually.
2. Produce 37.5 million tonnes of processed cassava products (i.e. *gari*, HQCF (high quality cassava flour), pellets, chips, starch and ethanol) for local and export markets.
3. Organize the export of cassava and processed-cassava products as a revenue-generating project.
4. Earn about US\$5 billion annually from exporting value-added cassava products.

According to the United Nations Industrial Development Organization (UNIDO, 2006), existing and new policies aimed at supporting investment and market development in the cassava industry in Nigeria include:

- ▶ **Policy on national strategic food reserve.** The food reserve policy was aimed at ensuring food security, guaranteeing food and industrial raw materials and providing employment opportunities for the rural labour force. *Gari*, the most produced and traded cassava product, has recently been added to the list of products. This should stimulate the *gari* production industry, creating more cassava plantations, essential for the growth of the overall cassava industry.
- ▶ **Policy on Pioneer Status Investment Incentives:** Companies can obtain pioneer status in several ways: if they produce products declared 'pioneer products' under the Industrial Development (Income Tax Relief) Act No. 22 of 1971 as amended in 1998; if the Nigerian Investment Promotion Council (NIPC) has declared it a deserving enterprise; if the company is located in an 'economically disadvantaged' area. Pioneer status provides a five-year tax holiday to qualified investors, with a two-year extension for those located in economically disadvantaged areas. These areas are defined in the NIPC guidelines for investment incentives in Nigeria (NIPC, 1998). However, it must be noted that pioneer status is not automatic and must be applied for; even with pioneer status such companies must report taxes to the Federal Inland Revenue Service (FIRS) even though the tax is not taken from the company.
- ▶ **Policies on export incentives for non oil sector:** These include (a) a 10 percent tax concession for five years for industries exporting no less than 60 percent of their products; (b) retention of export proceeds in foreign currency; (c) an Export Development Fund (EDF) that provides financial assistance to private sector exporting companies; (d) an Export Grant Fund Scheme (EGFS) that provides cash inducements for exporters that have exported a minimum of ₦50 000¹ worth of semi-manufactured products; (e) a duty drawback/suspension and manufacture-in-bond scheme; (f) an export adjustment fund scheme providing supplementary export subsidies to compensate exporters for the high cost of local

1 ₦ = Nigerian naira.

production arising mainly from infrastructure deficiencies and other negative factors beyond the control of the exporter; (g) Nigeria Export/Import (NEXIM) Bank Foreign Exchange facilities; (h) a capital assets depreciation allowance, which is an annual allowance of five percent on plants and machinery to manufacturing exporters who export at least 50 percent of their annual turnover, provided that the product has at least 40 percent local materials content or 35 percent value added.

All of these incentives are also applicable to cassava-based industries (e.g. starch or ethanol) that are produced for export purposes.

- ▶ **Policy on the provision of credit loans for agriculture producers** through specialized banks like the Nigerian Agriculture, Credit, and Rural Development Bank (NACRDB).
- ▶ **Policy on mandatory substitution of 10 percent wheat flour with high quality cassava flour** in the flour mill industry. This policy will link high quality cassava flour processors to large-scale wheat flour millers in Nigeria, and consequently create the desired jobs.
- ▶ **Policy on provision of gainful employment** for the country's population. The present government of Nigeria strongly supports a growth-oriented economy with the capacity to create jobs.
- ▶ **Policy on blending of 10 percent Ethanol in fuel.** The Nigerian government as part of its commitment to the 2000 Kyoto Agreement has decided to implement a policy of blending fuel with 10 percent ethanol. Ethanol blended fuels will lower the emission of carbon monoxide into the atmosphere.

Nigeria's PIC was to have been implemented during the period 2002–2007. To achieve these objectives, there was a need to develop the domestic market and create national policies in order to promote cassava development in the country.

11.2.1 Stimulating effect of Presidential Initiatives

These Presidential initiatives on cassava generated great excitement and hope, and greater expectations on the part of relevant stakeholders, contributing to the achievement of the United Nations' Millennium Development Goals as explained in Table 11.1.

In general, the PICs have helped create awareness about the multiple uses of cassava to produce value-added products such as flour, starch, cassava chips, glucose syrup, animal feed, ethanol, and composite (cassava–wheat) baking flour. Both the public and private sectors have been giving increasing attention to the cassava sub-sector. In Nigeria, the PIC has stimulated an increase in cassava production and processing activities. The promotion of HQCF in the baking and confectionary industries was given further political support to enhance public and industrial acceptance. With strong advocacy at all levels there was support for processing and export.

TABLE 11.1

Millennium Development Goals and the roles of PICs and other parties

Millennium Development Goal	Roles of PICs and others
Eradicate extreme poverty	Cassava is a secure source of food and nutrients. Post-harvest processing adds value and enables farm-gate businesses to boost farmers' incomes.
Promote gender equality	Women benefited especially from improved cassava farming and processing activities. Women's participation in cassava initiatives increased their knowledge and skills, and enable them to make better enterprise decisions.
Reduce child mortality	PICs have contributed to this goal by reducing hunger and raising farmer-processors' standards of living.
Improve maternal health	Through better nourishment, PICs directly improved the health of women and their unborn children.
Develop a global partnership	More partners involved in cassava for development.

A policy was promoted to add 10 percent of cassava flour to the wheat flour used in bread, to open additional market opportunities for smallholder farmers. The growth in demand activated the industrial scale-up of HQCF and starch processing by about 48 percent (Maziya-Dixon and Onadipe, 2007). The awareness created greater interest and increased investment in the industry by foreign and local investors. During the period, private sector participants established over 500 microprocessing centres (MPCs) and 100 small- and medium-sized enterprises (SMEs) for the production of intermediate cassava products. The enterprises provided substantial job opportunities for the young, technicians, professionals and artisans (Sanni *et al.*, 2006). There were substantial investments in new factories for the manufacture of glucose syrup, starch and HQCF. Such factories include Ekha Agro Farms, Ogun State, a glucose syrup factory built in 2007; Dutch Agricultural Development Company Nigeria Ltd, Benue State, an automated HQCF factory built in 2006; and Matna Foods, Ondo State, a cassava starch factory built in 2005. The market for HQCF in Ghana is already established with the Plywood manufacturers and the biscuit factories (Piccadilly Biscuits and Parle Biscuits). There is also instant *fufu* being manufactured and available on the market. Finally, a company named Lee Chemicals that is chiefly into export trade also purchases HQCF.

Some companies attempted regional marketing of cassava starch, e.g. Matna Starch Industry exported cassava starch through Nestle Plc to Cote d'Ivoire, while Ayensu Starch Mills, Ghana, attempted to enter the Nigerian market. There was a policy on 5 percent inclusion of HQCF in bread, but it has not been passed into law as the bill had not gone through parliamentary scrutiny. The Ghana Agro-Food Company

(GAFCO) had a significant interest in HQCF, provided that the other two flour millers (Irani Brothers Flour Mills and Takoradi Flour Mills) would be willing to use it in the production of composite flour.

The Nigerian PIC rested its success more on strong financial support to relevant institutions, most especially the International Institute of Tropical Agriculture (IITA), the National Root Crops Research Institute (NRCRI), the Raw Materials Research Development Council (RMRDC) and the Root & Tuber Expansion Programme (RTEP), towards the achievement of the objectives of the initiative.

The period between 2007 and the present day has seen a new outlook in liberalization of food trade, including cassava products. Unlike previous regimes, African leaders are decreasing trade barriers on flour products, including cassava. This conflicts with research findings that suggest nationals made more money in local substitution with high tariffs on importation of food products. Today, Africa is lacking in the area of reliable and sustainable policy implementation on trade liberalization.

Various reports (mainly in the news media in Nigeria) and an impact study published in Ghana (Tonah, 2006) have been highlighting difficulties in their implementation. For example, processors failed to meet the deadline of January 2005 related to government policy on 10 percent cassava flour inclusion in bread making in Nigeria. In Ghana, Tonah (2006) found that farmers were unhappy with low prices paid by the processors who, in turn, complain about insufficient supply of raw cassava roots.

The coordinating Government Ministries in Nigeria (Federal Ministry of Agriculture and Water Resources, FMAWR, and Federal Ministry of Commerce and Industry, FMCI) failed to provide strong influence to ensure early commencement of the initiative. There were also conflicting positions as regards the implementation of PIC, which shows a serious lack of monitoring and evaluation; this problem is still lingering.

Price has always been the bone of contention among all stakeholders in the cassava sector. Farmers complain of the prices offered for the cassava roots by processors, while processors in turn complain of the prices that major end users are offering to purchase their finished products. Furthermore, Nigerian processors were unable to sell high quality cassava flour (HQCF) to flour milling industries because of a price disagreement. At present, HQCF is sold at ₦65 000 (US\$439) per tonne in Nigeria while processors are clamouring for ₦90 000 (US\$608) per tonne. There are two types of HQCF available in the Ghanaian market – the food grade HQCF, which sells for Gh₵700/tonne, and the other grade for the plywood industry, which sells for Gh₵600/tonne. Kokorte sells for Gh₵400/tonne. Price is greatly affected by seasonal differences in this part of the world.

The perceived challenge at present is that ongoing efforts are not adequate and that the cassava sub-sector needs a further push for it to play a leading role in

the agricultural and economic development of SSA countries. To this end, African leaders made a call, through the New Partnership for Africa's Development (NEPAD), to give priority to cassava in regional agricultural development strategies. This led to the creation of the NEPAD Pan African Cassava Initiative (NPACI), a strategic institutional arrangement that is aimed at linking national agricultural research and extension systems to regional initiatives on cassava, in order to ensure food security and income generation in Africa.

Changes in successive governments and leaders have been a bane in sustainable agro-based industrialization in sub-Saharan African countries. Incentives that opened windows of market opportunity based on paradigm shifts from production to market-oriented approaches are easily withdrawn, simply because of changes in leadership, without any policy dialogue involving the stakeholders. This has implications for product and process innovations that can enhance agro-industrial development. It is pertinent to note that the sustainable and stimulating effect of a cassava diversification policy in Africa rests heavily on supportive and amiable approaches, continuous political will, constant dialogue with stakeholders and collaboration by development partners. This has been exemplified by South American countries such as Brazil and Colombia, which have advanced cassava development systems that play a vital role in their successful industrialization. With 70 percent of South American market share, these two nations, especially Brazil, have become leading world producers, processors and marketeers of cassava and its corollary products (UNIDO, 2006).

11.3 Influence of Presidential Special Initiatives on product innovations

Efforts made so far towards improving the quality and safety of fermented cassava products (*gari*, *attieke*, instant *fufu* flour, *agbelima*) based on Presidential Initiatives in Nigeria and Ghana are presented as case studies. Advances made in the local substitution, fortification of traditional and new products are presented.

Findings from the Collaborative Study of Cassava in Africa indicated that the majority of cassava consumed on the continent is fermented (Nweke, 2003; Tanya *et al.*, 2006). These include *fufu*, *gari* (Figure 11.1), *eba*, *attieke*, *kokonte*, *chikwangue*, *placani*, cassava beer, fermented boiled cassava, etc (Kuye and Sanni, 1999). In many African countries, age-old traditional methods were employed before the presidential initiatives in traditional fermentation processes.

Pilot initiatives in 2002–2006 undertaken by Natural Resources Institute (UK) and its partners in Ghana demonstrated the technical and commercial feasibility of producing new/improved cassava products such as instant *fufu* (Figure 11.2), instant *agbelima*, and improved *kokonte* in Ghana and Nigeria, applying the HACCP principle (Hazard Analysis and Critical Control Point) (Johnson *et al.*, 2006; Tomlins *et al.*, 2007).

FIGURE 11.1 Gari Market, Edo State, Nigeria, 2005



FIGURE 11.2 Instant fufu flour



11.4 Process innovations

According to Nweke *et al.* (2002), there are three types of cassava-processing machines in use in Africa: graters, pressers, and mills. Mechanized graters were first introduced in the Republic of Benin by the French in the 1930s, and were modified in Nigerian in the 1940s by welders and mechanics, using local materials such as old automobile motors and scrap metal. The mechanized graters are owned by village entrepreneurs, who provide grating services to farmers. In Nigeria, the PICs encouraged remarkable modifications with technical backstopping from the International Institute of Tropical Agriculture (IITA) in cassava processing techniques, and equipment manufacturing for peeling, grating, drying, frying and milling (Sanni *et al.*, 2006a,b).

Local (mainstream) manufacturers have come up with diverse forms of innovation and improvements to enable processors to overcome some of their limitations. The locally adapted post-harvest technologies were introduced by the IITA-implemented cassava enterprise development project (CEDP) in support of the PIC (Sanni *et al.*, 2005, 2006, 2007). These machineries include mobile graters, flash dryers, pulverizers, centrifuges and plate mills. Other low cost innovations suitable for micro-processing included: the improvement of the cassava presser from screws to hydraulic mechanism; the design of a mobile grater; improvement in cassava sieves; the development of a low cost cassava dryer that can use charcoals and kerosene (for drying of cassava chips and pellets); the integration of the cassava grater, cassava press, cassava sieve and *gari* fryer in a single package.

The development of peeling machines in Nigeria began in the 1980s (Olukunle *et al.*, 2006). IITA, in collaboration with the African Regional Centre for Equipment Development and Management (ARCEDEM), the A & H Engineering Construction Company (Iwo), Fataroy Steel Industry (Ibadan), and other engineers from public institutions in Nigeria commenced modification of cassava peelers in 2005. Based on the assessment, minimum peel retentions were 5.7 percent, 6 percent, 11 percent, 0 percent and 0 percent respectively for A&H, FUTA, FATAROY, Hand Fed Model and manual method,

with capacities of 0.25 tonnes/ha and 1 tonne/ha. Various suggestions were discussed and manufacturers were encouraged to improve on their designs. Consequently, ARCEDEM produced a prototype peeler in collaboration with IITA (Sanni *et al.*, 2006b).

A recent field visit by engineers from the National Centre for Agricultural Mechanization (NCAM) to A & H Engineering revealed some improvement in innovative cassava peelers (Olowonibi *et al.*, 2009). The peeling machine comprises three cylindrical rotating rollers with a crest of about 0.5-inches and 2 mm mild steel wound round the rollers, which serves as the peeling blade. The blade winds round the top left and wooden rollers anticlockwise while the top right roller blade winds clockwise. There is a stationary hollow cylindrical galvanized pipe positioned exactly at the top downroller; the three rollers connect together with a chain via sprockets. The machine has an efficiency of 85–90 percent with small cassava roots and 90–95 percent with large roots. Processors (Cottage to SMEs) in other parts of Africa are still using manual peeling, which is laborious. It is only Ayensu Starch Mill that uses mechanical peelers, which are not accessible for use by a critical mass of processors in Ghana. Some SMEs are currently testing using ARCEDEM-WABAMACO, Fataroy and A&H peelers, with some degree of success. However, there is still a need for further collaboration in the development and perfection of cassava peeling machines before they may be usefully integrated into cassava processing methods by other end users in Africa.

Based on considerable demand from vulnerable groups and processors in remote areas of Nigeria, a mobile grater was designed and manufactured by engineers from the International Institute of Tropical Agriculture, the Federal Institute of Industrial Research, State Agricultural Development, and manufacturers (Sanni *et al.*, 2007). The best version was produced by the Scientific Equipment Development Institute (SEDI) – a Government-owned engineering centre in Enugu, Nigeria. The mobile grater has the following features: a stainless steel hopper/delivery chute, a 7 HP (Horsepower) diesel engine prime mover, a steel chassis, a motorcycle wheel that supports and reduces vibrations, a push handle, and a rest/support metal frame.

This initiative resulted in the large-scale commercialization of the production of cassava derivatives such as *gari*, which culminated in the shift from the use of local roasters to stainless steel double roasters and automatic roasters.

Cassava processors in particular have perceived that the PIC has improved their access to improved processing technologies that reduce drudgery and facilitate the processing of high quality cassava products. They also believe that these technologies have enhanced their opportunities to earn income (Sanogo and Adetunji, 2008).

One notable benefit of process innovation from PIC was the positive collaboration from 2006 to 2008 between the IITA and other public agencies (e.g. the International Fund for Agricultural Development (IFAD)-sponsored Root and Tuber Expansion Programme (RTEP)) and in Godilogo farms, Obudu, Cross River State, on the design and manufacture of more efficient flash dryers. The new flash dryer installed

at Godilogo was commissioned in August 2008 with financial support from the IITA, the International Fund for Agricultural Development (IFAD)-Root and Tuber Expansion Programme (RTEP), Godilogo farms, and the Raw Material Research and Development Council (RMRDC) under the Federal Ministry of Science and Technology. It is an impressive machine that can produce 250 kg/hour of cassava flour (Kuye *et al.*, 2008).

11.5 Institutional support for cassava agro-enterprise development in Africa

Emphasis by the Global Cassava Development Strategy (GCDS) to turn cassava as an engine for industrial development in Africa spurred greater understandings of national and global cassava markets (FAO, 2001; UNIDO, 2006). The GCDS has influenced a number of larger initiatives including NEPAD's Pan-African Cassava Initiative, PICs in Nigeria and Ghana, and International initiatives (Table 11.2).

A major conceptual approach for these initiatives is to link activities that reduce production risks and costs (e.g. improved and disease resistance varieties), create reliable supply (agronomy and adoption), add value, and create reliable demand. The international, regional and national institutions played active roles to foster positive policy thrusts as a vehicle to promote employment generation, earning of foreign exchange, and encourage new investors in cassava enterprises.

Some of the major actors involved in the implementation of the initiatives are presented next, with a brief description of their main roles and responsibilities in the execution of the programme, especially as regards product and process innovations in Nigeria and Ghana (Sanogo and Adetunji, 2008).

11.5.1 Government agencies as stakeholders

The initial design and planning of the structure and objectives of the PIC in Nigeria were coordinated by the Federal Ministry of Agriculture, in collaboration with the Federal Ministry of Commerce and Industries. Most of the activities were implemented by national agencies such as the National Root Crop Research Institute (NRCRI), the Raw Materials Research and Development Council (RMRDC), the Federal Institute of Industrial Research at Oshodi (FIRO), the Scientific and Equipment Development Institute at Enugu (SEDI), the Nigerian Stored Products Research Institute (NSPRI), the Standards Organization of Nigeria (SON), the Nigerian Export Promotion Council (NEPC), the IFAD-sponsored Root and Tuber Expansion Programme (RTEP), as well as other institutions. Meanwhile in Ghana the secretariat of the Presidential Special Initiative (PSI) on cassava coordinates all aspects of the design, planning and implementation of the PSI on cassava with the following government institutions: the Ministry of Food and Agriculture (MOFA), the Crops Research Institute (CRI) at Kumasi, the Roots and Tuber Improvement Project (RTIP), and the Ayensu Starch Company Limited (ASCO).

TABLE 11.2
 GCDS-related initiatives

Name of initiative (funder)	Countries	Achievements/Impacts/Scalable innovations
1. Development of cassava chips and flour for commercial uses. An NRI/FRI research project funded by DFID. Beneficiary farmers (8 000) involved at the level of validation of technologies.	Ghana	Processing options developed and tested to produce HQCF which could be used directly by plywood and food industries or used as a feedstock for the manufacture of paperboard adhesive, glucose syrup and industrial and potable alcohol. The HQCF was used at levels of 10–35 percent in bakery products. HQCF was used for complete substitution of wheat flour as an extender in urea and phenol formaldehyde resin plywood adhesives. HQCF was used to produce Bauer-type paperboard adhesive that could completely replace imported starch-based materials. A controlled process was developed for conversion of HQCF into a range of sugar syrups for different end uses. Developed concept of commercial processors (SMEs) acting as market intermediary between the farmers and the end users.
2. Development of high quality cassava products (DfID and the EC-funded CASSAVA-SMES projects). A NRI/FRI/UNAAB research project funded by the EU, working with more than 10 000 farmers through a number of NGOs involved in validation exercises. Main focus on SMEs	Nigeria Ghana	The approach adopted of getting groups of poor local processors to supply cassava mash to the cassava processing plants (SMEs) has made them the net beneficiary (in terms of higher patronage) in this intervention (Adebayo <i>et al.</i> , 2004). The outputs of the project (dried <i>fufu</i> and HQCF, drying technology and market linkages) are currently being used in 11 SMEs in Nigeria and five medium-scale companies in Ghana. On a technical level the project has developed dried <i>fufu</i> (fermented – Nigeria) and instant <i>fufu</i> (unfermented – Ghana) as products and specific processing technologies. Also the approach of linking farmers to markets through SMEs acting as market intermediaries was refined further.
3. Development of small-scale cassava chip production in the Lake Zone (DfID).	Tanzania	Developed chip-based flour processing using non-motorized equipment to enable poor farmers to access supermarket chain outlets, addressing issues such as access to machinery and access to finance.
4. Small-scale cassava processing and vertical integration of the cassava subsector in southern and eastern Africa (funded by CFC/SARRNET/EARRNET/NRI/FOODNET and implemented by ILTA and five national institutions).	Uganda Tanzania (other countries in region)	Developed and tested new technological and management innovations offering significant potential for the commercialization of small-scale cassava producers. Results of the project turned out to justify the original assumption of the existence of a large unexploited market for high quality cassava products and the high positive potential impact on poor households. The outcomes of the project imply that any public–private partnership aimed at promoting higher scale application of the tested modern processing technologies and management approaches can ensure that the full benefits of cassava can be derived more quickly, by increasing demand for cassava and the incomes of more smallholder cassava producers. Poverty can be reduced through accelerated growth of rural value-addition enterprises, creating job opportunities and reducing the cost of food and other consumer goods for rural and urban consumers.

TABLE 11.2 (Continued)
GCDS-related initiatives

Name of initiative (funder)	Countries	Achievements/Impacts/Scalable innovations
5. Integrated Cassava Project hosted by IITA in south and southeast Nigeria, with funding from USAID and the Shell Petroleum Development Company, the Nigerian Federal Government Presidential Initiative on Cassava, the Niger Delta Development Commission, the Nigerian National Petroleum Corporation, and 12 State Governments.	Nigeria	<p>This project has facilitated the establishment of additional processing centres in the following states: Abia, Akwa Ibom, Bayelsa, Ebonyi, Edo, Enugu and Rivers. The project strategies include the distribution of mobile graters and assistance to existing enterprises by providing machinery based on need.</p> <p>As at March 2007, Over US\$21 million revenue had been generated from gross sales of cassava products.</p> <ul style="list-style-type: none"> • 463 processing enterprises established and over 1 000 new jobs created. • More than 5 000 persons trained on cassava post-harvest techniques. <p>Cassava products are sold in wet and dry forms such as mash, <i>gari</i>, <i>fufu</i> flour, HQCF, cassava chips and starch. Other products produced and sold, especially by SMEs, include bread and plantain flour.</p>
6. 'Cassava: Adding Value for Africa' hosted by NRI, UK sponsored by Bill & Melinda Gates Foundation (2008 to date)	Nigeria Ghana Uganda Tanzania Malawi	<p>C:AVA is developing value chains for HQCF in Ghana, Tanzania, Uganda, Nigeria and Malawi to improve the livelihoods and incomes of at least 90 000 smallholder households as direct beneficiaries, including women and disadvantaged groups. The project is focusing on three potent intervention points: (i) ensuring a consistent supply of raw materials; (ii) developing viable intermediaries acting as secondary processors or bulking agents in value chains, and (iii) driving market demand and building market share (in, for example, the bakery industry, components of traditional foods or plywood/paperboard applications).</p>
7. 'Great Lakes Cassava Initiatives' hosted by Catholic Relief Services sponsored by Bill & Melinda Gates Foundation (2008 to date)	Tanzania Uganda Malawi DRC Kenya Rwanda	<p>This project aims to achieve a level of 50 percent penetration of new disease resistant cassava varieties into the farming systems of cassava-based poor farming households.</p>
8. Cassava Value Chain Development in West Africa hosted by IITA, sponsored by Common Fund for Commodities, The Netherlands (2008 to date)	Nigeria Benin Republic of Sierra Leone	<p>CFC West African Cassava Value Chain Development project is strengthening the capacity of rural enterprises on supply lines, upgrading traditional processing technologies and products and creating sustainable markets with the deployment of superior cassava varieties, high capacity processing machines and workable business plans in 12 locations in project countries.</p>

11.5.2 Primary actors of the cassava value chain

The Presidential Initiatives on Cassava (PIC) strengthened the rapid formation and contribution of cassava growers' associations, cassava processors (medium-scale processors and microprocessors), equipment manufacturers, cassava traders, transporters, master bakers and NGOs. The roles performed by some of the NGOs, such as the Farmers' Organization Network of Ghana (FONG) and the Cassava Growers' Association of Nigeria, included the multiplication and distribution of cassava planting materials to farmers (in collaboration with the Root and Tuber Improvement Programme (RTIP) in Ghana and the Roots and Tuber Expansion Programme (RTEP) in Nigeria), capacity strengthening of local processors to produce cassava starch using traditional processing technologies, and the coordination and technical backstopping of farmers' groups.

The RTEP contributed positively to the promotion of cassava production and marketing in Nigeria. With funding from IFAD, the RTEP coordinated a cassava multiplication programme with farmers; this was followed by the release of the ten best improved cassava varieties. The implementation of the cassava developments in Nigeria was centred on the active participation of RTEP, the National Root Crop Research Institute (NRCRI), and the International Institute of Tropical Agriculture, as well as other public and private actors.

11.5.3 Support institutions

International Institute of Tropical Agriculture (IITA)

Since its foundation in 1967, IITA has worked with the national agricultural research system as well as agricultural development organizations on the improvement of cassava and the dissemination of improved varieties. More recently, IITA worked on the expansion of cassava enterprise in Nigeria. The implementation of the PIC in Nigeria has been built largely on the achievements of IITA's research activities. The Institute prepared a research report entitled *Opportunities in the industrial cassava market in Nigeria* that was made available to the Government of Nigeria and other stakeholders in 2002/2003 in support of the PIC. IITA is currently collaborating with national and international agencies to back up the PIC on cassava by promoting innovative technologies for the development of industrial utilization of cassava in Nigeria.

In addition, the Cassava Enterprise Development Project (CEDP), which supports the PIC on cassava, is being implemented through IITA as a lead institution. This project is a public-private partnership between the USAID and the Shell Petroleum Development Company, aiming to support the development of the cassava sector over five years (2004/05 to 2008/09). It has the global objective of increasing economic opportunities through sustainable and competitive cassava production, and marketing and agro-enterprise development in selected communities of the South-South and South-East States of Nigeria. Under the CEDP, IITA strengthened the human and

institutional capacity of producers, processors, commodity traders and manufacturers to produce, process and market cassava efficiently, as well as foster increasing private sector investment in the production, processing, storage and marketing of the product.

The implementation of the PSI on cassava in Ghana had also built greatly on the cassava improvement research at IITA. The three major cassava varieties with good starch content (*afisiafi*, *doku duade* and *agbelefa*) deployed on the implementation of the PSI were all developed at IITA, Ibadan, Nigeria. IITA's links with national systems are of great importance to the realization of common goals. IITA has been active in maintaining and further improving linkages between the cassava programme and the national root crops programmes in Ghana and other African countries.

NEPAD Pan African Cassava Initiative (NPACI) Secretariat

NPACI's Secretariat worked with actors in the Federal Government of Nigeria on the conceptualization and development of the objectives of the PIC. The Secretariat has been collaborating with all relevant partners to ensure the successful implementation of the programme. It assists with the organization of workshops and fora for the planning, funding allocation and execution of PIC's activities.

11.5.4 Global support

Over the years there have been agro-industrial initiatives from various national, regional and international institutions, as well as donor agencies. The Global Cassava Development Strategy (GCDS) provided a recent additional approach to intervention in the cassava sub-sector. It was endorsed at an international forum in Rome in 2000 attended by FAO, the International Institute of Tropical Agriculture (IITA), the International Center for Tropical Agriculture (CIAT), Agricultural Research for Development (CIRAD), the Natural Resources Institute (NRI), and the International Fund for Agricultural Development (IFAD). It promotes an approach to "spur rural industrial development and raise incomes for producers, processors, and traders, and contribute to the food security status of its producing and consuming households". The key to the approach is that it is market driven, i.e. driven by demand. The idea is that groups or individuals use an 'industry analysis based approach' to improve their techniques by adopting the following principles:

- ◉ regarding stakeholders as equal partners;
- ◉ building a practical, shared vision;
- ◉ helping to make action plans for industry;
- ◉ building better linkages with private sector organizations;
- ◉ building better links with and among public sector institutions;
- ◉ ensuring co-stewardship of research and service outputs with users;
- ◉ facilitating the rapid introduction of high-impact technologies through public and private sector partnerships.

At the FAO/GFAR (Global Forum for Agricultural Research) conference 'Global Initiative on Post-Harvest Technology, Phase 1', held in Entebbe, Uganda, 17–19 September 2001, two strategies for promoting the post-harvest sector were developed by the participants. One was based on the existing post-harvest system and traditional commodities. It suggested upgrading products and processes, and improving value addition and quality, thereby allowing the products to enter higher value urban and regional markets. This strategy also encompassed storage of traditional commodities, for on-farm use or to take advantage of higher prices in the off-season. The second strategy focused on the development of novel or non-traditional export commodities/products, aimed at both regional and global markets, including products with large volumes and those with a niche but higher unit-value market.

The African Agricultural Technology Foundation (AATF)–IITA Ibadan Strategic Plan of 2005 encouraged the industrialization of cassava in Africa based on available resources, a global competitive framework, and vertically-integrated agricultural business ventures. The UNIDO Abuja 2006 Master Plan declaration promoted domestic, regional, and international market strategies for the cassava sub-sector, in line with the FAO Entebbe 2001 action plans for the cassava agro-industrialization system in Africa. Meanwhile IFAD's cassava processing and marketing regional initiative workshop – the Accra declaration of March 2006 – also affirmed previous action plans with the private sector as the key driver. Various action plans went in tandem with the FAO Entebbe plans and the Commission for Africa initiatives. The Commission for Africa was set up by Tony Blair in early 2004. It recognized that everyone would benefit from – and has a role in creating – a strong and prosperous Africa using commodities like cassava.

The action plan proposed a commodity chain approach, which is by definition a pragmatic, results-oriented approach. A commodity chain describes the full range of activities required to bring a product (e.g. fresh cassava) from its conception (e.g. production) throughout all intermediary phases, transformation (e.g. processing) and delivery (e.g. marketing) to its final consumers.

11.6 Dissemination of strategies for successful and appropriate processing systems

Successes recorded in the development of appropriate processing systems through the implementation of cassava initiatives, especially in Nigeria and Ghana, need further dissemination to African manufacturers and processors. Most of the sound innovations on appropriate processing systems are still limited to one part of the African region. There is a need for project implementers to harmonize their implementations and release information through documentation, peer learning workshops, study tours, and regional 'train the trainer' workshops. National, regional and international exchanges of experiences, skills and technologies also need to be encouraged.

11.7 Conclusions

There have been noticeably successful outcomes to the introduction of cassava presidential initiatives in Africa, with sound process and product innovations in the cassava agro-industrial sector. The technologies and machinery involved, particularly for mobile graters, peeling, drying etc, are still not well known in many African countries. An effective and complete cassava production–utilization system in Africa requires a coalition of private–public partnerships, with the private sector investing in market development and procuring the machinery required. Clear and effective policies that cover the influence of presidential initiatives on trade liberalisation, access to markets, equitable distribution of benefits, gender, environment, credit, infrastructure, taxes, legal requirements, grades and standards need to be embarked upon. The examples outlined in this chapter show that through political will and appropriate policy incentives, much can be accomplished in the promotion of agro-industrial development. The lessons learned from these examples, and some critical success strategies for cassava development that have emerged, are summarized as follows:

Lessons learned from the PICs:

- ▶ The right policy environment is critical to attracting adequate investment and stimulating growth in Africa.
- ▶ Without legislated policy support, gains in cassava development will not be sustained.
- ▶ Access to long-term investment finance at low (single digit) interest rates continues to be a major bottleneck that denies African private sector operators the ability to respond to new market opportunities.

Strategies that will enhance proper legislation for the advancement of commercially-driven cassava sectors in Africa include:

- ▶ increased 'research for development' efforts and investment in the area of cassava innovations;
- ▶ initial substantial investment by government for the establishment of farm gate processing centres;
- ▶ joint partnerships between entrepreneurs and foreign investors for the successful provision and operation of adapted and efficient processing units;
- ▶ formal legislation and enforcement to facilitate the compliance of relevant implementing actors for the successful achievement of PIC objectives, such as the inclusion of cassava in baking (composite) flour;
- ▶ promoting the establishment of a cassava development commission;
- ▶ provision of basic infrastructure by the Government, especially energy sources at affordable rates for cottage industries in rural and semi-urban areas;
- ▶ provision of tax-free regimes for SMEs in their first 5–7 years of operation.

Various issues for sustaining cassava equipment development in Africa, such as intellectual property rights, the technical know-how of manufacturers, environmental risks (renewable vs. non-renewable energy sources), gender influence and flexibility of equipment use, adoption rates (viability and durability of equipment), and quality hazards, are becoming more important and must be addressed for sustainable technology transfer.

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CHAPTER 12

Transiting cassava into an urban food and industrial commodity through agro-processing and market driven approaches: Lessons from Africa

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12.1 Introduction

Sub-Saharan Africa (SSA) has the largest population of poor people in the world (World Bank 2009). Agriculture accounts for 70 percent of the labour force and as such is very important for economic growth, but productivity for many agricultural commodities is low. Rapid urbanization, food aid, and an increased taste for cheap foreign foods, are all contributing to significant food import expenditure in sub-Saharan Africa. In 1995, *per capita* importation of wheat into Africa was estimated at 8.25 kg/year. African farmers are not able to supply agricultural products to both the local and export markets, partly because of tough price competition in the world market. African markets are therefore flooded with surplus food products from other markets where farming is probably subsidized (IITA, 1999). Graffham *et al.* (1999) observed that fluctuations in wheat flour prices suggest that the wheat flour market was likely influenced by the political wish to keep prices of food staples low. Such low prices increase the access of low income families to cheap food, but they also create negative impacts on the rural poor because farmers have no incentive to increase production of local crops. The lack of technologies to transform crop produce into higher-value products further exacerbates the problem. Rural populations responsible for the processing of staple foods at village level – particularly women – are unable to increase the quantity and improve the quality of their outputs because of limited access to labour- and energy-efficient processing machinery. Excess production therefore leads to huge spoilage and loss of incomes.

Scott *et al.* (2000) showed that the production of the most important root and tuber staples of sub-Saharan Africa – cassava, yams and sweet potato – has been increasing since 1968 and will continue to increase till 2020. The production

increases can be explained by an increase in the area cultivated and the introduction of high yielding, disease-free and pest-resistant cultivars. However, demand issues and uncertain markets remain major constraints to the development of the crops. According to Hartmann (2004), cassava is one of the most consumed staple food crops in sub-Saharan Africa; the *per capita* consumption (kg/year) is 103, followed by maize (40), banana/plantain (28), yam (28), sorghum (23), and millet (17). Although cassava, maize, banana, yam, sweet potato, beans, sorghum and millet form the bulk of what the rural poor in SSA produce and rely on for food security, the markets for these crops are seriously under-developed. The efforts concentrated on the development of markets for traditional export crops such as coffee, tea and cotton is disproportionate when judged on the basis of the values of trade involved. The annual value of staple food crops in Africa exceeds US\$150 billion, compared with the gross value of the traditional export crops which stands at around US\$8.5 billion/year, and non-traditional export crops (especially horticulture and fish) which stands at around US\$7.8 billion/year (Adesina, 2008). Therefore, processing and value-addition to staple food crops in sub-Saharan Africa can improve market opportunities for African farmers, who may thereby gain the full benefits of new production technologies (Abass *et al.*, 2009).

The cassava subsector in Africa is largely subsistent and rudimentary. Smallholder farmers are dispersed over large areas and there is little coordination of production, processing and marketing activities. Average farm holdings in many countries are less than 0.5 ha; the farmers operate using low input technologies and lack mechanization. Yields are very low, typically 10 tonnes/ha compared with 25–40 tonnes/ha in India, Thailand, Brazil, and Colombia. Farm holdings and yields can vary considerably from location to location in the same country. While the average farm holding in the major cassava growing areas of Nigeria is 0.75 ha/farmer, it is 0.43 ha in the moderate growing areas. Although root yields are determined by ecological factors, cassava production is more strongly determined by the availability of labour-saving technologies for production and processing than ecological factors (Ugwu, 1996). Plant population density is often low in many countries where cassava is considered a subsistence crop; this contributes to the low yields per hectare.

In high production countries such as Nigeria, cassava production exhibits high levels of variability and cyclical gluts, mainly because of the inability of markets to absorb supplies. As a result, prices decline sharply and production levels reduce in succeeding years before picking up again. Most of the poorest of the poor in Africa depend on cassava, and are therefore vulnerable to such adverse short-term supply and price fluctuations (Scott *et al.*, 2000), significantly increasing their income risk. This can result in more people becoming poorer and farmers being discouraged from taking up improved production technologies. Insufficient processing options for cassava, inadequate marketing channels, and a lack of linkages between producers and end users are other factors preventing higher production and greater profitability for producers and processors.

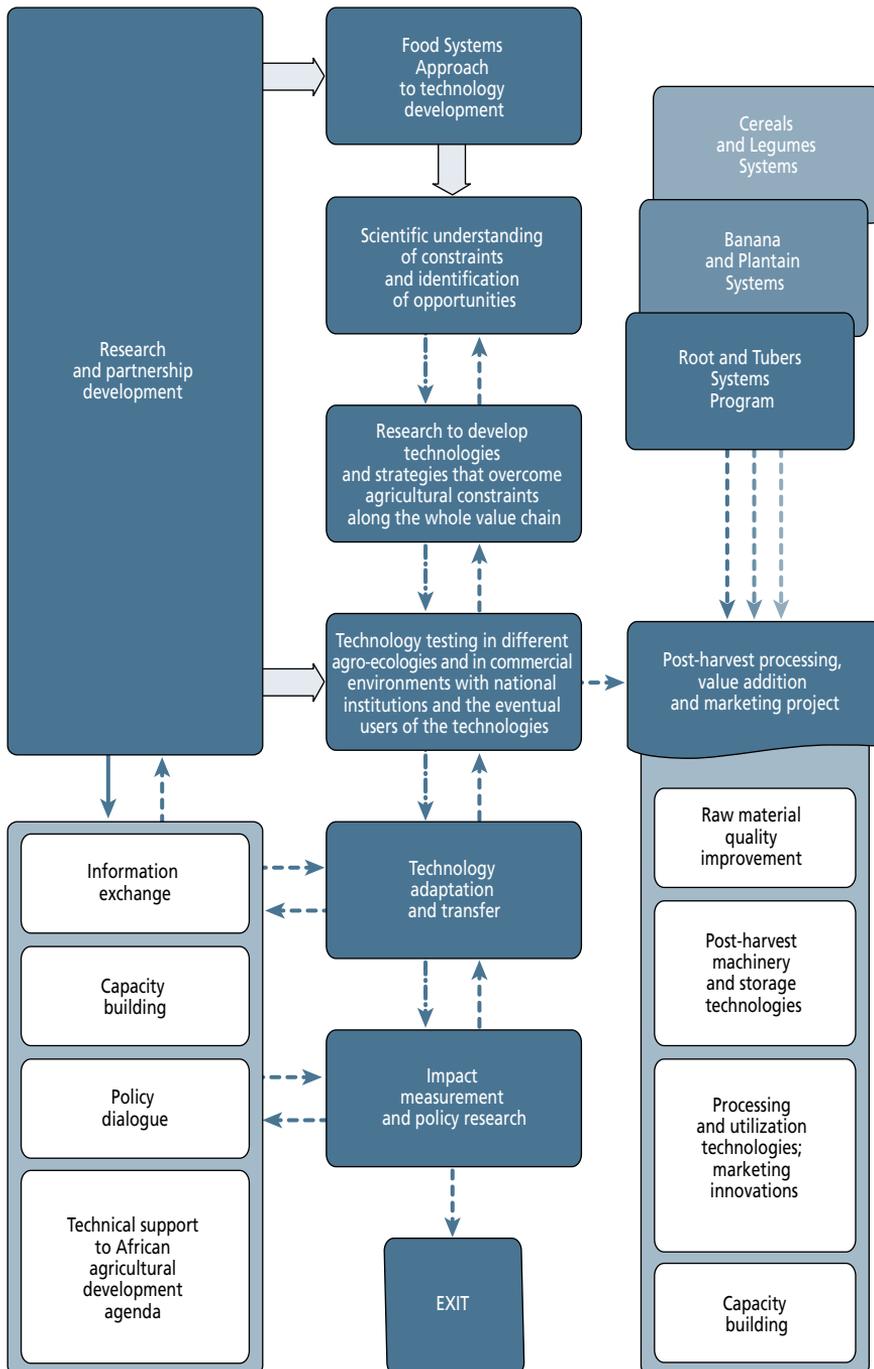
To resolve these problems, the International Institute of Tropical Agriculture (IITA) and national institutions in SSA have, since 1974, continued to invest in the development of technologies and innovations that improve the productivity and tradability of cassava and other crops. A holistic value chain or food systems approach is used to develop proven agricultural technologies that address the constraints of African farmers from input supply to production and marketing. This is combined with a concurrent delivery of technologies to national institutions, capacity building, information exchange, policy dialogue and technical support to the agricultural development agendas of various African governments (Figure 12.1). The research for development activities was redesignated as 'root and tuber systems' which became one of the seven medium-term programs that have been recently integrated into the consultative group on international agriculture research programs (CRPs). These measures in total constitute the IITA Research for Development (R4D) approach to enhance food security and improve livelihoods of smallholders in Africa.

The model is implemented through development platforms that use long-term agricultural development needs of Africa for designing research and choosing partners. It involves a process of mid-term research outcome, impact and exit strategy (<http://www.iita.org/what-we-do>). This approach contributes to the development of agro-industries, and supports a more commercially-based farming system compared with the conventional production-based research strategy. The combined efforts of IITA, other international research centres and international and bilateral development agencies, have contributed to the change in status of cassava from a 'poor man's crop' to a commodity with high potential for industrial use. Although cassava commercialization is spreading across Africa, faster advances have been made in Nigeria and Ghana than in other countries. Yet, cassava commercialization still faces major problems arising from the high cost of primary production that makes cassava products less competitive in some cases. Processing infrastructure in many countries (except Nigeria and Ghana) is poor; institutional support for mobilizing investment and use of modern technologies is low; implementation of policy instruments that support cassava-based agro-industrial processing is weak.

12.2 The integrated food systems approach

According to Nweke *et al.* (2002), African policy-makers and members of the international donor agencies and NGOs are searching for a solution to Africa's food production crisis. However, solutions are difficult to offer because statistics and other information on the economics of production, processing, and marketing of most crops, including cassava, are unavailable. In the past, increasing food security in Africa was tackled via a single-step approach: increasing productivity. Plant-breeding research was carried out with little knowledge of the agronomic, processing, and marketing problems faced by small-scale cassava farmers and traders (Nweke *et al.*, 2002). This approach did not achieve the desired success because the application of a single

FIGURE 12.1 The IITA R4D approach to cassava development



solution to a specific problem in the 'food pipeline' without considering the upstream and downstream problems leads to a blockage in the food supply system. It makes the continual supply of adequate food unachievable.

The integrated food systems approach at IITA involves investigating the problems faced and the development needs of the smallholder farmer, including poor rural dwellers, and designing agricultural research to tackle those problems. The development needs are identified through diagnostic surveys, stakeholder consultations and participatory identification of challenges and opportunities (Robert Asiedu, personal communication). The Collaborative Study of Cassava in Africa (COSCA study) implemented between 1989 and 1997 demonstrates the procedure used to identify research and development needs, on the basis of which strategic research at IITA is designed. During the COSCA study, researchers collected primary data on cassava in the main cassava producing countries of Africa, namely the Democratic Republic of Congo, Côte d'Ivoire, Ghana, Nigeria, Tanzania, and Uganda. These data included cassava production systems, processing and food preparation methods, markets and consumption patterns. The information was subsequently used in the food systems approach to research, design, develop and extend programmes and policies for reducing food insecurity and poverty in many African countries (Nweke *et al.*, 2002).

The food systems approach focuses on the poor, the markets for their commodities, and the profits involved in marketing a crop. It uses new approaches to improve traditional production and processing methods and to develop new market opportunities (IITA, 1999). The approach has been implemented through structured multidisciplinary research projects or programmes at IITA; these are either based on themes or are focused on specific production systems. Currently the main IITA research programmes are: Agriculture and Health, Agrobiodiversity, Banana and Plantain Systems, Cereals and Legumes Systems, Horticulture and Tree Systems, Root and Tubers Systems, Opportunities and Threats. The Institute also hosts the System-wide Program on Integrated Pest Management (SP-IPM) of the Consultative Group on International Agricultural Research.

Many projects dealing with different aspects of the food system, such as inputs, production, post-harvest and other issues are carried out within most of these programmes. The 'Improving post-harvest systems' project adopted in 1994 was part of the food systems approach. It involved post-harvest processing, value addition and marketing research. It emphasized the links between crop characteristics, farmers' resources, cropping systems, commodity handling and storage problems, processing requirements, food quality characteristics and consumption patterns, seasonal and special price variability, and the movement of agricultural products between rural and urban areas. The emphases were meant to improve food availability, increase accessibility by consumers, and raise the income of small-scale farmers and processors (IITA, 1999). Four main

areas were involved: raw material quality, post-harvest machinery and storage, processing, utilization and marketing, and capacity building and information exchange (IITA, 1999).

12.2.1 Raw material

The quality of fresh roots in terms of storability, processing characteristics, palatability and the safety of food products are critical factors to enhance market prices and rate of adoption of improved varieties by farming communities (IITA 1997). The cassava breeding research is focused on incorporating market quality requirements in new varieties in addition to the usual breeding for high yield and disease resistance.

New technologies and improved practices have been developed in partnership with other international and African institutions to limit or manage the major production constraints such as poor soils and agronomic practices, and devastating cassava diseases and pests. Between 1987 and 1996, new varieties were tested through on-farm adaptive research involving farmers in many agro-ecologies of Nigeria in collaboration with the National Root Crop Research Institute (NRCRI), the National Seed Service (NSS) Nationally Coordinated Research Project, and large-scale agricultural extension programmes such as the National Accelerated Food Production Project (NAFPP) and Agricultural Development Project (ADP). Six IITA-improved varieties (Tropical Manioc Selection or TMS series) were released through the National Variety Release Committee (NVRC) and some were given new names: TMS 50395, TMS 91934, TMS 63397, TMS 30555, TMS 4(2)1425 (Nigerian Cassava: Savanna), and TMS 30572 (Nigeria Cassava Idioshe). The National Variety Release Committee (NVRC) later released an additional 17 varieties for cultivation. The national research and extension institutions also engaged in very elaborate multiplication and distribution of planting materials of the TMS series of IITA-improved varieties in Nigeria (Nweke *et al.*, 1999). The well coordinated activities of the various extension programmes – with support from private companies such as Shell BP, Texaco Agro industries Limited, and Nigeria Agip Oil Company Limited – in the multiplication, promotion, and distribution of the improved cassava varieties, contributed to their rapid spread in Nigeria. By the end of 1990, planting materials of improved varieties for 9 130 ha at the rate of 10 000 planting stakes/ha had been provided to the state agricultural development programmes (ADPs) while 400 demonstration plots were completed by the ADPs and the National Seeds Service of Nigeria (NSS) (Nweke *et al.*, 1999). The collaboration and support given to the Nigerian National Agricultural Research and Extension Systems (NARES) contributed immensely to the increase in production of cassava from 1991. The existence of improved processing technologies in Nigeria acted as a catalyst to increased production through an upward pull effect on the market demand for cassava (IFAD and FAO, 2005).

The increased demand and increased production of cassava contributed to a reduction in poverty and hunger because the cash income for cassava-dependent farmers increased, while more food products were available at lower costs (Nweke *et al.* 2002).

Collaboration, capacity building and support to national root and tuber programmes in many African countries were further strengthened for the transfer, testing and selection of new varieties adapted to their specific agro-ecologies. In 1993, Ghana officially released three improved varieties (TMS 4(2)1425 (Abasa Fitaa), TMS 50395 (Glemo Duade), and TMS 30572 (Afsiafi). In 1994, Uganda officially released three varieties TMS 60142 (Nase 1), TMS 30337 (Nase 2), and TMS 30572 (Migyera). Additionally, six improved and disease resistant varieties of IITA origin were released in Uganda in 1999. These improved varieties later contributed to the improvement of yields and the slow-down or control of major disease epidemics that threatened the food security of millions of the poorest farmers in some African countries such as Nigeria, Ghana and Uganda (IITA, 1986; IFAD and FAO, 2005a). Major achievements in the development of additional varieties have been made since then, with hundreds of those new varieties currently being tested by many national programmes.

12.2.2 Post-harvest machinery

Grating and milling machines were already in commercial use in most Nigerian villages before the post-harvest activities started at IITA. From 1988 to 1998, collaboration and knowledge from many research and development institutions such as the International Centre for Tropical Agriculture (CIAT), the Federal Institute of Industrial Research Oshodi (FIRO), the Nigerian Stored Product Research Institute (NISPRI), and the Rural Agro-Industrial Development Service of the Nigeria Ministry of Agriculture and Natural Resources (RAIDS), among others, led to the introduction of some modifications that further reduced labour input to cassava processing (IITA, 1998a and b). Added to the existing and well-used machinery and tools such as graters, wet grinders, dry grinders etc, were trailer-type field carts, modified wheel barrows, double screw presses, manual chippers, power chippers (with 3.5 HP petrol engines), combined grating-chipping machines (with 5.0 HP petrol engines), peeling bays and tools, fermentation racks, drying racks with trays and stoves, double-stage frying stoves, agricultural waste-fired stoves, kerosene burners, and bucket-type starch sifters. When tested, the processing machines were found to reduce labour input and post-harvest losses, and increase product output, quality and safety (Figure 12.2). The output products were of higher quality and output volume had increased. The use of improved processing technologies increased the relative importance of cassava in many villages and contributed to the overall increase in utilization of cassava in Nigeria (Nweke *et al.*, 1999). Cassava field areas were found to be higher in villages where farmers had access to mechanical grating systems than in villages where they did not. In addition, high root yields achieved with the

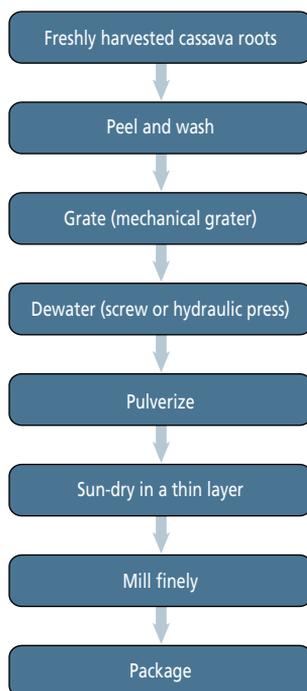
adoption of improved cassava varieties did not bring substantial cost-saving benefits to farmers without the use of mechanical processing machines (Nweke *et al.*, 1999).

12.2.3 Processing, utilization and marketing

From 1976 to 1985, a combination of increased urbanization, rising incomes, market promotions and specific policy decisions favoured the importation of large amounts of wheat into Nigeria. The annual average import of rice per person in Nigeria also increased more than 1 500 percent between 1960 and 1987 (Nweke *et al.*, 1999). In addition, Nigeria became the largest importer of wheat in Africa with imports totaling US\$37 million representing 2.2 percent of the nation's foreign exchange earnings in 1985. Manufacturers of a diverse range of products such as soft drinks, confectionery, automotive/dry cell batteries, paints, textiles, pharmaceuticals, iron ore, paper, soap, detergent, packaging, and cosmetics, all depended on imported syrup concentrates and starch (Abass and Shiwachi 2003a).

Following the adoption of a structural adjustment programme in Nigeria in 1985, the government banned the importation of certain foods and industrial raw materials in December of that year, notably wheat, rice and maize. The government was looking for ways to reduce expenditure on imports and develop markets for local raw materials. Various national institutions such as the Federal Institute of Industrial Research (FIRO) and the National Cereal Research Institute (NCRI) were mandated to investigate the suitability of locally-sourced raw materials for use in industrial baking processes, to modify such processes to suit local conditions, and to seek solutions to the basic technical problems of bakers in the use of locally-sourced raw materials. Although in 1985 cassava was not considered an import substitution crop, the ban on wheat imports presented an opportunity to develop flour from locally-grown grains, roots and tubers, as well as other crops.

In collaboration with many advanced research centres such as the Katholieke Universiteit Leuven (KULeuven) under the 'Cassava for Bread project', funded by the Belgian Administration for Development (BADDC), research efforts at IITA led to the development of the high quality unfermented cassava flour technology (from here referred to as high quality cassava flour, or HQCF) in 1985 (Figure 12.3). The method required the use of cassava processing equipment already in common use in Nigeria for preparation of *gari*, and thereby minimized the requirement for capital investment (Onabolu and Bokanga, 1995; Abass and Shiwachi, 2003a; Abass, 2006). This new technique was quick and effective for making large volumes of processed cassava flour. Recipes were developed for the use of HQCF in baked and fried foods and for various industrial applications. The recipes for making convenience food products such as composite bread (20 percent HQCF and 80 percent wheat flour), meat pies, sausage rolls, cakes, cookies/biscuits, doughnuts and chinchin were developed and popularized at this time (Onabolu *et al.* 1998).

FIGURE 12.3 High quality cassava flour processing (HQCF) technology

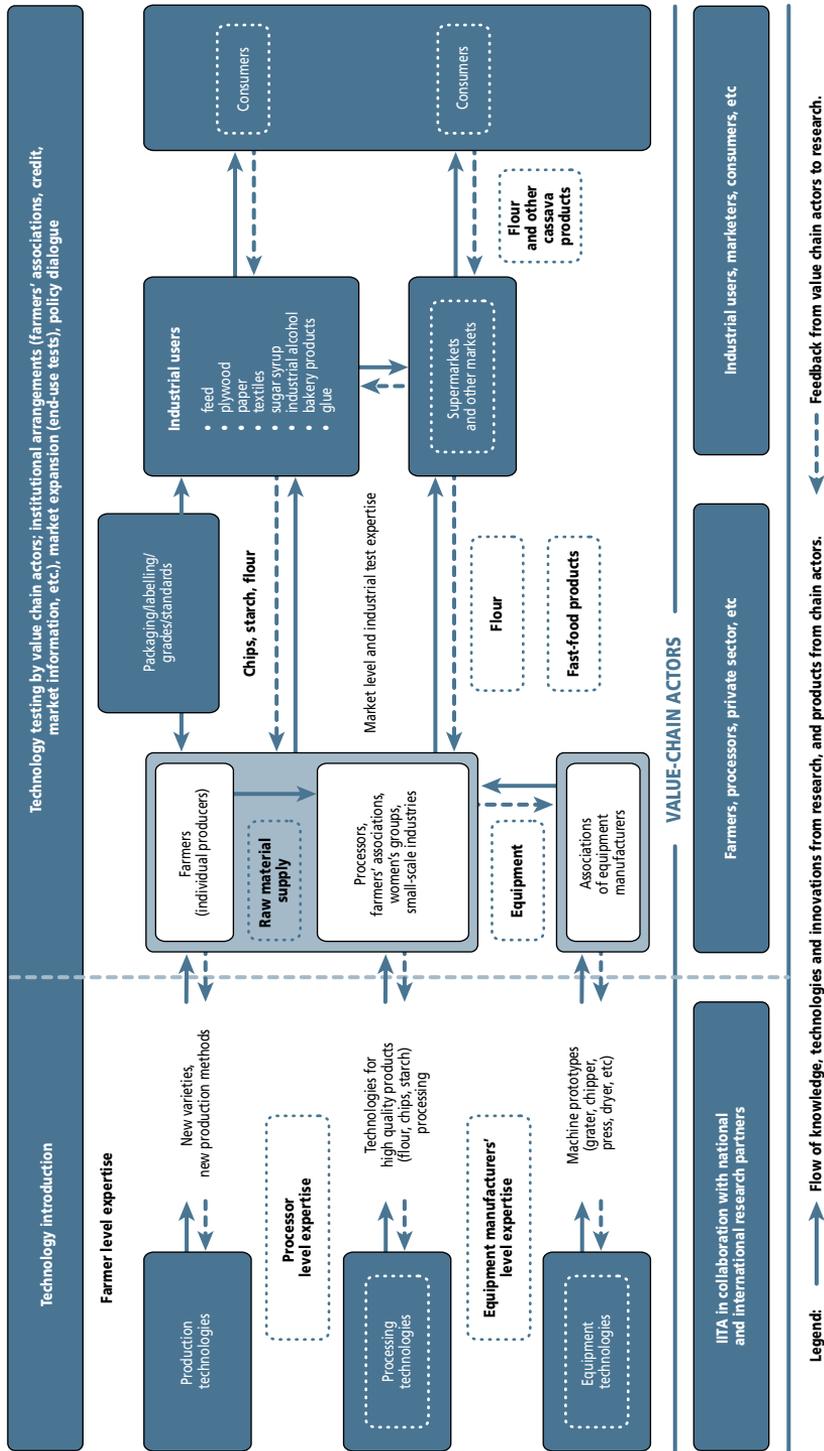
Source: Onabolu *et al.* 1998.

12.2.4 Capacity building and information exchange

As with all new products, there are barriers to the adoption of new technologies, particularly among low-income groups who are averse to risk, have poor access to capital, lack information, and may have limited business skills (IITA, 1997). To overcome these problems, testing of agroprocessing technologies was carried out under pilot systems in different locations to develop the value chain for cassava, while simultaneously developing manpower and mentoring of stakeholders. Capacity building for all categories of stakeholders was promoted through university degree training, short courses or workshops.

Pilot operations for value chain development involved the integration of available technologies along the cassava value chain and pilot testing with farmers, processors, and industrial end users in selected locations. The framework for pilot testing and transfer of new technologies is shown in Figure 12.4.

FIGURE 12.4 Framework for value chain development at pilot scale



The sequence of actions involved in pilot testing included:

- ▶ Identifying cassava products for which there were promising markets; identifying key stakeholders, their ways of operation and constraints.
- ▶ Selecting the sites and the participating groups or cooperatives of smallholder processors and end users; developing market strategies for the most promising cassava products.
- ▶ Training farmers/processors in the new processing technologies for making cassava products with the required quality characteristics.
- ▶ Producing and supplying cassava product(s) to end users, or urban-based supermarkets near the pilot locations.
- ▶ Training potential end user industries to adopt the new products as raw materials in their recipes or processes.
- ▶ Use of suitable improved varieties and agronomic practices to ensure sufficient and timely supply of raw materials for processing.

Pilot operations also involved training, information exchange and technology refining. During pilot operations experiences were shared on the performance of the technologies and other innovations being tested. The approach emphasized the collection of feedback along the 'research to development' continuum, during the field or pilot tests, during adaptation by national institutions, and from higher levels of policy-makers. Corrective actions were taken by designing new research activities based on the feedback.

Technologies and innovations are refined based on feedback from value chain actors during pilot testing. For example, previous knowledge before the development of high quality cassava flour technology in 1995 suggested that fermentation was critical to removing cyanide from cassava, so that flours to replace wheat flour could be made from certain cassava varieties. However, the products made from the fermented flours deteriorated rapidly (IITA, 1988) because of spoiling microorganisms in the fermented flour. It therefore became necessary to develop a new technique for processing cassava to flour with suitable baking properties. The refining of this technology led to the current HQCF processing method.

Pilot testing of HQCF technology was carried out in Nigeria from 1995 to 1998. The merits of using HQCF were demonstrated to potential user factories (biscuits and noodles) in Ogun, Oyo and Lagos states. A client-supplier relationship was developed between HQCF producers and user factories. National research institutes and state agricultural development projects (ADPs), local NGOs and a credit institution (the Farmers Development Union), community-based organizations, farmers' associations, as well as the private sector, were all involved. Smallholder processors and entrepreneurs were supported with respect to cassava value addition, agro-enterprise development, and marketing activities emphasizing better organization, collective action, better marketing, and private sector participation through investment. The farmers or their local government authorities provided farmer-level infrastructure, including the pilot processing buildings used for technology testing.

Capacity building through group and individual training

Capacity building and transfer of technology were achieved through degree and non-degree training, international training workshops for the demonstration of the technologies, participation in exhibitions and agricultural trade fairs. Selected countries were grouped into two zones: West and Central Africa (WCA), and East and Southern Africa (ESA). Countries in WCA included Benin, Congo (DR), Côte d'Ivoire, Ghana, and Togo; in ESA they included Kenya, Madagascar, Tanzania, Uganda and Zimbabwe. In each country, interdisciplinary and interinstitutional groups of project personnel responsible for coordinating the dissemination of cassava technologies were trained in the design and execution of pilot projects for promoting cassava processing and utilization. In addition to these, equipment manufacturers were trained in Ghana, Nigeria, Benin, Tanzania, Uganda, Cameroon, etc., on equipment design, building and servicing.

Information exchange

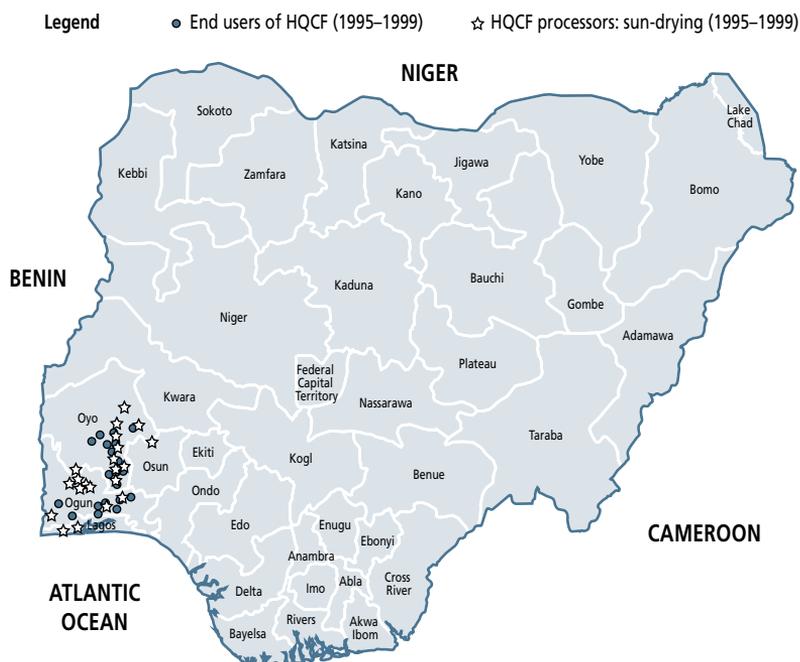
Market information service (MIS) was designed to benefit farmers, traders and consumers. MIS was initiated first in Uganda, by the Post-harvest and Marketing Research Network for Eastern and Central Africa (FoodNET). Market data were collected on current prices of agricultural commodities and products in different markets, including the variation in prices due to season or qualities. These were disseminated through radio broadcasts, newspapers, e-mail, fax, or post office couriers (IITA 1999). Access to market information helped farmers to better negotiate prices of their products based on current market prices, instead of accepting prices offered by traders or local marketing agents. It enabled farmers to take decisions on the need to bulk their produce for higher value in times of best market prices.

12.3 Selected cases and outcomes of capacity building through pilot tests, and training on agroprocessing technologies

Pilot tests in West Africa

Before 1994, there was no producer or user of HQCF in Nigeria whatsoever. By 1999, after four years of pilot testing in Nigeria, 25 to 30 groups of HQCF producers were involved in regular processing and trading of cassava flour at commercial or household levels. Demonstration of the use of HQCF to potential end user industries led to the use of HQCF in 1995 by three biscuit factories and the only noodle factory in Nigeria. By 1999, the number of industrial users increased to 11 while 9 small-scale bakers and caterers were using HQCF for baking bread and making other snack foods (Figure 12.5).

HQCF was used in about 18 brands of biscuits (10–50 percent of the country's total biscuit output) and in a brand of noodles amounting to about 10 percent of the

FIGURE 12.5 Nigeria, showing locations of HQCF processors and end users during the pilot phase


country's output. Home caterers used 10 to 100 percent HQCF depending on the products they made, e.g. cake, pies, chinchin or buns. The products were sold freely in Nigerian markets. According to the end users, the benefits of HQCF included increased profits as a result of the lower cost of HQCF compared with wheat, and increased product quality and yield. To maintain product quality, users of HQCF set quality specifications for screening HQCF before purchase (Abass *et al.*, 2001).

The main factor that favoured the use of HQCF as wheat flour replacement in Nigeria was its lower cost compared with wheat flour. The price of HQCF was about 55 percent of the price of wheat flour delivered at bread bakeries (Abass *et al.*, 2001). Processors also maintained that the HQCF processing enterprises were profitable. However, the cost of fresh cassava constituted a very high percentage of the total cost of HQCF processing (Table 12.1). Although the use of cassava flour in the baking industry proved to be technically possible and appeared economically beneficial to processors, farmers, and users alike, its production and use were hindered by the disorganized state of its marketing structure (Abass *et al.*, 2001). Due to the small-scale processing method, which was based on sun-drying, production capacity in the dry season by processors (2.5 tonnes/week) was reduced to nearly 1.0 tonne during the rainy season.

TABLE 12.1

Some cost parameters of cassava flour production by small-scale processors during the pilot phase

Parameters	1996	1998
Cost of fresh cassava roots (US\$/tonne)	54	32
Cost of transporting fresh cassava from the farm to the processing centre (US\$/tonne)	8	8
Cost of production (US\$/tonne)	256	209
Selling price, delivered at end user's gate (US\$/tonne)	291	314
Cost of production attributable to fresh cassava (%)	81	57
Cost of production attributable to labour and other inputs (%)	19	43
Wheat flour price, delivered at end user's gate (US\$/tonne)	538.9	570.8
HQCF to wheat flour price ratio	0.55	0.54

Source: Abass et al. 2001

It became obvious that the use of better drying technologies for HQCF processing, better organization of the market and targeted national policies were needed to help expand the market for cassava, increase farmers' incomes, and create jobs for more people, especially women, who are the majority involved in cassava production and processing. In 2000, a flash dryer owned by Femtex Starch factory in Lagos was tested for drying HQCF. The result of the test was encouraging and it was subsequently proposed that flash drying technology needed to be promoted for HQCF processing to elevate the scale of processing and to resolve the drying dilemma once and for all (Abass *et al.* 2001). By 2002, a partnership with the Raw Material and Development Council of Nigeria was initiated to develop flash drying technology in Nigeria. Overall the results of pilot testing showed that, while the use of intermediate cassava products by industries provided the opportunity to reduce the cost of raw material importation, it also proved to be a successful approach to developing markets for smallholder farmers.

The replication of the Nigerian experience then began in Ghana and Benin. The pilot testing of HQCF processing was carried out in the Oueme and Mono regions of Benin by the Departement de Nutrition et Sciences Alimentaires, Université Nationale du Bénin and the Laboratoire de Technologie Alimentaire, Institut Nationale de Recherches Agronomiques du Bénin. The project staff had earlier received training on product development from IITA in 1998. Results in Benin showed that substituting starch with HQCF in biscuits and 'galettes', and substituting wheat with HQCF in 'atchonmon' improved the quality of the traditional products. Incorporation of HQCF

as a 15 percent substitute for wheat in bread loaf and French baguette produced products with 100 comparative quality *vis-à-vis* wheat bread (IITA, 1999).

A study on expanded markets for locally-produced cassava flours and starches in Ghana funded by the United Kingdom's Department for International Development (DfID) was carried out in the 1990s by the Natural Resources Institute, Food Research Institute (FRI), University of Ghana and the Forestry Research Institute of Ghana (FORIG). A marketing sample survey conducted in 1997 by the team clearly showed that composite flour with a 20 percent cassava inclusion rate was widely accepted by the Ghanaian public as comparable to 100 percent wheat flour. This was then followed up by FRI demonstrating HQCF processing technology, the production of various new convenience foods from HQCF, and the adoption new techniques for using HQCF in plywood (IFAD and FAO, 2005c).

The market potential of HQCF as a partial or total replacement for wheat in food, and for the manufacture of plywood and paperboard, began to increase significantly in Ghana (Day *et al.*, 1996). The increase in cost of wheat flour in Ghana in the late 1990s increased the potential to use HQCF, which was cheaper. While the cost of producing HQCF was between US\$0.13/kg and US\$0.22/kg, the wheat flour price was US\$1.30/kg. Bakers were able to save 32 percent of the cost of flour when HQCF was used to substitute 35 percent of the wheat flour, and the replacement of wheat flour with HQCF in adhesive formulations led to a reduction in the cost of adhesive extenders (Graffham *et al.*, 1999). The application of HQCF for partial replacement (20 percent) of imported wheat flour (2 500 to 300 000 tonnes/year) and imported industrial starch (about 2 500 tonnes/year) in Ghana therefore proved to be technically feasible and economically competitive (Graffham *et al.* 1999). It was evident that an expanded use of HQCF for food and non food industries in Ghana would reduce the dependency on imported raw materials for these industries (Abass and Shiwachi 2003b).

Pilot tests in East and Southern Africa

In East and Southern Africa (ESA) from 2000, pilot activities were supported by more NGOs, FoodNET, bilateral development agencies and others, for the development of agroprocessing and markets for cassava. These activities helped in the transfer of the agroprocessing technologies for transforming cassava into intermediate shelf-stable industrial raw materials (HQCF, chips, pellets and starch), and refined food items such as *rale* or *gari*, biscuits, noodles, and bread. From 2003, the IITA small-scale cassava processing project funded by the Common Fund for Commodities (CFC) adapted the IITA pilot testing approach to Tanzania, Uganda, Zambia, Mozambique, and Madagascar. Results from the pilot activities in the five countries suggested that processing of cassava to high quality industrial raw materials such as HQCF, chips and starch provided opportunities for smallholder farmers to access more profitable markets (Mbabaali and Abass, 2008). Tests by industrial users showed that the intermediate cassava products (e.g. HQCF, chips and starch) were suitable for various industrial applications (paper, biscuits, etc).

End user industries were therefore encouraged to try out the use of the products. Estimates of market opportunities for cassava products, particularly HQCF, showed that there were significant opportunities for increasing the production and supply of fresh cassava by primary producers of cassava.

In Madagascar, end users such as bread and biscuit factories expressed the need to expand the processing capacity for making HQCF to meet growing demand. As of 2005, the demand for HQCF by eight bread bakers in Antananarivo was 425 tonnes/year, while the demand by makers of pastries was estimated at 1 000 tonnes/year. In Tanzania, two supermarkets, six food processing factories and two textile manufacturers that tested cassava in 2005 demanded 95 tonnes of HQCF and 42 tonnes of cassava starch per month. The annual market opportunity for fresh cassava created by these ten end users was 4 500 tonnes of fresh cassava (Mbabaali and Abass, 2008).

In 2004 Tanzania imported about 10 484 tonnes of starch at the rate of US\$400/tonne, and 730 000 tonnes of wheat at US\$168/tonne, an expenditure of over US\$124 million. Assuming 10 percent of the imported wheat was replaced with HQCF (the rate could be much more for biscuits, bread, etc), the demand for fresh roots would have been about 297 000 tonnes. Up to 1 240 small agroprocessing industries would have been required to supply HQCF and at least US\$12.5 million foreign exchange expenditure would have been saved. The amount would be distributed among the farmers, processors and other people who are involved in ancillary activities such as harvesting, transportation, bulking and marketing activities in the agroprocessing industry. While the price of wheat flour was US\$164/tonne in 2005, operators of supermarkets in Dar es Salaam offered higher prices for HQCF, between US\$169 and US\$253 per tonne. Textile factories that import starch at US\$400/tonne offered US\$350/tonne for HQCF.

In Zambia, seven end users requested 505 tonnes/year of HQCF for the production of various items such as biscuits, paper, and packaging materials, providing an opportunity for smallholder farmers to supply about 2000 tonnes of fresh cassava annually (Mbabaali and Abass, 2008).

However, in terms of HQCF processing, small-scale operations with sun-drying were again found to be a major constraint, as previously reported in West Africa (Abass *et al.* 2001, 2009). Output volumes were low, supply to end users by small-scale processors was irregular, and product quality was inconsistent. The uncertainties about the available volume of products of acceptable quality to meet end user requirements, the poor image of cassava, the widespread belief that cassava is a food security crop, and the lack of policy support for the use of cassava in the industry, continued to hinder its wide adoption as a reliable raw material. The opinion of a few policy-makers in the ESA region is that the use of cassava in large volumes in the industrial sector might disrupt food supply systems. They are therefore reluctant to support or promote industrial utilization of cassava. The successes in Nigeria

and Ghana, however, have shown that this view is questionable. A detailed analysis of the profitability of processing enterprises (for starch, HQCF and chips) and the factors that influenced the overall success of such enterprises in Tanzania has been investigated (Abass *et al.*, 2009a). The factors identified include:

- ▶ The low ability of smallholder processors or farmers to operate the processing plants at optimum processing capacity for a significant number of days per year. Village processors did not ensure that the output volumes of the plants exceeded the break-even volumes. The potential to achieve this was found to be affected by the length of the rainy season and the time farmers spent on other farming activities.
- ▶ Efficient use of inputs such as labour and access to water. Such inputs are often limiting in many rural villages where cassava processing occurs, and therefore affect efficiencies.
- ▶ Ability of the processors to maintain the quality of products. Quality was also affected by insufficient supply of water and dependence on sun-drying. These made it difficult to avoid fermentation, contamination and spoilage during the rainy season.
- ▶ Availability of sufficient raw material at low cost. Insufficient raw material was found to be a major issue in ESA villages, unlike the West African countries of Nigeria and Ghana. Most cassava farmers in ESA are not yet market oriented; they produce mostly for subsistence and have little or no excess cassava to sell to processing plants.
- ▶ Access to a product market was poor. Most rural farmers/processors shy away from getting their products to end users in the cities; transacting business or negotiating prices with urban-based factory owners was difficult for most rural-based farmers. The processors resorted to selling the processed products to traders who buy at lower prices than those offered by the end user industries.
- ▶ Managerial skills were not good enough.
- ▶ Support infrastructure such as electricity, water, roads and affordable transport systems are generally inadequate in rural areas and affected the enterprises negatively.

Training

Between 1996 and 2001, during the implementation of the 'Cassava for Bread Project' alone, more than 550 trainees from national research and extension agencies in 25 African countries were trained on cassava processing and utilization (Table 12.2). Over 350 Nigerians (farmers, processors, caterers, bread bakers, biscuit manufacturers, etc) received classroom and practical skills enhancement during the training of trainers. The project helped in the development of researchers, extension officers and university scientists from more than 40 partner institutions in the 25 African countries. In addition, other units and programmes of IITA such as the post-harvest engineering project, the East African Root Crops Research Network (EARRNET), the Southern African Root Crops Research Network (SARRNET),

and the Post-harvest and Marketing Research Network for Eastern and Central Africa (FOODNET), conducted similar training sessions in Central, East, Southern, and West Africa. Performance testing of small machines, and training of equipment manufacturers on the design, operation, and maintenance of post-harvest tools and equipment was carried out in collaboration with other agencies such as FAO, national cassava programmes, post-harvest programmes, and roots and tubers (RandT) programmes of Central, East, Southern, and West African countries (IITA, 1999). About 9 000 people were trained from 2003 to 2008 during the IITA-led Preemptive Management of virulent CMD (cassava mosaic disease) in the south-south and south-east of Nigeria (the CMD Project), and the Cassava Enterprise Development Project (CEDP) implemented in Nigeria.

The results of the pilot tests improved knowledge of the constraints against the cassava agroprocessing sector in ESA, and were bases for additional research to improve the sector through additional out-scaling and up-scaling programmes and projects. In 2008 and 2009 the Common Fund for Commodities provided additional funding to IITA to adopt lessons from the past pilot projects and test a higher-scale technology for HQCF processing. This occurred with farmers and local entrepreneurs in Tanzania, Madagascar and Zambia, ensuring that the entrepreneurs participated as constructively as possible by taking a 'business outlook'. The United States Agency for International Development (USAID) also provided funds to IITA to apply the approach in Nigeria, Ghana, Democratic Republic of Congo, Sierra Leone, Malawi, Mozambique and Tanzania. The government of Italy through FAO and the Ministry of Agriculture and Cooperative (MACO) is replicating the approach in Zambia and Malawi. Similarly, the Bill and Melinda Gates Foundation (BMGF) provided funds to the Natural Resources Institute (NRI) to implement a value-addition project on cassava ('Cassava: Adding Value to Africa', or CAVA), focusing specifically on the processing of HQCF in Nigeria, Ghana, Uganda, Tanzania, and Malawi. The NRI selected IITA to participate in the project to provide both production and post-harvest support. Several organizations and governments are currently involved in the development of the cassava sector and there are many on-going projects or programmes through which the pilot tests are carried out in many countries. The next sections will explain how multi-country investments on cassava have had positive effects on the development of cassava-based agro-industries in ESA.

Having acquired the necessary expertise on cassava processing and product development, national institutions took on the dissemination of the new processing technologies to the wider public at national and regional levels during meetings, trade shows, etc. End users were made aware of the possibility of using cassava flour in their products and processes. The recipes and baking techniques developed by IITA were adapted to the food tastes and preferences of consumers in different countries (Gensi *et al.*, 1998; Mlingi *et al.*, 1998; Sanni *et al.*, 2006). The development of more expertise for cassava processing, product development, and use of HQCF is an ongoing activity in various African countries and is now undertaken by previous

TABLE 12.2
Trainees during 'Cassava for Bread' Project, 1996-2001, IITA

Country	Total	% Female	NARES Affiliation
<i>International training</i>			
Benin	7	57	Laboratoire de Technologie Alimentaire; Institut Nationale des Recherches Agricoles du Benin
Burkina Faso	2	50	Institut de Recherche en Science Appliquée et Technologie
Cameroon	2	100	University of Maryland
Chad	1	100	Ministère de l'Agriculture
Congo	1	0	Institut Nationale d'Etudes et de Recherches Agronomiques
Gambia	3	67	Gambia Food and Nutrition Association; National Agricultural Research Institute
Ghana	51	29	Food Research Institute; Ministry of Food and Agriculture; Sasakawa Africa Association; University of Science and Technology; Crops Research Institute
Guinea	2	50	Institut de la Recherche Agronomique de Guinée
Kenya	13	100	Kenya Agricultural Research Institute; Ministry of Agriculture, Livestock Development and Marketing; Kenya Industrial Research and Development Institute
Madagascar	6	33	Centre Nationale de la Recherche Appliqué au Développement Rural; Cité Universitaire Ankatso
Malawi	1	0	Private
Mali	1	100	Institut d'Economie Rural
Mozambique	1	100	Southern Africa Root Crop Research Network

TABLE 12.2 (continued)
Trainees during 'Cassava for Bread' Project, 1996–2001, IITA

Country	Total	% Female	MARES Affiliation
Netherlands	2	0	Private
Niger	2	0	Institut National de Recherche Agronomique du Niger
Nigeria	18	67	Federal Institute of Industrial Research; Institute for Agricultural Research; National Root Crops Research Institute; Shell Petroleum Development Corporation; Technoserve Nigeria; University of Ibadan
Portugal	1	100	Southern Africa Root Crop Research Network
Rwanda	2	50	Institut des Sciences Agronomique du Rwanda
Senegal	3	33	Institut de Technologie Alimentaire
Switzerland	2	50	Private
Tanzania	2	50	Agricultural Research Institute; Sugarcane Research Institute
Togo	5	20	Institut Togolais de Recherche Agronomique; Institut Togolais de Recherche Agricole
Uganda	6	0	Kawanda Agricultural Research Institute; Ministry of Agriculture, Animal Industry and Fisheries; National Agricultural Research Organization;
Zaire	2	50	Institut National d'Etudes et de Recherches Agronomiques
Zimbabwe	3	67	Private
<i>Local training in Nigeria</i>			
Nigeria	415	61.9	Small-scale cassava processors and farmers, staff of the only noodle factory in Nigeria, and bread and biscuit bakers involved in the initial pilot testing activities
Total	554	57.9	

trainees who apply the knowledge acquired to the implementation of new projects in various countries. For example, two metal manufacturers in ESA – Tonnet Enterprises in Uganda and Intermech Engineering in Tanzania – provide training services to other manufacturers in the region. They also provide appropriate and affordable equipment to farmers, processors and investors.

12.4 Policy dialogue

The safety and quality of processed cassava products for domestic and export markets are essential to establish confidence in consumers and importers and to ensure their long-term willingness to purchase. Assurance of quality may also contribute to price premiums and consumer brand loyalty. Many national institutions face the challenge of developing cassava-based food quality standards, and management systems that cassava processors can implement easily and cost-effectively. End users often avoid using cassava in their products for a number of reasons, including the lack of approved standards, lack of required knowledge for using cassava, and the uncertainty of obtaining product certification from relevant regulatory agencies. Of course, an unfavourable policy environment also constrains the commercialization of cassava. Experience from Nigeria suggests that fiscal policies that effect increases in the domestic prices of rice, wheat and maize, also lead to increases in the demand for cassava and cassava products. Similarly, in Tanzania, shortages in the supply of cereal crops resulting from natural disasters such as droughts have also led to a rise in the domestic price of cassava. In these situations, political leaders often encourage farmers to grow more cassava to fill the gap in food supply; farmers usually respond by increasing production. Unfortunately, reversals of such policies in ways that depressed cereal prices after farmers had increased production have in the past caused major financial losses to farmers. Adoption of food importation as a quick fix, without any supportive systems of marketing the surplus cassava already produced by farmers, have often led to a drop both in the demand for and the price of cassava. Such serious inconsistencies discourage farmers from cassava production and may be contributing to their reluctance to adopt new technologies that enhance productivity. IITA and the national institutions engage in policy dialogue and information exchange with political leaders on ways to achieve economic growth and food security without resorting to arbitrary policy measures that further worsen the farmers' situations.

12.4.1 Some selected cases and outcomes of policy dialogue

Nigeria

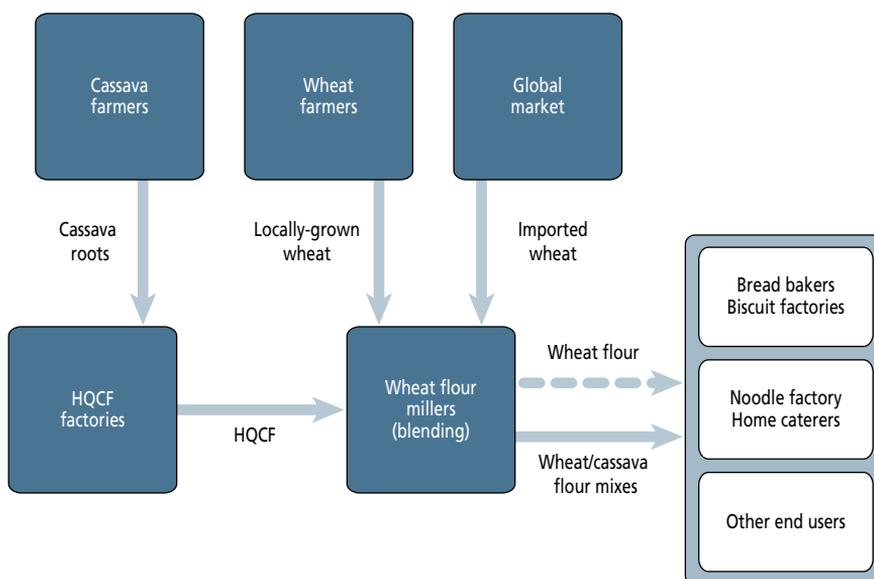
Following the evident enthusiasm of the Government of Nigeria to acquire knowledge and develop suitable policies to move the cassava industry forward,

an international workshop on 'Cassava Competitiveness in Nigeria' was held in 2002 in collaboration with national institutions, such as the Raw Materials and Research Development Council (RMRDC), the Federal Ministry of Agriculture and Natural Resources (FMANR), the United Nations Industrial Development Organization (UNIDO), the National Seeds Service (NSS), the Nigeria Chamber of Commerce, and private sector companies such as AGIP Oil. Various recommendations were proposed for improving the competitiveness of the Nigerian cassava sector. For example, three areas of policy intervention for the development of cassava markets and agro-industry for poverty reduction were proposed by Abass (2002):

- ◉ A composite flour policy: a five-year development plan to make all flour mills include 10 percent cassava flour in baking flour.
- ◉ A national ethanol production policy: alcohol distilleries should derive 80 percent of their ethanol from cassava in order to progressively reduce importation of (crude) ethanol.
- ◉ A national starch-use policy: a phased development plan for industries such as confectionery, textiles, paper, gum, to source their starch requirements locally, with the aim of meeting 70–100 percent starch-based raw material needs in the food, pharmaceutical, oil drilling and textile industries from internal sources.

A conceptual framework for the implementation of the HQCF policy was proposed (Abass, 2002). It was suggested that the implementation should involve direct blending of locally-sourced wheat, HQCF, and imported wheat by flour millers before marketing to bread bakers and other users (Figure 12.6). Direct blending by the flour millers was expected to reduce problems associated with irregular quality, low supply volume, fear by cassava users of sanctions from regulatory agencies, and possible negative consumer reaction to these cassava-containing products. It was projected that the policies would open significant market opportunities for smallholder farmers and reduce poverty and hunger, given that more industries would be required to use secondary cassava products – such as chips, baking flour and ethanol – as raw materials. The potential benefits of implementing the policy proposals from IITA were further discussed by the Federal Institute of Industrial Research (FIRO) Oshodi-Lagos with the Nigerian Government in 2004.

In 2005, the Nigerian Government finally announced its intention to implement a policy on mandatory inclusion of 10 percent locally-sourced flour in bakers' flour. This was followed by the approval of a Biofuel Policy by the Nigeria legislature in 2007; the policy aimed to integrate the agricultural sector with the downstream petroleum sector. The policy made special reference to the use of cassava, sugar cane, oil palm and other crops as biofuel feed stocks. In addition, the policy also identified the National Root Crop Research Institute (NRCRI), the Root and Tubers Expansion Program (RTEP) and the IITA as some of the institutions charged with the responsibility of developing biofuel feedstock in Nigeria (FGN, 2007). Further policy dialogues were carried out with relevant Government agencies and policy-makers at two levels to support cassava development programmes. Discussions were

FIGURE 12.6 Conceptual framework for the import substitution policy in Nigeria


Source: Abass, 2002.

held with technocrats such as agricultural and marketing extension experts at the 36 State and Federal levels and in Abuja, and also with the programme managers of all the agricultural development projects (ADPs). Discussions were then also held with high-level policy-makers including State Commissioners, the Ministers of relevant Ministries, and the Presidency.

Development of quality standards to strengthen the cassava industry in other countries

Through the Common Fund for Commodities (CFC), the CMD and the CEDP projects, SARRNET and EARRNET, IITA established partnerships with standards bureaus in many countries, as well as other organizations such as the Eastern and Central Africa Program for Agricultural Policy (ECAPAPA), concerning the analysis of cassava food safety and quality and the drafting of standards for cassava products. From 2004, countries such as Tanzania, Zambia, Madagascar, Malawi, Nigeria and Ghana have either revised old standards or drafted and approved new standards for cassava products in food, feed or other industrial applications (HQCF, edible cassava flour, cassava starch, chips, *gari*, *rale* etc). In many cases, IITA representatives and lead experts on post-harvest issues in partner institutions served in the technical committees for standards development and other committees for preparing cassava development programmes in the various countries. Nigeria, Tanzania, Zambia

and Madagascar are some of the countries where such collaborative activities are strong. In Tanzania, IITA serves as a member of the technical committee of the bureau that developed the standards for cassava products (starch, HQCF, chips). It was represented in the committees of the Commission for Science and Technology (COSTEC), and the Ministry of Agriculture and Food Security and Cooperatives (MAFSC), responsible for cassava sector development, including a programme on the development of composite flour technology. The national institutions responsible for the coordination of the 'IITA small-scale cassava processing project' – Centre National de Recherche Appliquée au Développement Rural (FOFIFA) in Madagascar and the Zambian Agricultural Research Institute (ZARI) – are members of the technical committees of the standards bureaus that developed the standards for cassava products – starch, edible cassava flour, chips – in the two countries.

12.5 Technical support for the African agricultural development agenda

IITA partners with national institutions, the private sector, NGOs and other participants in the agricultural sector of many African countries to apply available technologies in their agricultural programmes. Most technologies relate to the areas of production, processing and marketing, with the aim of developing staple food crops as a remedy for hunger, poverty and the underdevelopment of agro-industry in Africa.

12.5.1 Support for national cassava initiatives¹

The government of Ghana announced a Special Presidential Initiative (SPI) on cassava in 2001. The idea was to transform cassava production from its subsistence nature into a commercially-viable agribusiness that can generate revenue through exports. The SPI planned to establish ten cassava starch processing plants under the farmer-ownership scheme called Corporate Village Enterprises (COVE). The ten starch plants to be installed by the International Starch Institute would be owned by farmers, as a means of bringing rural communities and cooperatives of farmers into mainstream economic activity. Revenue was expected to be earned through the export of starch from the starch plants. Farmers, particularly women farmers, were to supply cassava roots to the processing plants established with government-backed funding from three banks.

1 Further information on these initiatives is provided in Chapter 11.

The processing plants were to be managed by management professionals. The project started with the establishment of the Ayensu starch plant and the distribution of high yielding varieties to farmers. Some of these high-yielding cassava varieties were from the TMS series, e.g. *Afisiafi* (TMS 30572), *Doku Duade*, and *Agbelefa*. Through its links with the Root and Tuber Improvement Program (RTIP) and the National Root crops programme, IITA contributed to the SPI through capacity building previously provided to most of the institutions involved in the SPI. Some of the processing experts went through degree training or group training previously organized by IITA both in Ghana and in Nigeria. IITA has also been providing backstopping support to the RTIP since the 1990s. Extensive analysis of the outcome and constraints of the SPI have been well documented (Tonah, 2006; Sanogo and Olanrewaju, 2008).

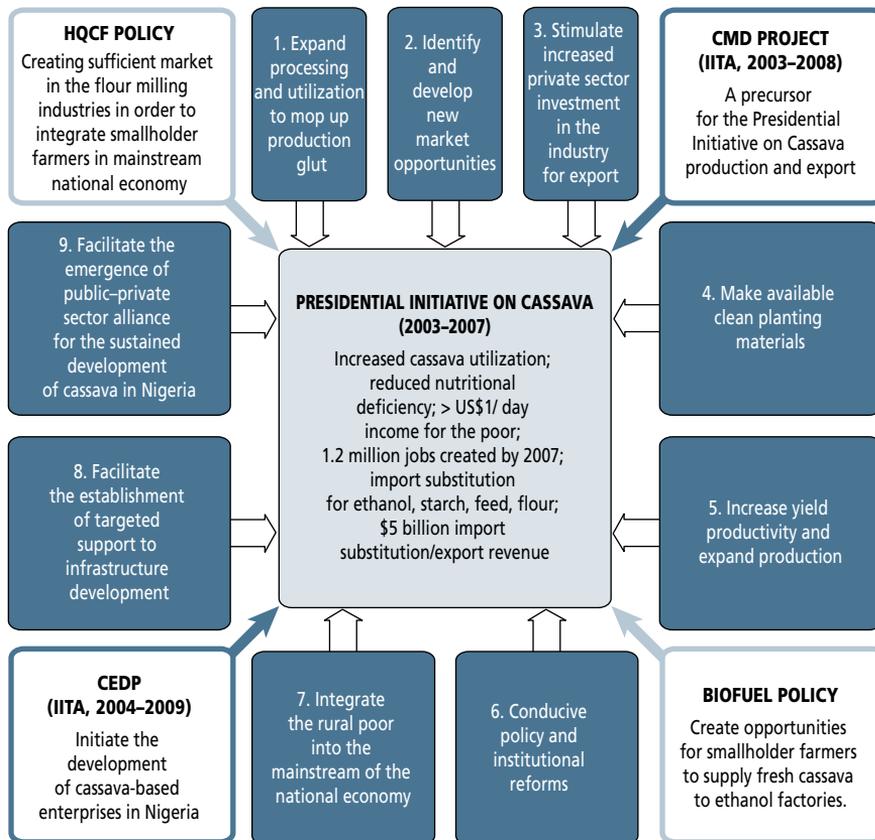
The Presidential Initiative on Cassava (PIC) was announced by the Government of Nigeria in August 2005. PIC was a three-year initiative (2004–2007) to increase the contribution of cassava as an engine of economic transformation, to spur rural industrial development, to generate employment, to reduce poverty, to ensure food security, and to generate and conserve foreign exchange through exports and import substitution. It aimed to enhance the productivity and production of cassava by increasing the area cultivated to 5 million ha – with a target yield of 30 tonnes/ha – in order to produce 37.5 million tonnes/year of products for local and export markets.

The PIC was designed to involve a coordinated set of activities that would promote a competitive cassava production, processing and marketing system, and generate revenue of about US\$5 billion annually. The PIC was implemented through two policy initiatives – one on composite flour and the other on biofuel production – with eight major output targets. Complementary to these, two major cassava value chain development projects were implemented as precursors to the PIC. The two projects, led by IITA, formed extensive partnerships with national institutions to deliver cassava technologies and marketing innovations to all actors in the Nigerian value chain, to develop institutional arrangements, and to facilitate the development of the cassava industry. The projects were:

- ▶ the preemptive management of virulent CMD in the south-south and south-east of Nigeria (the CMD Project);
- ▶ the Cassava Enterprise Development Project (CEDP), funded by the Government of Nigeria and Petroleum companies (Figure 12.7).

Technologies that addressed multiple cassava constraints from production to consumption were introduced to farmers, processors and other stakeholders using the commodity chain approach. Production technologies were integrated with value-adding post-harvest processing and storage technologies, microenterprise and market development, the development of supply-chain structures and management, the promotion of agro-inputs and service delivery systems, and the enhancement of farmers' access to credits. They also improved the links between producers/processors and end users.

FIGURE 12.7 Presidential Initiative on Cassava (PIC) showing the nine component parts, the two precursor projects and the two policy drives



Close partnerships were maintained with a wide range of stakeholders from both public and private sector institutions: the Root and Tuber Expansion Project (RTEP), the National Root Crops Research Institute (NRCRI), Agricultural Development Projects (ADPs), strategic private industries, NGOs and individuals, CIAT, the Latin American Consortium for Cassava Research and Development (CLAYUCA), and the private sector in Brazil. These led to the introduction of wide range of technologies, including new designs and higher scale machinery for cassava processing.

The machinery designs introduced provided opportunities for equipment manufacturers in Nigeria to improve on the efficiency and cost-effectiveness of local machinery, and also to acquire additional expertise in the manufacture of

a wider range of new machinery with the higher capacity needed to support the emerging cassava agro-industry. In addition to the previously existing cassava-based associations such as the Root and Tuber Growers Association of Nigeria (RATGAN), new associations such as the Nigeria Cassava Processors and Marketers Association (NICAPMA) and the Agricultural Machinery and Equipment Fabricators Association of Nigeria (AMAEFAN) have emerged, and are currently driving commercial activity in the cassava sector.

12.5.2 Support for regional cassava initiatives

Through the East and Southern African Root Crops Research Network (ESARRN), the East African Root Crops Research Network (EARRNET) and the Southern African Root Crops Research Network (SARRNET), IITA supported links between national programmes in ten countries, provided access to suitable varieties and integrated pest management (IPM) technologies for major pests and diseases, improved cassava post-harvest techniques, and helped develop the NARES human resource capacity (IFAD and FAO, 2005). In addition, IITA and the root crops networks, SARRNET and EARRNET, support the NEPAD (New Partnership for Africa's Development) Pan-African Cassava Initiative (NPACI) to tap the potential of cassava to work for food security and income generation, via a transformation strategy that emphasizes expanding markets, better organization of producers for collective action, and increased private sector investment. IITA provides both secretariat and leadership in research on specific issues related to NPACI and supports NPACI's efforts to promote best practices for cassava development. NPACI provides suitable information on models for energizing the cassava sector and agro-industry development in cassava growing nations. Such information is needed in countries such as Tanzania, Mozambique, Madagascar, Zambia, Bénin, Gabon and Sierra Leone, where there are ongoing discussions on how to formulate national initiatives and policies on cassava development. Mozambique, Ghana and Sierra Leone are also currently discussing modalities for the blending of HQCF with wheat flour, while Tanzania and Zambia have national committees developing strategies for the expansion of cassava utilization, and the possible blending of cassava with other flours such as wheat or sorghum².

12.5.3 Support for global initiatives

The vision of the Global Cassava Development Strategy (GCDS) as described in 2001 is that "cassava will spur rural industrial development and raise incomes for producers, processors and traders, and will contribute to the food security status of its producing

² Available at: <http://allafrica.com/stories/200709181014.html>.

and consuming households". The spread of cassava technologies has been possible through collaborations with the network of NARES, Root and Tuber Crop networks, regional projects on cassava, the International Fund for Agricultural Development (IFAD), the private sector, NGOs, and policy-makers. So far the technologies have made it possible for the private sector to invest in cassava production, processing, and marketing of high-value cassava-based products.

12.6 Transformation of research outcomes to development impact

As part of the IITA R4D approach, the research outputs used by research and development partners to achieve outcomes are further made available to a broader number of partners including the ultimate end users of the technologies – farmers, NGOs, the private sector, policy-makers and other development agents – for out-scaling and up-scaling to generate the desired development impacts. The involvement of IITA in the process fosters the analysis of the evolving benefits of the new technologies being used, through measurement of their impact on their ultimate beneficiaries. Such analysis helps in the detection of new challenges emerging in the process of creating positive developmental impacts.

12.6.1 The outcome of the use of new cassava varieties and HQCF technology in Africa

According to Nweke *et al.* (2002) and Nweke (2003), there are four stages to cassava transformation, based on the role cassava plays in a county's economy or food system. The stages have been classified as: famine reserve (stage I), rural food staple (stage II), urban food staple (stage III), raw material for food, feed and industry (stage IV). Since the 1990s the increased activities on cassava development by national and international research centres, multilateral development institutions, NGOs and others, have helped many countries progress on the cassava transformation ladder. In the past 12 years, organizations such as IITA, CIAT, SARRNET, EARRNET, NRI, FAO and NGOs, have collaborated with the NARES in ESA countries, particularly the cassava programmes, on implementation of cassava research and development activities. These activities have included testing and disseminating market-oriented cassava processing technologies.

In Zambia, the Program Against Malnutrition (PAM) has been involved in the distribution of planting material in many parts of the country. In 2004, the Zambia Agricultural Research Institute in collaboration with IITA established the first HQCF pilot plant in Mansa, Zambia. The capacity of processor groups was enhanced to supply HQCF to paper, cardboard and food factories in the copper belt area of Zambia.

Compared with traditional cassava products, the significant improvement in the quality of cassava produce supplied to the industries using the new IITA processing methods and machinery led to an increase in industrial demand for new cassava products. Subsequently, the PAM, the Ministry of Agriculture and Cooperatives (MACO), FAO and some NGOs, collaborated to out-scale the cassava processing technologies through testing and adaptation with more smallholder farmers and processors in other locations in Zambia. Presently the CFC, FAO, International Trade Centre (ITC), United Nations Conference on Trade and Development (UNCTAD) and the World Bank (WB) are collaborating in the implementation of value chain development activities in Zambia.

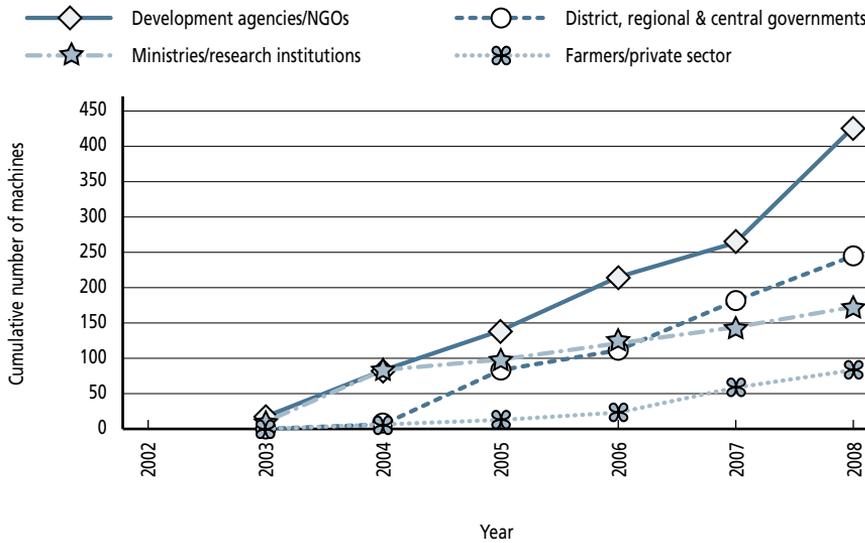
In Tanzania, collaborations between the Root and Tuber Programs on the mainland and Zanzibar, IITA, SARRNET, district and regional governments and the prison service, have improved the availability of new high-yielding disease-tolerant cassava varieties with acceptable food quality traits. Pilot cassava processing plants were established in collaboration with the Tanzania Food and Nutrition Centre (TFNC) and MAFSC, e.g. a CFC-funded project on small-scale cassava processing, a CIAT–IITA starch processing project, and the Livelihood project funded by the USAID 'Initiative to End Hunger in Africa' programme. Subsequently, many district and regional governments and NGOs became active in the formation of farmers' and processors' groups to take up and outscale the new processing technologies. There has been a significant demand for HQCF, starch and chips from industrial users. However, the private sector is yet to invest in cassava agroprocessing (Abass, 2008). Most investment was carried out by the public sector and NGOs to promote processing technologies and enhance food security (Figure 12.8). Consequently, industrial demands for cassava products have not been met by the small-scale processing groups, although consumption of cassava flour by the urban middle class has been on the increase since 2004/2005.

The sale of cassava flour in Tanzania's city supermarkets has increased. In addition, the consumption of fresh cassava as a snack has been on the rise in the cities. Public opinion seems to suggest that the high energy content and the lower glycaemic response properties of cassava are contributing to increased consumption. The activities of national and international research and bilateral institutions, NGOs and local governments, combined with the increased demand for cassava roots and products, indicate a growing recognition of cassava as an urban food and industrial raw material in Tanzania. The cassava sector in Tanzania appears to have transformed from the rural staple stage of the 1990s to the urban staple stage.

The increased demand has influenced production; cassava cultivation in villages around major cities has increased. These factors may have contributed to increases in cassava yield and total production in Tanzania. Statistics from FAO (Figure 12.9) show that for the first time in over ten years, cassava yields and production have both increased consistently for four years.

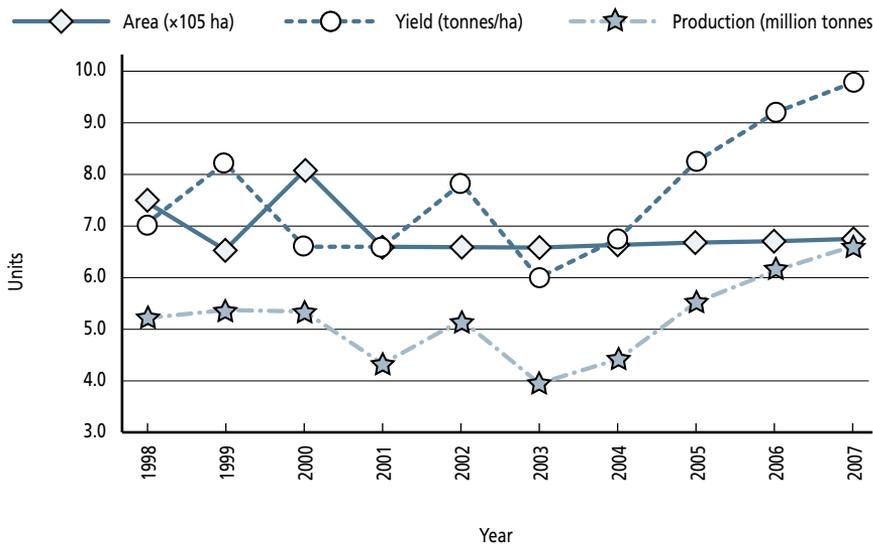
Transiting cassava into an urban food and industrial commodity through agro-processing and market driven approaches: Lessons from Africa

FIGURE 12.8 Trends in supply of cassava machinery by Intermech Engineering Ltd and Tonnet Enterprises to Burundi, Rwanda, Malawi, Tanzania, Uganda and Zambia



Source: Sales records of Intermech Engineering Ltd (Tanzania) and Tonnet Enterprises (Uganda).

FIGURE 12.9 Cassava production, area planted and yield in Tanzania, 1998–2007



Source: FAOSTAT 2009.

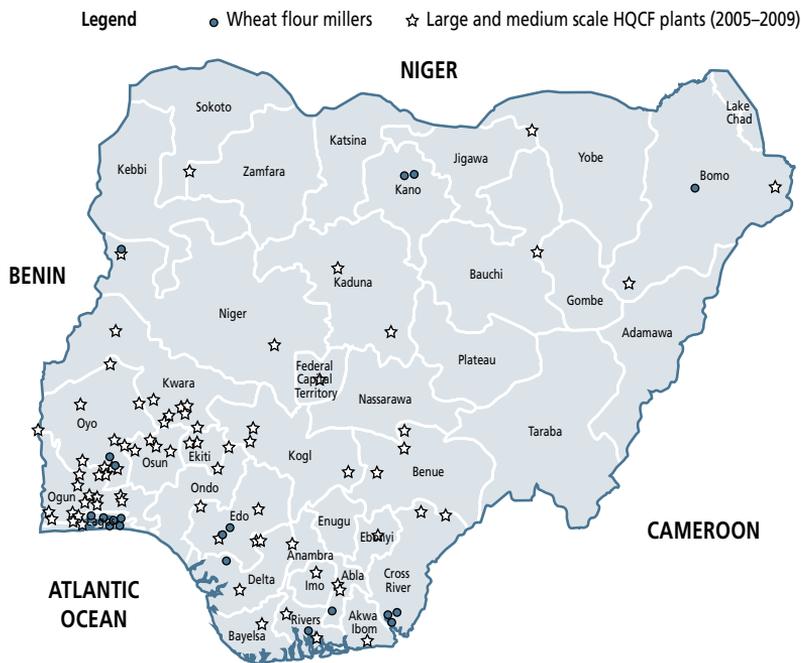
12.6.2 Assessing the impact: case studies of Ghana and Nigeria

In Ghana, the SPI energized further investment by the private sector. Additional medium- and large-scale cassava-based commercial enterprises are beginning to emerge in Ghana. These include Amasa Agro-processing Limited (Amasa) and Caltech Venture Limited (CVL). Amasa has been involved in the processing of fermented cassava foods for many years. The company has recently developed a new investment plan to install a flash dryer for the manufacture of HQCF. CVL was established in 2006 with the objective of producing ethanol, starch, and HQCF. The company started its operation with the supply of cassava roots to the SPI's Ayensu starch plant. Since the closure of Ayensu, CVL has installed medium-scale cabinets and flash dryers for making HQCF and is currently selling to the plywood industry in Ghana. The current plant capacity is 3.5 tonnes of HQCF per day. CVL adopted 5–8 TMS varieties, and uses the rapid multiplication technique on its current 500 ha cassava plantation, which the company plans to expand to 2 000 ha.

One of the varieties, *Afisiafi*, yields at least 25 tonnes/ha without the use of fertilizer at the CVL farm; in comparison, smallholder farmers in Ghana did not achieve more than 10 tonnes/ha yield with the same variety. Similarly, commercial farmers in Nigeria are also achieving 25–40 tonnes/ha with the Nigerian varieties. The higher yields have clearly come about because of good production practices, which smallholder farmers often do not give much priority. Without a doubt, good management practices can improve the competitiveness of cassava, whether with the existing high yielding varieties such as *Afisiafi* or the other IITA–TMS varieties grown by farmers. Smallholder farmers seem to lose the financial and competitiveness benefits of the new high varieties because they lack knowledge of good production techniques. It would therefore be necessary for the new R4D agenda to include the demonstration of best production practices through 'cluster systems' in a manner similar to how the 'pilot processing system' was used to transfer the HQCF technology across Africa.

During the PIC in Nigeria, significant manpower development was achieved through a series of training sessions and distribution of training manuals. Model cassava processing plants were built in nearly all the states that participated in the two precursor projects (Sanogo and Olanrewaju, 2008). Before 2003, limited success was achieved in the mechanization of harvesting, peeling, pelletizing and frying of *gari* at small- and medium-scales (Nweke, 2003). Starting from 2005, collaboration between machinery manufacturers (e.g. Fataroy Enterprises, Niji Lukas Nigeria Limited, Nobex Technical Company Limited, Peak Precision Products Nigeria Limited, Adebash, etc), many national institutions and universities, CIAT, CLAYUCA and IITA led to the development of new or higher capacity labour-saving machinery through hybridization of the local techniques and with designs from Brazil, Germany, and other countries. New designs and higher capacities were realized for peelers, dryers, pellet-making machines, hydraulic presses, and fryers for *gari*. For example, a new design of cassava peeler suitable for medium-scale enterprises emerged, and it is now on commercial sale for the

FIGURE 12.10 Nigeria, showing location of wheat flour mills and the medium- and large-scale cassava plants processing HQCF during the commercial phase



first time in Nigeria. In addition, a larger capacity flash dryer with a higher fuel efficiency and double output was designed, tested and commercialized. A major scaling-up of capacity and more advanced mechanization in terms of unit operations of the cassava processing industry was thereby achieved. This achievement was recognized with an award by the CGIAR (Consultative Group on International Agricultural Research) for an outstanding example of agricultural technology in SSA in 2008. Following the CGIAR award, doubts about the need for agroprocessing and value-addition research – which form part of the IITA R4D approach – seems to have been resolved and the Science Council of the CGIAR finally adopted the R4D approach in 2008.

The combined effects of the nine aspects of the PIC, two policy plans, and the two IITA-led projects, jump started the establishment of several medium-scale cassava processing enterprises between 2005 and 2008. By 2009, the number of companies and entrepreneurs that had invested in flash dryers for HQCF or starch production had increased to circa 140–150, from a mere six or so in the year 2000 (Figure 12.10).

Nearly 95 percent of the enterprises were for HQCF processing with additional facilities for making traditional products such as *gari* and *fufu*. These include the model processing plants established under the CMD and CEDP projects. The capacity that existed for processing HQCF with mechanical flash dryers increased

from near zero in 2003 to about 85 000 tonnes per year in 2009. The production of higher volumes of HQCF at consistent quality, even during the rainy season, was made possible. This represents a major achievement compared with the situation during the pilot testing stage in Nigeria, when groups of 14 small-scale processors dried HQCF by sun-drying (Abass *et al.*, 2001). At the medium scale, the cost of the machinery for HQCF processing and the daily output volumes were much higher than obtained during the piloting stage (Table 12.3).

In addition, new factories were established for the production of ethanol and glucose syrup. The demand for the intermediate cassava products increased – HQCF, starch, and glucose syrup – and came from wheat flour mills, textile factories and multinational food factories such as Cadbury and Nestlé. Farmers responded to the demands for cassava roots by increasing production. Total production in Nigeria increased from 34.1 million tonnes in 2002 to 45.7 million tonnes in 2006, and farm-gate prices also increased (Figures 12.11 and 12.12). Average farm size increased and truly commercial cassava farms emerged. The increases in the price of

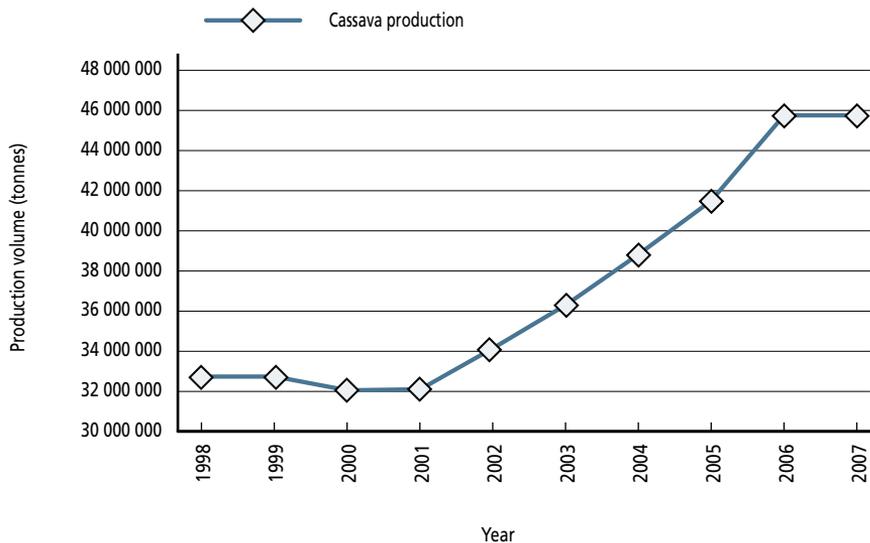
TABLE 12.3

Equipment required for production of HQCF during pilot and commercial phases

Item	Pilot phase (1995–1998)		Commercial phase (2005–2008)	
	Capacity	Cost (US\$)	Capacity	Cost (US\$)
Mechanical peeler			0.6–0.8 tonnes fresh roots/hour; 60–90% peel removal	2 966
Mechanical grater (two required for commercial processing)	0.3–0.5 tonnes fresh roots/hour	870	2.0–3.0 tonnes fresh roots/hour (two units/plant)	4 237
Double screw press	0.05–0.10 tonnes fresh roots/hour	300		
Twin basket hydraulic press (Brazilian design)			8 tonnes fresh roots/day (two units/plant)	11 017
Filter bag (used with twin basket hydraulic press)			20 pieces/day	424
Wooden drying racks (sun-drying)	Set (15)	30		
Flash dryer			4 tonnes flour/day	33 898
Hammer mill	0.25–0.40 tonnes flour/hour	1 550	5.0 tonnes flour/day	5 508
Total per processing plant	129–153 tonnes flour/year	2 750	960 tonnes flour/year	55 085

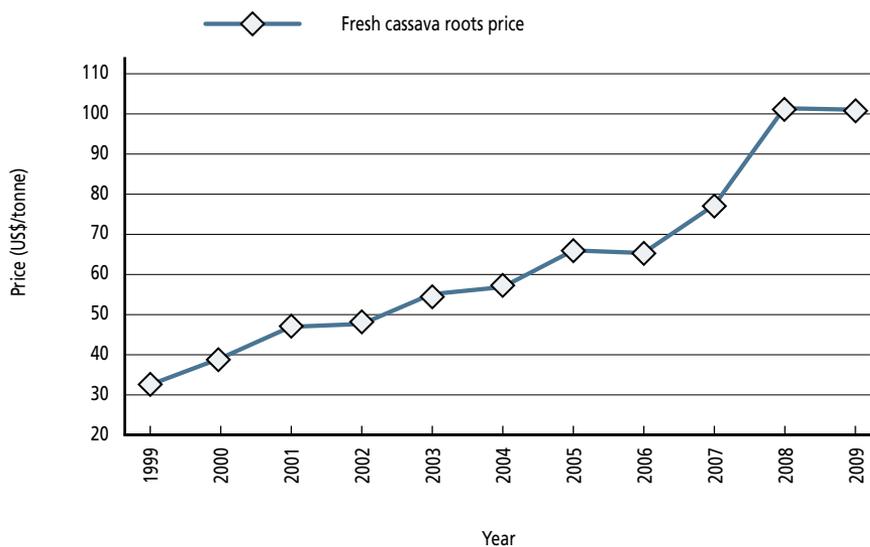
Source: Abass *et al.* 2001, SIS Engineering Ghana Limited, Niji Lukas Nigeria Limited, Nobex Technical Company Limited, and Fataroy Enterprises.

FIGURE 12.11 Cassava production trend in Nigeria before, during and after the PIC



Source: FAOSTAT 2009.

FIGURE 12.12 Trend of fresh cassava root prices in Nigeria before, during and after the PIC



Source: HQCF processors, and Agroprocessing Unit, Ogun State ADP.

fresh cassava during the years of increased production signify a reversal of the usual price collapse following production increases for an African crop.

The purpose of expanding market opportunities for cassava was to increase farmers' incomes. Such increases helped Nigeria to reduce rural poverty in the 1990s (Nweke, 2003). Many smallholder farmers in Nigeria benefited from the recent increases in prices, between 2006 and 2008, at the same time as they increased production. However, raising smallholder farmers' incomes through significant reductions in the cost of production is more desirable than increasing incomes from higher prices of cassava or land expansion. Reductions in the cost of production will make cassava and its products more competitive, both in the domestic and international markets.

12.6.3 Assessing new challenges in the development process: the case of the HQCF industry in Nigeria

The R4D approach requires assessment of new challenges arising from the development impacts of the use of IITA technologies by partners.

A recent assessment of the emerging challenges of the HQCF industry, following the impact being generated in Nigeria, showed that the major challenge in the cassava products market is the cheaper prices of imported substitutes. A high cost of cassava production translates into a high cost of cassava products and uncompetitive prices. At the same time, lower prices of imported substitutes reduce the market opportunities for cassava products because most consumers buy cheaper items. Farmers are then discouraged and drop out of the market; import volumes and national import expenditure grow once the local farmers are forced out of the market (World Bank, 2009). Such situations have often been followed by increases in the prices of the imported items already dominating the market.

According to the United States Department of Agriculture (USDA), Nigeria imports up to 85 percent of the wheat it consumes from the USA (USDA, 2009). About 3.2 million tonnes of wheat was imported in the 2008/2009 season; part of this may have been traded in the regional market. The milling capacity in Nigeria grew from 1.2 million tonnes per year in 1985 to about 6.2 million tonnes per year in 2008. According to USDA (2009) only about 52 percent of the 2008 milling capacity was utilized. It is estimated that the average import price of wheat into Nigeria during the 2008/2009 season was around US\$395.3/tonne. This implies that Nigeria's expenditure on wheat imports alone in 2008/2009 was about US\$1.3 billion (Table 12.4). The substitution of 10 percent of this with HQCF would save Nigeria US\$130 million yearly. Meanwhile over US\$49 million can be injected into the rural economy through the purchase of fresh cassava from farmers and to engage thousands of unemployed youths in the production, processing, transportation and marketing of the HQCF (Table 12.5). The possibility of achieving this depends on the competitiveness of HQCF compared with wheat, corn starch and maize, to which the price of HQCF is strongly linked.

TABLE 12.4

Summary of indicative cost of cassava production under traditional and modern methods in Uganda, 2007

Cost item/activity	Traditional production	Improved varieties and production methods
Yield (Fresh, tonnes/ha)	10	25
Unit cost of production (US\$/tonne)	6.74	7.11
Current farm gate price for fresh roots market (US\$/tonne)		19.13
Most probable farm gate price for processing plants; high volume or high turnover opportunity for farmers (US\$/tonne)		15.30
Gross value of output (current, US\$/ha)	191	478
Net income (US\$/ha)	124	300
Net income (US\$/tonne)	12	12
Net income ratio (Improved production method to traditional production method)		2.43 : 1

Source: Starcas Ltd, Uganda.

The price of HQCF in Nigeria has risen gradually from the time of pilot testing in 1995–1998. Although HQCF has more added value in terms of its stage of processing compared with imported wheat, processors and end users often settle for about 75 percent of the on-going price of imported wheat for HQCF. The HQCF price was about US\$290/tonne in 2000, and was traded at US\$609/tonne in 2007 when the implementation of the mandatory inclusion of 10 percent HQCF in wheat flour was implemented (Figure 12.13). This relatively high price was also influenced by the recent global food price crisis caused by low global wheat stock and general high prices of food items. By 2008, the imported price of wheat in Nigeria decreased from the US\$450–550/tonne in 2007 to about US\$280–510/tonne (Figure 12.14). Wheat flour millers became reluctant to buy HQCF at the 2007 price. The price was not acceptable to the majority of HQCF processors, particularly those that adopted flash drying technology, who argued that the price of fresh cassava was high and the profit margin was too low.

TABLE 12.5

Analysis of the potential benefits of the HQCF use in Nigeria

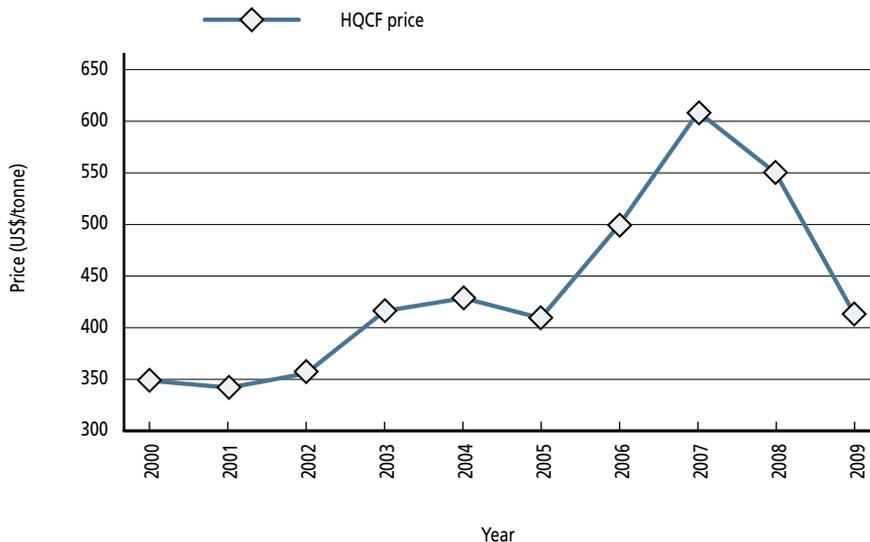
Wheat use and HQCF development in Nigeria	Estimates
Installed capacity of flour mills in Nigeria (tonnes/year)*	6 200 000
Estimated annual volume of wheat importation into Nigeria (based on 2008/2009 season, tonnes/year)*	3 200 000
Current capacity utilization of wheat flour mills in Nigeria (%)	52
Estimated price of imported wheat (estimates for 2008/2009 season, US\$/tonne)*	385.3
Estimated value of wheat imports by Nigeria (based on 2008/2009 season costs, US\$)	1 232 960 000
HQCF needed to meet national target based on 10 percent substitution set by the Presidential Initiative on Cassava (tonnes/year)	320 000
Estimated processing days per year	240
Number of HQCF processing plants needed (based on 2.5 tonnes HQCF/plant/day)	533
Estimated number of existing HQCF processing plants	140
Average installed capacity of existing HQCF plants (tonnes/plant)**	2.5
Estimated existing HQCF flash drying capacity (tonnes/year)	84 000
Potential annual savings from import substitution which could be saved from export to boost the internal economy had the 10 percent substitution been achieved (US\$, based on 2008/2009 season)	123 296 000
Estimated amount from import saving that could be injected annually into the rural economy through the purchase of fresh cassava from farmers, based on 40 percent value of savings from import (US\$/year)	49 318 400

* USDA, 2009; ** Data supplied by Nigerian flash dryer manufacturers.

Yet, wheat millers pointed out that the price was acceptable to HQCF processors located in semi-arid or dry regions of Nigeria who are using sun-drying. The cost of HQCF processing was cheaper when sun-drying was used, although the method can lead to supplies of low quality and inconsistent volume during the rainy season. The safety of the sun-dried HQCF may be easily compromised and could cause serious financial losses to wheat flour mills and bread bakers who use the composite flour (Abass *et al.*, 2001, 2009).

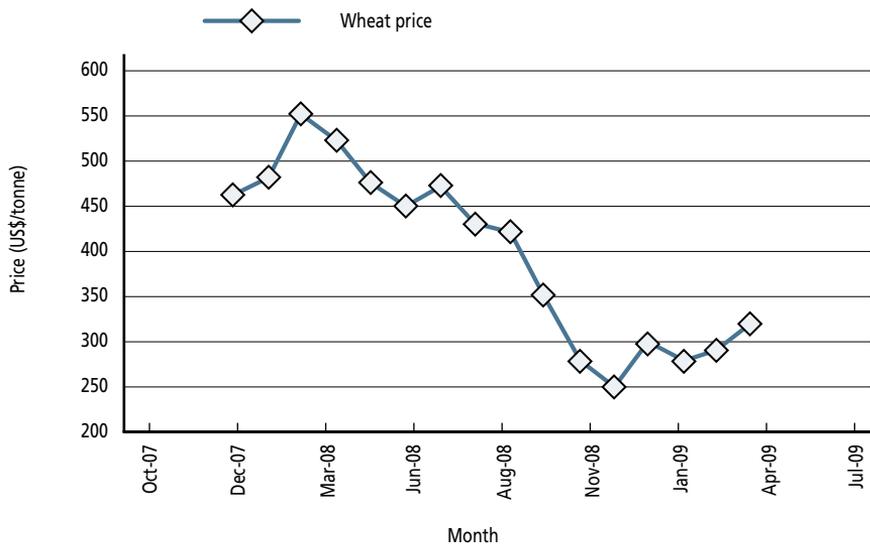
According to some of the processors the purchase price of HQCF should be at par with – if not more than – the factory gate price of wheat grains. HQCF is of higher added-value than whole wheat grains in terms of the extent of processing and readiness for bagging and marketing. There were no additional milling costs incurred by wheat flour mills for the use of 10 percent HQCF, given that HQCF enters the flour

FIGURE 12.13 HQCF price trend in Nigeria



Source: HQCF processors, and Agroprocessing Unit, Ogun State ADP.

FIGURE 12.14 World wheat price trend



Source: USDA 2009.

milling process at the final sifting, blending, and bagging stages. The HQCF processors observed that there was no evidence that the reduction in the price of imported wheat since 2008 resulted in any commensurate reduction in the price – US\$835–848/tonne – which bread bakers pay for the wheat flour. In addition, consumers were observed not to have benefited from the reduction in import price for wheat because the prices of loaves of bread did not reduce proportionately. Processors therefore argued that the savings gained by using HQCF and the substantial reduction in the price of imported wheat in 2008/2009 have both been to the almost exclusive benefit of wheat flour millers. Field data has shown that for an efficient HQCF processing plant, the profit margin would be near US\$47/tonne (Table 12.6).

A model of marketing margins also showed that smallholder cassava farmers, HQCF processors using flash drying technology, HQCF distributors, and bread bakers, can achieve additional benefits of US\$14.92, US\$14.92, US\$4.47 and US\$48.47 respectively for every tonne of HQCF sold for bread baking, and this including the potential for reduction in prices of food items, particularly bread. Clearly the current price formation model in the HQCF industry is not understood very well by all the stakeholders, particularly farmers, processors and users. This evident disorganized state of the market is a major factor slowing down progress in HQCF development in Nigeria. A similar situation was observed in 1996–1998 during the pilot phase

TABLE 12.6

Some cost parameters of HQCF production by medium-scale processors in Nigeria during the commercial phase

Costs	HQCF	US\$/tonne
Fresh cassava		203
Peeling labour		34
Washing labour		8
Permanent staff costs/ tonne		34
Diesel (15 litres/ hour)		85
Electricity		8
Cost of equipment		42
Overhead costs		21
Packaging/ Transportation		42
Contingency (5%)		24
TOTAL		503

Source: HQCF processors, 2009.

(Abass *et al.*, 2001). Nearly 96 percent of the HQCF plants in Nigeria are now idle because of these pricing problems. It is therefore necessary that marketing margins are discussed by all stakeholders to improve confidence and business cooperation in the Nigerian HQCF industry.

The existing HQCF plants in Nigeria are constrained by the unreliable supply of electricity. The processing enterprises rely on fuel-operated electricity generators that make the processing operations expensive. Nigeria often experiences chronic shortages of fuel, especially diesel, which results in a complete shutdown of processing operations. If the current state of infrastructure and inputs permits it is advisable for idle HQCF plants in Nigeria to diversify into drying of other products, such as plantain flour, *ogi*, *fufu*, and soy flour. Although the composite flour policy of the Government of Nigeria seems to be slowing down as a result of the confusing pricing situation resulting from the disorganized marketing structure, wheat flour millers are aware that the Government could sanction erring flour mills, as occurred in 2007 when many of the flour mills did not comply with the requirement (USDA, 2009). The huge capacity of wheat flour millers and the implementation of the policy on 10 percent import substitution provide an opportunity for agricultural growth and poverty reduction in Nigeria. The capacity to grow wheat (if possible) and to produce and use HQCF will need to be developed and sustained (Abass, 2002). The competitiveness of HQCF as an import substitute in the medium to long term depends on the possibility of reducing the production cost of fresh cassava. However, organization and training of the entrepreneurs who have invested in the HQCF plants will facilitate proper management or optimization of the drying operations, which appear to be inefficient at the moment. The Nigerian cassava industry needs a robust price formation strategy to ensure a fair distribution of profits and benefits along the whole chain. The stakeholders – cassava farmers, processors, wheat millers, bread bakers and other players – need mentoring in developing good business relations.

12.6.4 Translating new challenges to development interventions: the case of HQCF plants in Nigeria

The new challenges identified in the HQCF industry in Nigeria require development intervention, particularly in the area of infrastructure development and policy interventions.

However, the stakeholders at the cassava competitiveness workshop held at IITA (Nigeria) in 2002 before the announcement of the import substitution policy by the government of Nigeria in 2005, had cautioned that there were no 'quick fixes' for achieving economic growth and poverty alleviation. A deliberate, strategic and sustained set of actions were recommended for a private-sector-led agricultural transformation and long-term commitment (e.g. for 15 to 25 years) to invest in

market-oriented strategies, with an emphasis on value addition and productivity enhancement along the entire cassava value chain. The provision of an enabling environment for the adoption of modern techniques by stakeholders will make cassava competitive within and outside the country. The focus for the immediate development of the cassava sector should be the sale of cassava products in the domestic and regional markets, rather than export out of Africa. African countries need to make the foods they want from what they grow, and grow what they eat to feed themselves sufficiently before considering exporting food. As such, success in providing market opportunities for African farmers in the immediate and medium term would depend on good strategies and policies that encourage internal use of secondary processed cassava products as food, feed, and industrial raw materials. Export does not seem to provide an immediate competitive advantage to African cassava farmers because of the high cost of production, and poorly organized or expensive logistics of production and marketing activities. Improvement in the marketing structure of cassava products can be achieved with an efficient real-time national and regional market information system (MIS) with readily available disaggregated price data. The MIS would allow comparisons of volumes, prices, seasonality of supply, and evaluations of opportunities in the domestic and export cassava markets. It would also assist existing and potential investors to make informed decisions on how, where and when to invest in the cassava industry, and would help to attract more investments in the cassava sub-sector.

Recently, consumers in Nigeria seem to have accepted the inclusion of cassava in bread and other food items. Consumer rejection can no longer be a reason for the baking industry not to use HQCF: the public perception of cassava is better in Nigeria than in any other African country. New market outlets for HQCF can be created through product development research and promotion activities. For example, the promotion of a maize–cassava flour blend for home consumption might be considered. Such products may be less affected by the fluctuating prices of imported food items and could stabilize the price of HQCF. This strategy will work even better for ESA countries where there are larger populations dependent on moisture-sensitive crops (such as maize or rice) as staple foods. Most of these countries are prone to droughts that cause frequent food shortages and food price instability. These often lead to frequent reliance on food aid and cheap food imports that make it even more difficult for smallholder farmers to compete, thereby destabilizing agricultural growth. Some millers have suggested tax concessions for wheat millers who use a set minimum quantity of HQCF, or other incentives similar to the vitamin and iodine supplementation strategies used in some countries. Millers in Nigeria also noted that 10 percent inclusion was difficult to achieve, particularly at the beginning, since the HQCF plants were few and did not have the capacity to supply the required volume of HQCF. A gradual increase from 3 percent inclusion rate to 10 percent over a period of 5–8 years is proposed for Nigeria, and Ghana is currently developing its own composite flour strategy.

Other countries such as Madagascar, Mozambique, Tanzania and Zambia, all of which are hoping to transform their cassava industries, may adopt a similar approach. The experiences and labour-saving technologies developed in Nigeria can help these countries in their transformation processes. Deliberate efforts should be made to tap into the Nigerian experience and technologies through international collaboration. It is proposed that African governments planning to implement composite flour policies should ensure that HQCF is not a burden, but rather an acceptable and positive input for millers in terms of the quality, quantity and competitiveness of their businesses.

12.6.5 Transfer of roles from the IITA to national institutions

IITA facilitates the building of partnerships with national and international institutions in the development of technologies based on the specific development objectives in each sub-Saharan African country. In general terms, partnerships are formed from the point of identification of agricultural constraints. Solutions to these constraints are developed together with the national and international institutions in specific research locations; the results are widely applied by the partners and other beneficiaries, e.g. small farmers or processors, to achieve desired outcomes. This approach contributes to the development of institutional capacity, since national institutions are often able to take over the adaptation and application of the research results to achieve impacts after IITA's exit. IITA's role reduces to the level of monitoring and evaluation of the impacts on the beneficiaries, and the identification of further development needs³. This transfer of responsibility to the national institutions and the private sector ensures sustainability of development programmes on agriculture in the various sub-Saharan African countries, such as is presently occurring in Nigeria and Ghana for the development of the HQCF industry.

12.7 Conclusion

The IITA R4D approach emphasizes the development of technologies that solve the problems of African farmers along the whole value chain of each mandated crop, from input supply to consumption. The technologies are designed to reduce risk and generate income for poor farmers. The application of a holistic value chain or food systems approach is working: in partnership with national and international research partners, in the development of proven agricultural technologies that address the constraints of African crops, combined with a concurrent delivery of these technologies to the national institutions, capacity building, and technical support to the agricultural development agendas of various African governments.

3 Available at: http://www.iita.org/cms/details/research_summary.aspx?a=1570andz=63.

The continuous interaction of partners along the research to development continuum, and the development of the capacity of NARES to adapt technologies to their specific needs, are an important factor for the spread of technologies and their eventual impact. The engagement in policy dialogue with various governments helps to ensure that favourable economic and policy environments are created for the application of the technologies to benefit smallholder farmers and help the development of national economies.

This approach played a significant role in the cassava transformation that occurred in Nigeria from the 1960s to the 1990s because of the spread of high-yielding cassava varieties and the availability of processing technologies. The investment and policy initiatives adopted by Ghana and Nigeria from 2001–2007, aimed at commercializing the HQCF technology developed by IITA, have enhanced the acceptance of cassava as an urban food and as an industrial raw material. The level of processing and marketing activities by the private sector in the two countries during the period represents a shift to the industrialization step on the cassava transformation ladder. However, those development activities have led to new challenges that need to be addressed. Nonetheless, the experiences of IITA applying the R4D approach on cassava in Africa have proven to be successful, and to the greatest extent in Nigeria and Ghana.

Acknowledgements

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CHAPTER 13

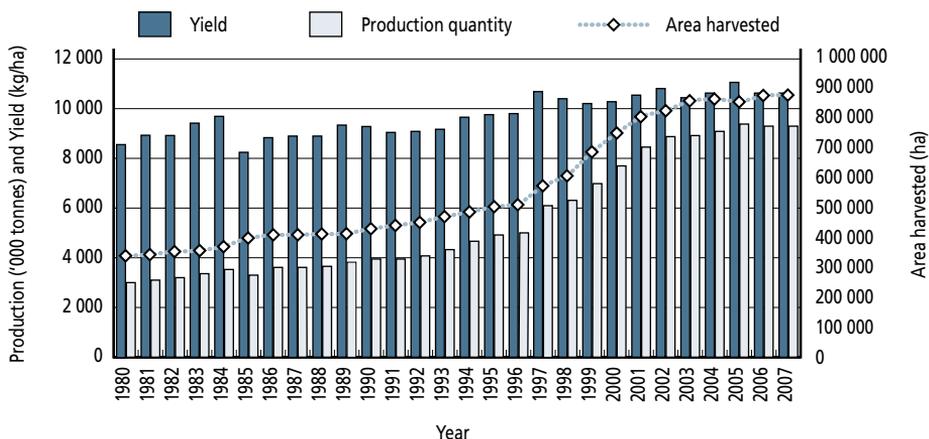
Development and diffusion of vegetable post-harvest and processing technologies in the Greater Mekong subregion of Asia

KATINKA WEINBERGER AND ANTONIO L. ACEDO JR.

13.1 Introduction

Cambodia, Laos and Viet Nam have experienced sustained growth in vegetable production, from about 2.9 million tonnes in 1980 to 9.3 million tonnes in 2007 (Figure 13.1) (FAOSTAT, 2008). Harvested acreage also increased by approximately threefold, from 337 850 ha to 875 400 ha. In Viet Nam, widespread vegetable production and commercialization has been observed even in the most impoverished communities of the northern uplands (International Food Policy Research Institute, IFPRI, 2002).

FIGURE 13.1 Vegetable production area, volume and average yield, in Cambodia, Laos and Viet Nam, 1980–2007



Source: FAOSTAT (2008).

Post-harvest losses negatively impact on the economic benefits derived from vegetable production. They are usually high in developing countries such as those in the Greater Mekong subregion – Cambodia, China’s Yunnan Province, Laos, Myanmar, Thailand and Viet Nam – where a lack of knowledge, skills, technologies, techniques and facilities for produce handling and processing are compounded by the perishable nature of most vegetables and the region’s hot and humid climate. The loss of food and economic opportunities contributes to the persistent problems of poverty, unemployment and malnutrition in the region. Reducing post-harvest losses through the proper application of appropriate post-harvest technologies has far-reaching benefits. It improves the incomes of farmers and marketers, makes diversification into vegetable production less risky and more attractive, creates rural employment and income generation opportunities through value-added activities and post-harvest enterprises, enhances productivity and competitiveness in vegetable industries, increases opportunities for export, and sustains economic growth (Jaffee and Gordon, 1993). As the world economy becomes more integrated, post-harvest technologies could enable developing countries to position their agricultural produce more effectively in domestic and export markets at competitive quality and prices. Post-harvest industries contribute to greater gender equality and empowerment of women, who often play an important role in post-harvest activities for fresh and processed vegetables (Jaffee and Morton, 1995).

Recently, AVRDC – The World Vegetable Centre – launched an initiative to strengthen the vegetable industry and advance economic growth and food security in Southeast Asia. The initiative aims to provide the groundwork and direction for future development activities within a supply chain setting, to improve the well-being of disadvantaged actors in Southeast Asia’s vegetable industry, particularly in Cambodia, Laos, and Viet Nam.

In this chapter the approaches used will be described; these included an assessment of post-harvest losses of vegetables along various points in the supply chain, an overview of the technologies developed, and an assessment of how adoption of post-harvest technologies improves the livelihoods of the rural poor, including some of the factors that contributed to adoption and uptake. The relevant methodologies applied will be discussed under each section. The chapter will conclude by discussing the major achievements of the project, and will offer recommendations for the replication of models that aim to support the rural poor by providing access to post-harvest technologies.

13.2 Post-harvest loss in vegetables

Post-harvest loss adversely affects the profitability and efficiency of supply chains. Reports on post-harvest losses in vegetables vary considerably, with studies reporting losses in developing countries of 50 percent or even higher.

Field observations have reported that 40–50 percent of horticultural crops produced are lost before they can be consumed, mainly as a result of high rates of bruising, water loss and decay during post-harvest handling (Kader, 2003). Poor post-harvest handling and storage can also lead to loss in nutritional quality, because of loss of vitamins and the potential for development of health hazards (e.g. mycotoxins in dried chili). Post-harvest related losses in quality also reduce opportunities for export and export revenues (Weinberger and Lumpkin, 2007). Typically, post-harvest losses vary greatly between different vegetable types, production areas and seasons. The magnitude of the losses and their impact on farm incomes can be difficult to calculate because the post-harvest handling chain includes all the steps between harvesting and consumption, including sorting, cleaning, packing, cooling, storage, transport and processing.

Reducing post-harvest losses for fresh produce has been shown to be an important part of sustainable agricultural development efforts whose aims are to increase food availability, but which usually attract little funding (Kader, 2005; Weinberger *et al.*, 2009). During the past 30 years, less than 5 percent of the funding provided globally for horticultural development efforts has been directed at the post-harvest phase (FAO, 2004).

Reasons for high post-harvest loss can include poor pre-harvesting and harvesting practices (e.g. harvesting leafy vegetables during the hottest time of the day), inappropriate post-harvest handling and packaging (e.g. packing tomatoes in woven bamboo baskets that can be crushed when stacked), post-harvest pests and diseases, and lack of storage, cooling and cold chains (e.g. the transport of tomatoes over long distances on the top of trucks and tankers). Knowing where loss occurs along the chain is essential to identify appropriate research strategies and training programmes. Thus, an initial activity during the AVRDC project assessed and quantified post-harvest loss in Cambodia, Laos and Viet Nam for priority vegetables – including chili, tomato, yard-long bean, cucumber, and Chinese kale – and, according to production quantities and sales, identified critical technological entry points for reduction of post-harvest loss. Based on the outcomes of the study, subsequent research focused on certain areas and crops to reduce post-harvest loss.

To analyse the supply chains and post-harvest loss for vegetables, detailed interviews were conducted with actors at various points in the supply chain using a structured questionnaire. Three types of questionnaires were developed to gather general and specific information from supply chain actors. The generic information sought included: socio-demographic data, post-harvest loss estimates, trading information, marketing information (e.g. the monthly volume of produce purchased and sold, the prices achieved, the main trading partners, the monthly turnover of the entire business), and attitudes towards post-harvest loss. For farmers, details about production and harvesting practices were obtained based on the past year's production cycles. An upstream interview approach (retailers to farmers) was applied. Through proportionate sampling the objective was to ensure equal

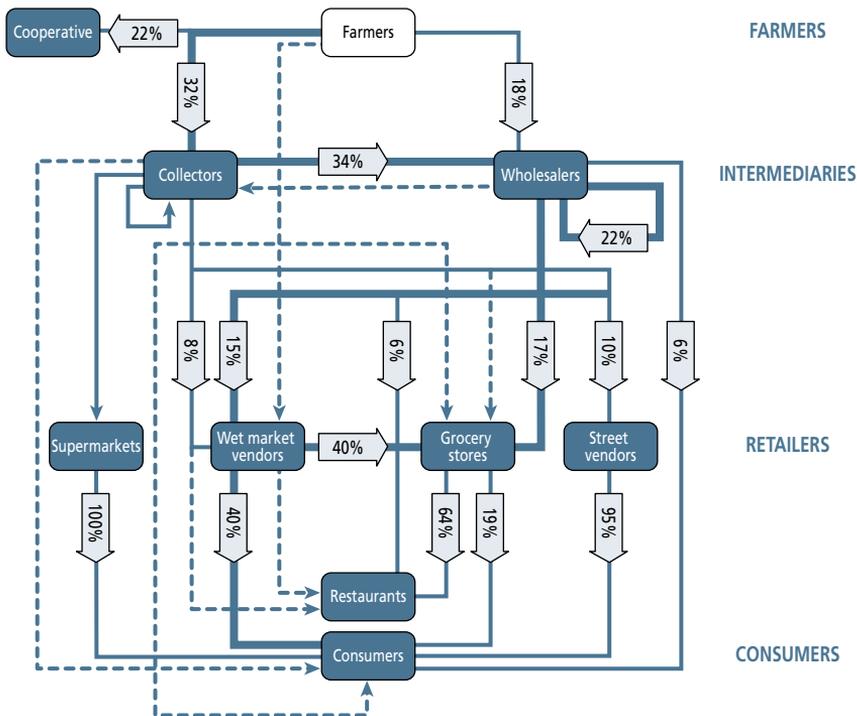
representation of retailers, intermediaries (collectors and wholesalers) and farmers, all from important production areas serving the larger cities of the countries involved. All actors were required to identify their main sources of the crop in question. After establishing the different forms of retail outlets for vegetables and their approximate share of total vegetable sales based on interviews with the key informant, the sample size of supermarkets, wet market vendors, small grocery stores and street vendors was determined. The initial respondents were selected at random from a list of retailers in two major cities in each country. At the conclusion of the retailer interview, intermediaries were selected based on the list of names provided by retailers; farmers were chosen from the list furnished by intermediaries. The sample included retailers, intermediaries and farmers. The number of actors surveyed was approximately equal: 190 retailers, 181 intermediaries and 187 farmers, for a total of 558 respondents in the three countries.

In the study, loss referred to produce unfit for human consumption, and excluded produce of lower quality that was still saleable. For farmers, post-harvest loss was quantified in absolute terms for produce lost *after* harvest, and then calculated as a percentage based on total harvested quantity. For intermediaries and retailers, loss was estimated as the difference between quantity purchased and quantity sold¹. To obtain a monetary value of the loss experienced, actual loss in kilograms (kg) was multiplied by the average selling price achieved in each month or harvest. This value was divided by the total amount of vegetables produced or purchased by each actor (kg) to obtain a value of loss based on a uniform denominator; the value was then added across all actors in the supply chain. The total number of observations used for collectors, wholesalers and retailers was the monthly observations collected for the entire year. For farmers, the total number of observations amounted to the past year's production cycles (a maximum of three production cycles in each country with one wet and two dry seasons). The data presented are a summary for wet and dry seasons. Data for post-harvest loss by individual actors along the chain was aggregated to obtain the total loss along the chain.

Figure 13.2 maps out the flow of fresh vegetables from the producer to the consumer level. Supply chain channels are similar across the various crops. Respondents were asked to identify the main actor they sold their produce to, and to estimate the share of produce sold. The percentages in green arrows represent the shares of vegetables that suppliers at different levels sold to their main trading partners as a share of total produce sold. Dotted lines represent minimal transactions by the actors (less than 5 percent). Where our analysis generated missing links between actors and their main buyers, the main sources of their vegetable produce, represented by solid lines with no percentage value, were added into the flow chart to obtain a complete picture of the demand and supply side of vegetable transactions in each country.

1 This approach may include small errors due to personal consumption.

FIGURE 13.2 Overview of the supply chain for fresh vegetables



Source: Weinberger et al. (2008).

The main flow of vegetables is highlighted by the thick black line and usually moves from farmers to collectors and wholesalers. Wholesalers either resell the produce to other wholesalers who distribute the product to other regions, or sell to grocery stores and wet market vendors who then sell vegetables to final consumers.

Table 13.1 provides an overview of the post-harvest loss situation across crops as perceived by various actors in the supply chain. Post-harvest loss was incurred by most supply chain actors, with 94 percent of farmers, 93 percent of intermediaries and 87 percent of retailers experiencing vegetable losses. The volume of loss per million tonnes of produce harvested or sold was highest for farmers, slightly higher than intermediaries and about 30 percent higher than that of retailers. Seasonal effects escalated the problem, especially among farmers, where losses increased by 20 percent during the wet season compared with other actors. The median of loss was lower than the average value for all actors, but still substantial, indicating that

TABLE 13.1
Post-harvest loss estimates in the vegetable supply chain

Parameter	Farmer	Intermediary	Retailer
Number of respondents (N)	187	181	190
Percentage share with loss	94.0	93.4	86.8
<i>Loss values</i>			
kg per million tonnes	64.8	61.1	43.0
US\$ per million tonnes	13.4	18.6	21.9
<i>Percentage loss</i>			
Dry season	6.0	5.9	4.2
Wet season	7.2	6.2	4.4
Average	6.4	6.0	4.3
Median	5.0	3.9	3.0
Maximum	50.0	90.8	69.4

Source: Weinberger et al. (2008).

most supply chain actors were affected by post-harvest loss. The maximum loss that a single supply chain actor experienced was 50 percent for farmers, 91 percent for intermediaries, and 69 percent for retailers.

Table 13.2 shows the accumulated loss values for specific vegetables in the supply chain per country. Tomato was the only crop surveyed in the three countries and had the highest physical loss – amounting to about 20 percent of production (205 kg per million tonnes) – of all the crops covered. The monetary value of loss was highest for chili, at about US\$75 per million tonnes. Cambodia had the highest post-harvest loss among the three countries. Factors that contributed to the high loss in Cambodia may have included relatively complex supply chains² – with more backward and forward linkages than in Laos – and lack of technological expertise in post-harvest handling and processing compared with Viet Nam. Across crops and countries, the average loss throughout the supply chain was about 17 percent.

2 The vegetable supply chain in Laos was rather short and direct. In contrast, there was a higher retailer participation in Cambodia and Viet Nam, i.e. supermarkets, wet market vendors, grocery stores and street vendors. In addition to final consumers, wet market vendors also cater to restaurants and grocery stores. A certain contingent of vegetables was supplied by importing suppliers and there was evidence that during certain months when local production was low, the share of imports to domestic supply was substantial.

TABLE 13.2

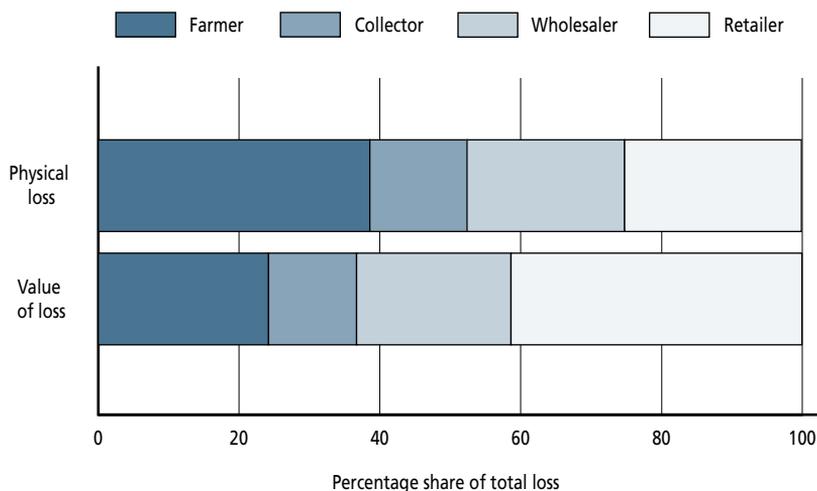
Total value of post-harvest losses in the vegetable supply chain by crop and country

Country		Tomato	Yard-long bean	Cucumber	Chinese kale	Chili	Average
Cambodia	N	50	50	50	50		200
	Kg/MT*	245.7	217.9	197.1	163.9		207.6
	US\$/MT	56.8	57.9	28.5	59.3		51.4
Laos	N	31	69	27		73	200
	Kg/MT	169	122.4	87.1		107.1	123.9
	US\$/MT	84.2	48.5	12.8		88.2	64.2
Viet Nam	N	105				53	158
	Kg/MT	191.2				168.7	184.5
	US\$/MT	35.3				60.1	43.1
Average	N	186	119	77	50	126	558
	Kg/MT	204.6	167.0	146.8	163.9	126.1	168.9
	US\$/MT	49.1	54.2	21.8	59.3	75.2	53.9

*MT = million tonnes. Source: Weinberger *et al.* (2008).

In terms of loss distribution, farmers incurred the highest physical loss of produce, estimated at nearly 40 percent of the total quantity lost in the entire supply chain, with a monetary value of about 25 percent of the total value of loss (Figure 13.3). The case is reversed for retailers, where the monetary value of loss was estimated at more than 40 percent and physical loss was only about 26 percent. These differences in physical and monetary values of loss at the farm and retail levels can be explained by the retail–farm price margins. Both physical and monetary values of loss were lowest for collectors, given that they merely transport the produce and have limited involvement in other value-adding activities such as re-packing.

The results showed that concentrating efforts only at the farm level to try to reduce post-harvest loss is not sufficient, and that losses further down the supply chain are relevant and large. The monetary value of loss and the consequent loss of economic opportunities is enormous. In 2005, the combined total vegetable production in the three countries was 8.5 million tonnes, worth US\$2 612.3 million (FAOSTAT, 2006). Assuming that 17 percent of this was completely wasted after harvest, this means a loss of 1.5 million tonnes of produce, worth US\$461 million. The loss quantified

FIGURE 13.3 Distribution of loss along the vegetable supply chain


Source: Weinberger *et al.* (2008).

would be even larger if the loss caused by reduced quality (qualitative loss), which always reduces product prices, and the loss of nutrients (nutritional loss) were also factored in.

13.3 Technological options developed

Supply chain actors provided information on various causes of loss that required technological and non-technological interventions. Some technological interventions had already been established (e.g. time and method of harvesting), and thus were directly available to overcome certain problems. Other technologies underwent research for adaptation and optimization to local conditions. Technology verification is important because a technology proven effective elsewhere may or may not work in another location, given a number of varying factors such as crop variety and growing conditions. Other technologies may not be practical in certain countries or localities, and may need to be modified using available resources.

Technology development under this post-harvest research and development programme addressed fresh produce handling and processing. Results of the supply chain surveys were validated and priority setting for research and development (RandD) to develop selected technologies was carried out during workshops.

RandD programmes initially focused on tomato and chili. Before undertaking these programmes, however, capacity building was critical because post-harvest RandD in vegetables was new to Cambodia and Laos partners, and the capacity of Viet Nam partners required upgrading. Post-harvest laboratories with basic facilities were established in Cambodia and Laos, the post-harvest laboratory in Viet Nam acquired new equipment, and training on post-harvest research and technology development was conducted with a component workshop to develop the RandD plan. A training manual incorporating a review of post-harvest techniques based on simple and low-cost technologies that should be adapted and optimized was selected for use in the workshops (Acedo and Weinberger, 2006b). Later, leafy vegetables were included and a workshop attended by GMS (Greater Mekong Subregion) network members was conducted to review the best practices in post-harvest management of leafy vegetables (Acedo and Weinberger, 2007), determine priorities, and plan for RandD programmes.

A series of post-harvest trials was conducted following standard experimental procedures. For tomato and chili, the AVRDC lines and commercial varieties used included those identified as having a good yield, and good shipping and processing qualities in on-station and on-farm variety trials in each country. For leafy vegetables (cabbage, Chinese/green mustard, Chinese kale, aromatic mustard, and kangkong or *Ipomoea aquatica*), commercial varieties were used. Brief descriptions of the research that took place to identify the most promising technologies are now outlined.

13.3.1 Cooling

Precooling

It was thought that rapid removal of product heat by precooling could improve the storability of tomato. A simple, portable, knockdown-type hydrocooler was developed (Acedo *et al.*, 2008b). Water was cooled using ice to 10 °C, monitored with an ordinary bulb thermometer, and the fruit was dipped for 4–12 minutes before storage at ambient or chilling temperature (10 °C). Hydrocooling for 12 minutes proved to be the most promising: it retarded fruit reddening and maintained high soluble solids at both storage temperatures. It also slowed the rate of acidity loss and reduced chilling injury at 10 °C.

Evaporative cooling storage

Evaporative coolers usually create slightly reduced temperatures but provide higher relative humidity (RH) than that at ambient temperature, which could be effective in improving shelf-life of fresh produce. Three simple evaporative coolers were developed: a brick-walled cooler with moistened sawdust (type 1) or moistened sand (type 2) as wall insulation, and a box-type cooler (type 3) covered with moistened jute sacking sewn to fit the structure (Acedo *et al.* 2009c; Vandy *et al.*, 2008a; Vandy *et al.*, 2008c). The vegetables were placed in trays inside the storage chamber. During storage, the evaporative cooler temperature and RH

were about 1–10 °C lower and 10–25 percent higher than at ambient temperature: 22.5–42 °C and 32–89 percent RH, respectively. As a result, weight loss decreased and shelf-life increased.

13.3.2 Packaging

Modified atmosphere packaging

Keeping produce in polymeric films creates low oxygen, high carbon dioxide, and high humidity conditions that retard quality deterioration. Modified atmosphere packaging (MAP) trials were conducted using three commercially available plastic films: low-density polyethylene (LDPE), high-density polyethylene (HDPE) and polypropylene (PP) of different thicknesses (25–75 microns) with and without perforations as vents (Acedo *et al.*, 2009b. Acedo *et al.*, 2008d; Chanthasombath *et al.*, 2008; Vanndy *et al.*, 2008b; Vanndy *et al.*, 2008d). Storage was at ambient temperature. The inclusion of an ethylene scrubber sachet (0.1–0.4 percent potassium permanganate) in MAP-wrapped leafy vegetables for control of yellowing was tried and in some trials, storage at ambient temperature and in a cold chamber (10–13 °C) was compared (Acedo *et al.*, 2009a). Cost-benefit analysis by partial budgeting showed that the techniques are potentially profitable.

TABLE 13.3

Technical and monetary benefits of using grid-polystyrene crate with paper shreds in reducing fruit damage of different tomato varieties relative to the use of carton box

Harvest maturity	Variety	Fruit damage reduction (%)	Net returns* (US\$/kg)
Breaker fruit	CLN2123A (AVRDC)	13	0.03
	CLN2498E (AVRDC)	18	0.05
	Perfect 89 (Syngenta)	18	0.05
Turning fruit	FM1080 (local)	11	0.02
	CLN2123A (AVRDC)	13	0.03
	CLN2498E (AVRDC)	18	0.05
	Perfect 89 (Syngenta)	15	0.04
	FM1080 (local)	11	0.02

* Calculated as the difference between the monetary saving attributable to damage reduction, and the added cost of using grid-polystyrene crate with paper shreds over the cost of carton box. Cost of 25 kg carton box (used only once) = US\$1; 25 kg grid-polystyrene crate (assumed to be used 3 times) = US\$3; paper shreds = US\$0.2/kg (1 kg/container); labour = US\$3.5/person-day (1 crate packed in 5 mins). Price of tomato = US\$0.5/kg.

TABLE 13.4

Tomato fruit decay reduction using 2 percent bicarbonate washing prior to storage in evaporative cooler (EC) and its monetary return based on partial budget analysis.

Tomato variety	Decay incidence (%)		Net return* (US\$/kg)
	With bicarbonate wash	Water wash (control)	
CLN1462A (AVRDC)	14	18	0.26
TLCV15 (AVRDC)	9	27	0.40
T56 (local)	4	37	0.33
TMK1 (local)	0	15	0.31

* Calculated as the difference between the monetary saving due to decay reduction and shelf-life improvement and added cost of bicarbonate wash and EC storage over that of water wash and ambient storage. Costs per 1000 kg tomato per year: baking soda = US\$2; EC annual depreciation = US\$100 (EC used 10 times/year); labour = US\$5; water (4 m³/year) = US\$2. Price of tomato = US\$0.5/kg.

Packaging system

Different packaging methods for tomato in Viet Nam (a 25 kg carton box and grid-polystyrene crate with and without paper shreds as cushioning material) were evaluated for reducing physical damage through simulations of handling hazards by drop test (Thanh *et al.*, 2008). The use of grid-polystyrene crates with paper shreds was the most promising and its financial return was estimated by partial budget analysis (Table 13.3).

13.3.3 Commodity treatments

Tomato decay control

Tomato storage is limited by decay. Pre-storage washes in 1–2 percent bicarbonate solution (prepared using food-grade baking soda) for 2 minutes, or 100–200 ppm chlorine solution (prepared using commercial bleach, 5.25 percent sodium hypochlorite) for 3 minutes, were tried as possible decay control treatments (Acedo *et al.*, 2008a; Acedo *et al.*, 2008c). After washing, the fruit was rinsed in water. Promising results were obtained only with 2 percent bicarbonate wash during storage in the evaporative cooler. The technical and economic benefits are shown in Table 13.4.

Cabbage soft rot control

Bacterial soft rot is the most serious post-harvest problem of cabbages in the humid tropics, causing enormous losses due to trimming after transport and during marketing. As possible control measures, three indigenous and safe treatments were tested: lime paste prepared as 1:1 lime powder and water mixture; 15 percent

TABLE 13.5

Promising treatments for the control of bacterial soft rot in cabbage in Cambodia, Laos, and Viet Nam and monetary return based on partial budget analysis

Country	Treatment	Trimming loss due to soft rot (%)	Net returns* (US\$/kg)
Cambodia	Lime	8.7	0.15
	Alum	20.3	0.09
	Guava leaf extract	7.2	0.15
	Water (control)	44.3	
Laos	Lime	0.0	0.12
	Alum	0.0	0.12
	Guava leaf extract	0.0	0.11
	Water (control)	20.0	
Viet Nam	Lime	0.0	0.16
	Guava leaf extract	2.0	0.14
	Water (control)	33.4	

* Calculated as the difference between the monetary saving due to trimming loss reduction and added cost of the treatment over that of the control. Costs per 1 000 kg cabbage: lime = 1 kg at US\$1; alum = 0.5 kg at US\$1/0.5 kg; mortar and pestle for guava leaf extraction = US\$4 (2 units at 2US\$/unit); labour = 5–7 person-days at US\$3.5–5.0/person-day. Price of cabbage: US\$0.5–0.7/kg.

alum solution (15 g alum granules in 100 mL water); guava leaf extract as 1:1 pure extract and water mixture (Acedo *et al.*, 2009d). These control agents were applied using any suitable applicator (e.g. fine brush, cloth, or cotton) at the cut butt end of the cabbage head where soft rot usually develops. Water served as a control. After air-drying, a paste made from soft-rot affected cabbage butts was spread on the cut surface, simulating possible infection of cabbages during post-harvest handling. Responses were consistent and promising treatments for soft rot control were identified for each country (Table 13.5).

13.3.4 Processing technologies

Solar drying

Dehydration can extend the marketability and usability of vegetables. In developing countries such as Cambodia, Laos and Viet Nam, vegetables are usually sun-dried in the open air, which is slow, weather-dependent, and subject to physiological and

hygiene-related problems. These constraints could be minimized by placing the produce in an enclosed solar drying chamber where it is protected from dust, rain, stray animals, and so on. Simple solar dryers were designed and manufactured in Cambodia (cabinet solar dryer and a solar dryer with heat collector—Royal University of Agriculture, Phnom Penh), Laos (solar dryer – National University of Laos), and Viet Nam (a solar dryer that combined the features of the Cambodia and Laos designs). The solar dryers maintained much higher temperatures and lower RH than those achieved under sun-drying conditions. In Cambodia, drying trials were conducted for chili and cabbage, with the latter first being shredded, mixed with 5 percent salt, and fermented overnight (as in traditional practice) before drying. The two solar dryers accelerated drying to less than 10 percent moisture content in chili in three days instead of six days for sun-drying, and in cabbage to one day instead of two to three days for sun-drying. In the Laos chili drying trials, drying rates differed according to variety, apparently as a result of differences in morpho-anatomical structures. Nevertheless, the solar dryer again accelerated drying of the produce compared with sun-drying (Table 13.6). Dipping in 65 °C water for 3 minutes was included as a pre-drying treatment to preserve the red colour of the fruit. In the Viet Nam trials, the use of the solar dryer similarly resulted in faster drying. Cost and return analysis showed that dried chili production could yield 32.5 percent higher income than fresh chili production.

TABLE 13.6

Days to achieve less than 10 percent moisture content of different varieties of chili dried using a solar dryer and in the sun

Chili variety*	Days to <10% moisture content	
	Solar dryer	Sun-drying
CCA 321 (AVRDC)	2	12
CCA323 (AVRDC)	6	12
PBC142 (AVRDC)	1	6
DemonF1 (commercial variety from Thailand)	6	8
Local variety	2	6

*All varieties belong to *Capsicum annuum*, except the local variety, which is *C. frutescens*.

Paste/sauce processing

Tomato paste and chili-tomato sauce processing trials were conducted. One trial determined the effects of tomato variety on the paste product processed following

the method developed at the Royal University of Agriculture, Phnom Penh. Two AVRDC lines (CLV1462A and TLCV15) and two commercial varieties (T56 from Viet Nam and the local TMK1) were used. The variations in paste quality resulting from different crop varieties provided useful benchmarks for choosing fruit for processing. For example, fresh paste from T56 showed the best quality, mainly on account of the deep red colour of the fruit, while pastes from CLN1462A and TLCV15 had more stable storage quality because colour and flavour was better maintained, especially compared with TMK1. In another trial, different combinations of tomatoes (CLN2498E and CLN2123A from AVRDC, Perfect89 from Syngenta, and FM1080 from the Fruit and Vegetable Research Institute, Hanoi) and chili (9955–15 and CCA321 from AVRDC, and Ox Horn, a local variety) were tested. The sauces were of good sensory quality regardless of chili-tomato variety combination, except for the 9955–15 and FM1080 combination, which had inferior colour, texture, and taste. Dark storage – keeping the bottles of sauce in a closed carton box – maintained better taste quality than storing bottles in the open. Profit analysis calculated the net return of chili-tomato sauce production at US\$0.04 per 250 gram jar and US\$151.5 per million tones of product.

Fermentation

Cabbage and Chinese mustard fermentation was optimized in Viet Nam in winter and summer using different salt concentrations (6–14 percent) and fermentation periods (2–10 days). Cabbage required higher salt concentration (10 percent) than Chinese mustard (8 percent), but the optimum fermentation period for both crops was the same, 4 days in winter and 2 days in summer. The fermented products had better sensory qualities and shelf-life than those produced using other salt levels and fermentation periods. Cost and return analysis for cabbage fermentation revealed that it could realize 23.2 percent higher income than fresh market production. Profit analysis for Chinese mustard fermentation showed a net income of US\$0.09 per 500 g jar and US\$190 per million tonnes of product. The optimized fermentation procedure for cabbage was adopted in Cambodia and for Chinese mustard in Laos; it was compared with traditional methods and those developed by the national universities. In both countries, the Viet Nam process was found to be very desirable for longer shelf-life. However, the products produced by the local methods were more positively appreciated in terms of colour and taste.

13.4 Evaluation of project outcomes

The technologies described above were disseminated to supply chain actors through a series of training programmes. In late 2006 to early 2007, a total of 237 actors along the supply chain in Cambodia, Laos and Viet Nam received training in post-harvest handling and/or processing of vegetables. These training sessions were held to test the approach for large-scale training programmes currently being conducted

with 2 000 supply chain actors in Cambodia, Laos and Viet Nam. Training manuals on post-harvest technologies for tomato, chili and leafy vegetables (Acedo and Weinberger, 2009, 2006a) were developed based on the results of RandD work and other information on best practices from various sources. These were translated to country languages, distributed during training sessions, and for wider dissemination were uploaded to the AVRDC post-harvest web page³. Demonstrations of some technologies were set up prior to the training so that trainees could observe the actual outcomes or results brought about by using the technologies. This increased the credibility of the training programmes and helped to build the trainees' trust and confidence in the training providers.

Monitoring and evaluation are tools to help manage the resources and activities of a project to enhance its impact throughout its term, and beyond. Under this post-harvest project a number of monitoring and evaluation tools were applied. These included regular assessments of training courses by participants, an interim assessment of training impacts, and a formal assessment of the impact of the pilot trainings two years after they were conducted. The evaluation of these pilot trainings is described now.

A questionnaire for the evaluation of the pilot training was distributed to partners for feedback and translation into local languages. Fifteen respondents per country were selected at random, based on the list of training participants available for each country; those unavailable were replaced accordingly. The complete sample included 45 respondents. The questionnaire was organized around ten open-ended questions. These covered aspects such as retention of information, details about the technologies adopted, impact on farm operations and livelihoods, and constraints to adoption. The survey was conducted in early 2009, with the following results.

13.4.1 Adoption of technologies

A very high share of respondents (all but one) in Viet Nam initially adopted one or more of the post-harvest techniques (Table 13.7). The share was lower in Laos and Cambodia. In these two countries, around 50 percent of respondents initially adopted one or more of the technologies covered in the training programmes. Two years later, 60 percent of the respondents in Viet Nam, 40 percent in Laos, and 27 percent in Cambodia still used one or more of the technologies. Of these, one or two respondents in each country modified the technologies and also used them on other crops.

Farmers adopted practices for fresh produce and for processing (Table 13.9). More farmers adopted fresh produce handling technologies (10) than sun-drying technologies (7) or processing technologies (6). Fresh produce handling practices

³ Available at: <http://www.avrdc.org/post-harvest>.

TABLE 13.7
Retention and adoption rates of training participants after two years

Particular	Cambodia		Laos		Viet Nam		All
	N	%	N	%	N	%	%
Adoption of techniques	6	40	8	53	14	93	62
Currently using the techniques	4	27	6	40	9	60	44
Modified the techniques	1	7	1	7	2	13	11
Stopped using the techniques	2	13	2	13	5	33	20

Source: Weinberger *et al.* (2009).

TABLE 13.8
Average number of techniques adopted by respondent

Country	Mean	Number of farmers
Cambodia	1.8	6
Laos	2.4	8
Viet Nam	2.1	14
Total	2.1	28

TABLE 13.9
Overview of post-harvest technologies currently in use

Classification	Share (%)	Specific technique
Fresh produce handling techniques	63	Careful harvesting and harvesting produce with <i>calyx</i> intact
		Careful handling of fresh produce
		Proper storage
Sun drying techniques	37	Chili sun-drying
		Tomato sun-drying
Processing techniques	32	Tomato paste processing
		Chili sauce processing

Average number of technologies adopted by each farmer is two, based on number of farmers (19)
Source: Weinberger *et al.* (2009).

included: harvesting with an intact *calyx* (tomato) and using scissors to cut the fruit from the vine; harvesting at the appropriate stage, i.e. when the fruit turns pink; careful handling of produce after harvest, e.g. using soft leaves or old newspapers to cover baskets before loading; gentle loading into appropriate containers; storage of harvested produce in cool rooms or in the shade; sorting and grading by colour and size; packaging into suitable containers. Farmers who adopted practices for handling fresh produce usually changed a range of practices between harvesting and selling.

The processing technologies that farmers adopted included practices for chili and tomato drying using a simple solar dryer, and for the preparation of chili sauce and tomato paste with improved hygienic standards, by filtering water and boiling glass bottles and lids.

13.4.2 Benefits of using post-harvest technologies

The adoption of the post-harvest technologies presented in the training courses has led to a number of benefits for the trainees (Table 13.10). All adopters in Laos, 86 percent in Viet Nam, and 67 percent in Cambodia, provided specific examples of the benefits they experienced from applying the improved technologies.

The range of benefits includes, among others, the reduction of post-harvest loss and enhanced product quality. Eight out of 24 trainees (33 percent) reported a reduction in post-harvest loss, and eight trainees reported an improvement in produce quality. For example, several farmers in Viet Nam recounted how their losses dropped to as little as 1–2 percent from almost 30 percent before the training.

The results also show that impact on farm profits is large. Around 71 percent (17 of 24) of the adopters reported that their farm profits increased because of higher prices, price differentiation for products of different grades, and being able to sell larger quantities. For example, one trainee reported that her sales of dried chili increased from 1–2 kg/month to 30–40 kg/month after training. Another retailer recounted that, while previous processing of dried chili was for home consumption only, after the training he began selling about 20–30 kg/month. One farmer from Vang Vieng District in Laos, who previously sold approximately 40 kg/year of dried chili for Laotian Kip (K)15 000/kg, was able to increase sales to 100 kg/year for an average price of K20 000/kg, a rise in price of 33 percent, and a 2.5-fold increase in volume. Another farmer was able to obtain a 25 percent higher price for tomatoes as a result of a change in harvesting practices.

The majority (80 percent) also reported an improvement in their buyer-seller relationship. While some farmers were able to find a larger number of buyers, many farmers reported that their buyers were satisfied, and crops could more easily be sold. There were cases in which the number of buyers doubled or even quadrupled after

participation in the training. In one case, a farmer from Hadxayfong District increased the number of trading partners to ten collectors, up from five collectors in 2007. Another farmer reported increasing the number of his buyers to 20, compared with five to seven in the past. Several farmers mentioned that overall it became easier to sell produce.

Other benefits respondents referred to related to enhanced knowledge and increased consumption.

TABLE 13.10
Benefits of using post-harvest technologies

Main benefit	Share (%)	Specific benefit	Share (%)
Buyer network	79	Satisfied buyers	54
		Increased number of buyers	29
		Crops can now be easily sold	29
Farm profit	71	Price differentiation	54
		Higher quantity sold	21
		Product diversification	17
Reduced loss	33	Reduced loss	33
Product quality	29	Better appearance	21
		Tomato paste is guaranteed clean	12
		Longer shelf-life for dried chili	8
Income stability	13	Contract arrangement	4
		Regular income	8
Other benefits	42	Improved knowledge	29
		Higher consumption of tomato paste	8
		Solves the problem caused by overpacking	4
		Time saved	4
		Wastes used as animal feeds	4
		Expanded relationship with neighbours	4

Based on number of farmers (24) Source: Weinberger *et al.* (2009).

13.4.3 Impacts on livelihoods

One important aspect of this evaluation was to assess whether new knowledge and skills acquired through the training programmes made a difference in the livelihoods of respondents. Results show positive impacts on the livelihoods of all the adopters from Laos, and half of those from Cambodia and Viet Nam (Table 13.11). Increased income was used mainly to invest in appliances (e.g. gas cooker, TV), equipment for farm operations (e.g. a generator for an electric pump, a motorbike) and land. In Laos, educational expenses were covered and additional savings were deposited in the bank. One respondent each in Laos and Viet Nam reported opening another business.

One particular trainee from Viet Nam was a remarkable example of the high potential for employment creation in a favourable environment. A former collector from Hai Hau District, Nam Dinh Province, he invested in a processing plant because farmers in his area had expanded vegetable production, on account of the higher income that can be realized compared with producing rice.

There was a surplus of tomato and chili during production peaks. The training course he attended in January 2007 provided him with handling and processing technologies and advice on factory construction and processing equipment. After attending the training course, he borrowed capital from the Viet Nam Bank for Agricultural and Rural Development (AGRIBANK) to invest in land, a building/factory, equipment, and two transport trucks. He started drying tomato and chili in December 2008, and subsequently expanded his drying operations to other products such as Vietnamese palm, onion, pumpkin, ginger and garlic. He reported that for the future he intends to move into producing tomato paste and chili sauce, as well as other processed products such as pickled cucumber and syrups. Currently he employs up to 100 people. This respondent has also initiated discussions with two export companies.

TABLE 13.11
Impact of post-harvest technology adoption on farmers' livelihoods

Impact factor	Share (%)
Increased income	100
Able to purchase other assets (e.g. land, motorbike, TV, etc)	61
Sent children to school	17
Saved money in the bank	17
Opened another business	11
Provided employment to family members	6

Based on number of farmers (18)

Source: Weinberger *et al.* (2009).

13.4.4 Constraints to adoption

Because a relatively large number of farmers in Cambodia chose not to adopt any of the technologies after the training, it is interesting to identify the underlying causes. The largest number of farmers (56 percent) did not adopt any of the technologies because of a lack of time, land or capital. Lack of time may also reflect a lack of interest in the post-harvest technologies. For eight participants, most from Cambodia, the training was irrelevant. The study found a high number of Cambodian respondents who were not (or who are no longer) chili or tomato growers. Six trainees were not interested in the training topics offered and chose not to adopt any of the technologies.

In all three countries, the adoption of processing technologies was less sustainable than fresh produce handling practices. Two farmers (22 percent) in Laos who gave up fresh produce handling technologies did so because they left the farming sector. All other respondents (78 percent) simply stopped using the processing and/or drying techniques because of a lack of time and capital. This highlights the need for access to credit; lack of credit can be a constraint to adoption, especially of processing technologies.

TABLE 13.12
Technologies initially adopted but later discontinued

Technology	Share (%)	Reason for discontinuing use	Share (%)
Tomato paste processing	44	Lack of time to do processing	44
Chili drying	33	Lack of capital and/or machinery	22
Chili sauce processing	33	Stopped collecting/retailing	22
Fresh produce handling technique	22	Only wanted to try and test the technique	11
Tomato sauce processing	11	Chili sauce is readily available in the market	11
		Prefers fresh tomato to tomato paste	11
		Year-round production of tomato: no need for processing	11

Based on number of farmers (9) Source: Weinberger *et al.* (2009).

13.5 Discussion

13.5.1 Relevance of the problem

Nearly all supply chain actors reported that they incurred large volume losses. The average loss of these vegetables along the entire supply chain from farmers to retailers was about 17 percent, but differed by country, type of produce and even growing season. This was anticipated as every country has its own peculiarities in supply chain and handling practices. Different vegetables have different degrees of perishability and susceptibility to hazards in the post-harvest period, during which environmental conditions vary with time of year. It is likely that this loss situation prevails in the entire vegetable industry of the three countries. All actors along the supply chain were affected, indicating that solutions to reduce post-harvest loss must address different stages along the supply chain.

Supply chain actors would have better control over product quality, longevity and marketability through appropriate storage and processing techniques, as well as through better market coordination. Improved market coordination would lessen the oversupply of produce and thus reduce waste. A major component of improved market coordination is market information, yet studies in the region indicate a lack of availability or use of information (Genova *et al.*, 2006a; Genova *et al.*, 2006b; Genova *et al.*, 2006c). Interventions that address the availability of information related to produce volume and quality requirements could help to reduce waste. Another important requisite for ensuring market coordination is the standardization of product quality. Product quality standards serve as the universal language that guides supply chain actors in producing, handling and marketing agricultural produce. Without product quality standards, poor quality produce will be a persistent problem in the supply chain. Poor quality produce was the second leading cause of loss at the retail level, likely caused in part by poor transportation during distribution from the farm or wholesale market to the retail market. An immediate solution to this problem is greater care during harvesting, as well as interventions that address packaging and transport conditions.

13.5.2 Factors that contributed to the successes and failures of the project

Technically and economically feasible packaging systems (e.g. MAP, polystyrene crates) and commodity treatments (e.g. bicarbonate wash for tomato decay control, lime treatment for cabbage soft rot control) were developed that can enhance quality and shelf-life and reduce loss during transport and storage. These and other technologies developed for fresh produce handling (e.g. precooling, evaporative coolers) and processing (e.g. solar dryers, tomato paste and chili-tomato sauce

processing, fermentation of leafy vegetables) provided farmers and other supply chain actors with more alternatives for better control of product quality and marketing, and for generating more income. It is vital that these technologies and other best practices in produce handling and processing reach the users of such technologies. Thus, a training programme was developed to address this need. Careful planning and preparations are essential for successful training, including capacity building of country partners, training teams, and developing the RandD and training master plans.

Adopters of technologies noted the benefits of post-harvest technologies. The majority of the intermediaries had an explicitly positive attitude towards the technology changes because of the positive impact on produce quality. Improved networks, which in turn lead to greater demand for produce from a larger number of buyers, were most important to farmers. In many cases this translated into higher farm profits and profit stability. Farmers reported an increase in price of 25–30 percent, and in many cases, substantial increases in the volume of sales. There were reports that losses had gone down to 2–3 percent, from previous rates of 20–30 percent. Substantial improvements in income were observed for those who adopted the improved post-harvest technologies, ranging from 25–30 percent. Other beneficial impacts at the community level were also reported, and the most striking among these was employment generation.

Fresh produce handling technologies involve little additional effort and investment, therefore adoption rates were high. In contrast, a move to commercial processing requires investment in infrastructure and equipment, which is difficult without access to capital and risky in a situation where small-scale businesses are not supported by the political environment. Adoption rates for processing technologies were lower, therefore.

Because the benefits of fresh produce handling are high and attainable without the need for large investment, it is worth identifying major constraints in the uptake of the technologies. An analysis of non-adopters suggested that careful selection of participants is crucial for the success of future training programmes. Trainers and trainees alike should be selected based on criteria that indicate the likelihood of the respondent to make further use of the technologies. Current involvement in production, handling, and marketing of fresh or processed vegetables is one such indicator. Another approach could be to request that participants make a small contribution to the training programme, perhaps in-kind, e.g. by offering food. As in the past, training programme participants should include all actors along the supply chain, because intermediaries play an important role in the uptake of technologies.

13.5.3 Recommended models of good practice for small scale post-harvest and processing technologies

Overall, the results discussed here indicate that several strategies can contribute to the development of the post-harvest and marketing sector for vegetables, with the objective of enhancing the livelihoods of small and marginal farmers. These strategies include both technological and organizational interventions:

- ▶ To contribute to a reduction of post-harvest loss for farmers, more research is required on pest and disease-resistant varieties and improved production methods. Insect pests and fungal diseases were identified as major reasons for loss.
- ▶ In designing training and other dissemination activities, limited access to credit should be considered. Previous studies indicate that farmers' access to credit is very limited, especially in Cambodia and Laos. NGOs providing microfinance could become involved in training programmes. This may enhance uptake of equipment-intensive processing technologies.
- ▶ Recruiting the most successful trainees to lead future training programmes is one way to expand on experiential learning. The positive experiences of these successful trainees can convince others about the usefulness of the technologies.
- ▶ Processing at farm level is underdeveloped in Laos and Cambodia, and farmers in both countries face high price variations. Farmers also reported a lack of knowledge on how to conduct processing; access to the credit necessary for the procurement of equipment is also a limiting factor. Training in processing technologies may be a viable approach, especially in collaboration with microcredit NGOs.
- ▶ Technologies and varieties that allow year-round production of leafy vegetables – as is occurring in Viet Nam – could help reduce price fluctuations and contribute to year-round income.
- ▶ Encouraging value-addition at farm level should focus on the promotion of grades and standards, especially in Laos and Viet Nam, as these are important for the development of high-value agricultural markets: currently an underdeveloped sector in these two countries.
- ▶ In terms of enhanced efficiency of the supply chain, two areas for intervention deserve attention. More emphasis on collective marketing by farmers can reduce marketing costs and enhance the bargaining power of farmers. Contract farming is another area for development. Currently, very few farmers are engaged in contract farming and opportunities for farmers to become involved in contract production and marketing are limited.

13.6 Conclusion

AVRDC – The World Vegetable Centre – aims to address post-harvest loss in vegetables through a supply chain approach administered through research and development efforts in Cambodia, Laos and Viet Nam. These efforts include studying and quantifying loss in vegetables along the entire chain, identifying appropriate strategies, conducting research for adaptation of available technologies, and developing a training programme for wide dissemination of technologies. The benefits of adopting post-harvest technologies were high and involved improved supply chain networks, higher farm profit, and profit stability. Farmers reported an increase in prices of 25–30 percent, and in many cases substantial increases in the volume of sales. There were reports that losses had gone down to 2–3 percent, from previous rates of 20–30 percent. In future, more emphasis should be placed on developing and disseminating post-harvest handling and processing technologies and facilitating the access of smallholder farmers to these technologies, especially in the upland areas of Cambodia, Laos and Viet Nam. The limited post-harvest and value-adding activities that currently characterize the sector are a positive step towards providing the scope and potential to enhance the livelihoods and well-being of millions of small and poor farm households.

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