

# Rural transport of food products in Latin America and the Caribbean

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**Cover photograph:**

Transfer of agricultural products from farmer to buyer, Guatemala.  
Leonardo F. De León/Guatemala.

# Rural transport of food products in Latin America and the Caribbean

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## Foreword

Transportation is fundamental for the development of human activities, especially production and trade-related activities, including the production and trade of agricultural products. The swiftness and cleanliness of transport have a direct impact on food availability, given the special nature of food of agricultural origin, which is always to some extent perishable. Sanitation, food safety and the economy in general all come into play here, especially the cost structure of the supply chains and the final price of food products.

All countries face serious logistical problems, depending on their climatic conditions and the lay of their lands. They use the most disparate means available to transport their goods – which may be shouldered by people, carried on muleback or in vehicles of all sizes and shapes pulled by people, or animals or perhaps engine-drawn. Goods may be moved by road, rail, air or ship – all to reach the end consumer on time and in good condition. There are regions, however, populated by millions of people (usually the poorest people), where transport problems are especially acute. In large areas of the world, transport problems keep people in isolation, with very little chance to develop and to better their lot in life. These difficulties are often why people remain isolated and unable to meet their most basic needs for food, education and health.

Even more importantly, the direct factors involved in transport are not independent: they involve a whole series of closely related activities. These include the storage, processing, industrialization and distribution of food products, all of which give rise to a great volume of activities and demands for infrastructure, thus generating jobs in parts of the world often sidelined, and where unemployment is very high.

This document presents case studies drawn from 17 countries of Latin America and the Caribbean. Duly adjusted and adapted, they may also be useful for an interpretation of transportation problems in other parts of the world. The study covers the region of Central America and Panama (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama), the Expanded MERCOSUR countries (Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay), and the Andean Pact countries (Bolivia, Colombia, Ecuador, Peru and Venezuela). One country from each of these three regions is also reviewed in detail.

FAO's Agricultural and Food Engineering Technologies Service (AGST) of the Rural Infrastructure and Agro-Industries Division believes that the search for solutions to these problems deserves due consideration and support. This complex productive network has great impact on a country's economic efficiency, and on its GDP. It is unquestionably FAO's duty to offer its member countries information and opportunities for technical assistance in these disciplines, which are so fundamental to the social and economic development of their populations.

## Acronyms and abbreviations

ALADI	Latin American Integration Association
ALCA	Central American Free Trade Association
ADC	Andean Development Corporation
ACN	Andean Community of Nations
CACIA	Costa Rican Chamber of the Food Industry
CACM	Central American Common Market
CENMA	Central Wholesale Market (Guatemala)
COMITRAN	Commission of Ministers of Transport
CORPOICA	Colombian Corporation for Agricultural Research
EAP	Economically active population
ECLAC	Economic Commission for Latin America and the Caribbean
FONAPAZ	National Peace Fund
FONPLATA	Financial Fund for the Development of the River Plate Basin
GDP	Gross Domestic Product
GFP	Good Farming Practices
GMP	Good Management Practices
HACCP	Hazard Analysis and Critical Control Point
IBTA	Bolivian Institute of Agricultural Technology
IFAD	International Fund for Agricultural Development
IICA	Inter-American Institute for Cooperation in Agriculture
ILO	International Labour Organization
INCAE	Central American Institute of Business Administration
INDDA	Agroindustrial Development Institute
INDEC	National Institute of Statistics and the Census (Argentina)
INDECORI	Institute of Industrial Research and Technical Standards
INEI	National Institute of Statistics and Informatics (Peru)
INIA	National Institute of Agricultural Research (Peru)
INIA	National Institute of Agricultural Research (Venezuela)
INIAP	National Institute of Agricultural Research (Ecuador)
INTA	National Institute of Agricultural Technology (Argentina)
ITDG	International Technology Development Group (Peru)
MAGA	Ministry of Agriculture, Livestock and Food (Guatemala)
MERCOSUR	Southern Common Market
OIRSA	International Organization for Plant Protection and Animal Health
NGO	Non-Governmental Organization
NARE	Non-agricultural rural employment

PIRT	Rural Transportation Infrastructure Programme (Peru)
PRODAR	Rural Agroindustrial Development Programme (Peru)
SUNAT	National Superintendence of Tax Administration
SWOT	Strengths, opportunities, weaknesses, threats
UNDP	United Nations Development Programme
UNIFEM	United Nations Development Fund for Women
VAT	Value Added Tax
WB	World Bank
WTO	World Trade Organization



# Introduction

## RURAL TRANSPORT OF FOOD PRODUCTS IN LATIN AMERICA AND THE CARIBBEAN

Transport operations are a basic component of agrofood supply chains. They may contribute to entrepreneurial success and profits or they may spell failure and physical and economic losses for producers and other entrepreneurs at any scale of operations. Food transport is a highly complex operation. Fresh or processed products are moved raw or processed for direct consumption or for use as raw materials or ingredients in the preparation and manufacture of food, or even non-food products. Food transport is unique in that food materials are highly complex biochemical entities subject to damage by a host of agents ranging from heat, moisture, light and other physical and biochemical factors, to micro-organisms or poor handling practices. They are entities with a specific shelf life determined by their specific composition, history, handling and environment, and are therefore perishable. Food quality and safety can be seriously compromised unless transport operations are correctly and promptly carried out. This can nullify every effort made at the farm, processing plant, storage and sales stages. Lack of equipment and proper transport practices, poor transport infrastructure and logistics are crucial factors. They must be addressed to ensure food quality and safety, achieve highly efficient supply chains, and ensure the necessary sales and earnings for all involved (Heap *et al.*, 1998).

Transport affects the cost structure of supply chains and final product price in many ways. Indeed, transport is frequently the most expensive operation in the entire food chain. It can be the decisive factor for the success of a productive or business activity, or else the one constraint that makes costs prohibitive or renders a project economically unviable.

In many developing countries rural transport concerns not only the marketing of food products and the household tasks of procuring food and other essential inputs such as water and fuelwood, it also involves the basic needs of mobility and access to markets and social services, including schools and health centres. There are many low-cost alternatives for transporting small loads in rural areas. These range from carrying the load on the backs of animals or people, to shouldering loads with a pole to carry a double or single burden, to the use of carts, bicycles or motorcycles (UNIFEM, 1999).

The transport factor therefore not only affects final costs, but home food security and the competitiveness of producers and other key actors in the agrofood chains. This is independent of the scale and capacities of farmers and business people, which may be micro, small, medium or large. Transport is so important that it may become a barrier for small producers and for the development of efficient, lucrative agribusinesses. Transport is, in short, a key link in the supply chain.

Clearly, there are major needs in the post-production food chain in developing countries that demand strategies and policies, and technical and managerial action within the institutional and private sector frameworks including resource allocation plans and programmes to help improve food product transport systems, and enhance agricultural development in these countries (Mrema and Rolle, 2003).

## STUDIES ON THE RURAL TRANSPORT OF FOOD PRODUCTS

The Agricultural and Food Engineering Technologies Service (AGST) carried out three studies based on an exhaustive review of the documentation backed by primary field data on

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key topics, analyzing the needs and opportunities for improved rural transport of agrofood products. It includes scenarios for the various food chains in different countries of Latin America and the Caribbean.

The work was subdivided into three sections designed at the same time to reflect the nature of the regions with some fairly specific coverage of sub-regions and specific countries. The first of the three sections covers the Central American Region, with general information on Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama, and specific examples and information from the field for Guatemala, in particular. The second section covers the Andean Pact countries: Bolivia, Colombia, Ecuador, Peru and Venezuela, with specific examples from Peru. The third section covers the expanded MERCOSUR countries: Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay, with specific field data and examples from Argentina.

The transport of food products is defined for the purposes of this study and in this context as the mobilization and displacement of these products using a range of methods and means of transport, for a variety of routes, distances and directions. However, the study focuses on motorized transport by road or highway at distances of 50 kilometres or more, for loads of at least one tonne (these being common practices in the region). Less attention has been paid to medium-scale transport operations. The study did not, however, exclude other ways and means of transport where these were important in specific countries. Air and water transport, though prominent in a number of countries, was not included in the study. Rail transport was considered where relevant.

The study looked at certain specific aspects such as the socioeconomic and policy aspects of the agrofood sector, including agricultural production volumes and characteristics for small and medium producers, the needs and demand for transport, road infrastructure, transport infrastructure and management, and marketing channels. The main problems and requirements for the development of the food transport sector were reviewed, along with successful interventions to provide feasible and practical solutions. Also considered were opportunities for implementing solutions with holistic approaches, and ways of kick-starting the improvement of transport systems, including cold chains as an alternative to rural transport. We also looked at key factors to guarantee the adequate

supply and availability of food through effective and economically viable transport systems. The effort included those policy aspects capable of affecting the effectiveness of the potential solutions to the issue of rural transport, such as capacity needs and institutional arrangements for decision-making, resource allocation and action implementation.

Each of the studies of the three subregions estimated the importance of such variables as time, distance, freight quantity (weight, volume, weight/volume ratio), value, size and type of means of transport, extent and quality of road networks, characteristics of producers and agricultural entrepreneurs, logistics and marketing practices. The impact and role of the geographical, climatic, cultural and political characteristics of a country with references to food transport systems have been considered as well. The special situation of the small farmer, the role of intermediaries, road construction and maintenance, the nature of markets, effect of the various types of farmer organizations and the importance of marketing information systems are all examples of the various aspects covered by the study. Naturally, the impact of specific transport system characteristics on the quality, safety, amount and value of agrofood products was an essential thread running throughout the study.

Small farmers are often at a disadvantage *vis-à-vis* marketing because their traditional practices and transport problems translate into inequality and inefficiency. Small farmers usually face high rates of postharvest losses — up to 30 percent of their total output. Producers may be unaware or unclear about product quality specifications and conditions demanded by the market. They may also lack the preparation to understand and meet market demand. The outcome is that small producers may get very little for the same products for which consumers pay high prices on the market. This price differential often reflects the high cost of transport, excessive post-harvest losses, the many intermediate stages from production to final sale, and other inefficiencies of the agrofood chain.

Intermediaries, for their part, consider their businesses high-risk activities due to the many threats connected with physical and economic losses, delays and uncertainties in the delivery of the harvest, and near-daily variations in supply, sales, prices and profits. Further must be remembered that transport hired in the region may not be exclusively used for food transport. This



definitely has a bearing on the final quality, safety and efficiency of operations. The study of the Southern Cone countries, in particular, offers an efficient breakdown of the issue with reference to its structural and institutional roots, and the vision of producers themselves.

A common solution to transport and logistical barriers in many countries has been to set up collection plants and/or pre-processing plants, usually in association with cooling, refrigeration and/or freezing facilities. These are designed to ensure the safe transport of perishable food products from farm to market, at the same time facilitating physical and commercial integration of the various supply chain components. This has frequently proven an effective measure; always assuming it has been properly planned and administered. The study section on the Andean countries offers some interesting data on this type of approach in Peru.

These collection and/or pre-processing plants may be installed and administered by various commercial operators, including national or multinational industries, buyers or collection agencies and product retailers, supermarket chains, cooperatives and producers' associations, or even decentralized state bodies. The plants are usually located near highways and basic services such as water, light, communications, security and financial institutions, but not always near producers, even though often sited strategically so as to maximize cost/benefit and logistical criteria. Consideration has also recently focussed on maximizing quality through value chains by means of mutual benefit linkages. The range of action of these plants may go beyond actual collection and storage to include operations such as selection, sorting, cleaning, cutting, washing, cooling, packing, traceability and quality control in line with established quality parameters or market requirements.

Such plants may have their own transport units, or simply lease and administer them. They may also use the services of a trucker, but then supervise his performance and contract. These units may either collect the product directly from the farmers, or take them directly to the plant or some previously agreed-upon midway point for transfer. In this case producers negotiate the terms of supply, including transport, directly with the plant. A second solution is for several intermediaries to perform one specific function, such as transport. They may also purchase the products from the farmer (negotiating transport costs) and then charge the

plant for the product picked up at the farmgate. In this case intermediaries may either collect the product at the farm or field or some other site such as the main local road. This usually impacts on producer income and interests, implying less room for negotiation and moving their products. In a third possibility, producers own their own transport vehicles. This happens in many rural communities in the region. Either the individual producer or some *ad hoc* association owns the truck, and several producers offset the costs of the transport units, sharing operating costs and earnings. Or producers may hire the transport unit or subcontract this service, which may or may not include loading and unloading. Producers can thus reach a collection and transfer point, or go directly to the plant or markets. They are then better placed to negotiate and organize alliances at their convenience and in accordance with their own interests.

Once transport and logistical problems have been solved and collection and pre-processing centres are contributing to food chain efficiency, proper links and mechanisms to protect the collective interest must still be put in place to ensure that producers get a fair share of the value added for their products. This demands proper organizational machinery and a modern approach to alliances of mutual benefit. The goal is to establish true value chains that can guarantee food quality and safety, and at the same time satisfy the consumer and all stakeholders in the chain, for the benefit of all. Transport costs and logistics are typically among the shared costs in the more effective alliances and in the development of business conglomerates, as is true of the implementation of effective measure to reduce post-harvest losses and costs. This is illustrated in the case study of Guatemalan farmers presented in the section on Central America and Panama.

Another crucial factor in current markets is how to meet the demand for fresh produce. Such products always have some type of value added such as sorting, cleaning or packing, unless they are directly marketed as harvested. Another exception is products destined for use as agroindustrial raw materials, where other inputs and higher costs will be necessary. Fresh products are conserved "fresh" by means of additives or preservatives, modified atmospheres or by cooling and subsequent handling and transport in cold chains. These technological inputs could drive up costs considerably in some cases, putting them beyond the reach of small producers in the Latin American and Caribbean

countries. Here the logistical and institutional support aspects of infrastructure, information and services need to be addressed and not just the technical and economic factors. Often the decision implies determining the siting of pre-processing and cooling plants with respect to the distances to be covered from farm to market, and the solution is refrigerated transport units.

Another alternative, not necessarily a better one technically but attractive in terms of costs, is an in-plant cooling operation to lower the temperature of food products for later shipping in non-refrigerated transport with insulated chambers. Though often mistakenly termed “cooled” or even “refrigerated” units, these are not really refrigerated but rather thermally insulated units. They also often prevent heat losses, so that by the end of the day the “cooled” products are practically at ambient temperature. This is even more drastic in hot climates. One decision that may need to be faced is how to combine overland transport with air and water transport in terms of market requirements and logistics, distances, costs and infrastructure.

Another example of the importance of collection centres and transport in national level food chains is a project of the FAO Technical Cooperation programme jointly executed by FAO and the Secretariat of Agriculture, Livestock, Fisheries and Food of Argentina. The project looked at the problem of the post-production grain-handling chains, especially genetically modified and non-genetically modified soybeans and maize. Participants in these chains used an integrated, participatory, multidisciplinary and multisectorial analysis to describe the various handling stages from farm to export port (Cuevas, 2003).

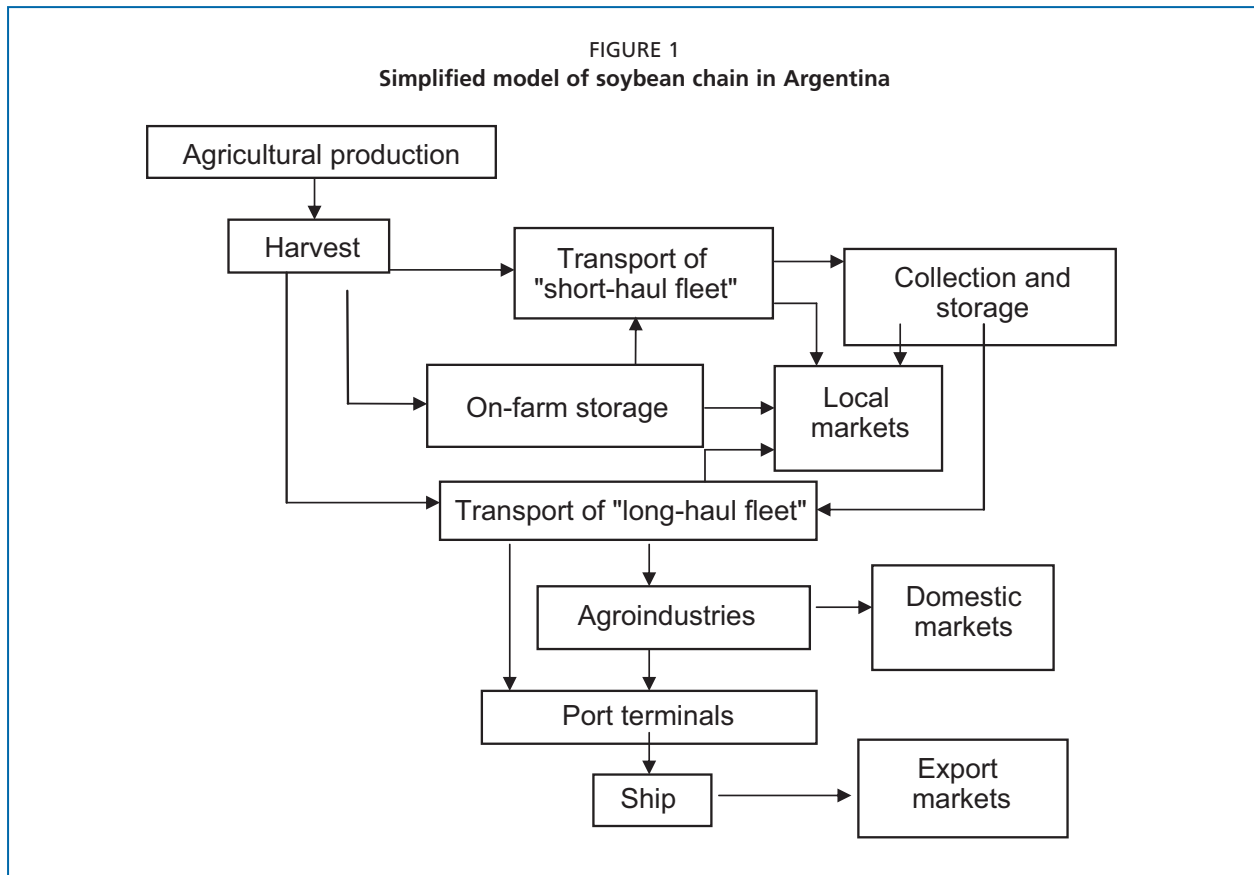
The project dealt with a highly complex issue, given the enormous distances involved and the huge quantities of grain produced, handled and exported in Argentina. Transport and logistical operations proved crucial for the efficiency of these chains, with a major impact on export costs, quality and opportunities. “Short-haul” transport, i.e., from farm to the reception, collection and storage centres, or from on-farm storage to these centres, or to domestic markets near the production units was highly significant in terms of costs, especially for small and medium producers. On the other hand, “long-haul” transport, i.e., from farm to terminal ports or regional or central agroindustrial centres, normally minimized handling but could drive up costs.

Figure 1 illustrates the model developed in the first phase of this project to describe the soy chain.

Another efficient way of introducing guidelines and regulations for food transport would be for national authorities in the various countries to recommend application of Codex Alimentarius Hygiene Practices for food transport (FAO/WHO, 1995, 1999, 2001). These cover the following aspects: food transport units, loading, in-transit storage and unloading operations for bulk, packed and semi-packed, processed or fresh products. The factors to address are final destination, freight value, expected shelf life and perishability, quantities transported, recommended conditions of transport including temperature and relative humidity, transport unit design and hygiene, plus environmental conditions at points of origin and destination. Further factors are transit time, loading and transport services conditions, dedicated transport of products for human consumption, and the quality of the service.

To sum up, transport costs are high for many farmers because their land is distant from collection and pre-processing centres, wholesale markets and export ports. Much farmland lies in mountainous areas far from main roads, or even secondary roads. Moreover, intermediaries pay a major role in the food chains, but the conditions under which they operate are very rarely advantageous for the farmer. Introducing organizational arrangements, including cooperatives, to deal with the production, transport, collection, processing and export aspects is one effective way of increasing the bargaining power, earnings and the quality of life of smallholders. This was brought out in the study on Central America and Panama. Such systems share the labour, risks and benefits through alliances in which all actors have had their say, and in which the agrofood chain truly benefits all involved.

Elements that need to be considered are cost/benefit and the advantages and drawbacks of each transport chosen, plus the requirements and special features of each, their technical and economic feasibility, and the institutional context. Several options can be combined to maximize a given situation in light of the special conditions of specific regions or countries. In Argentina, for example, overland and river transport are combined, and in other countries, overland transport is combined with air transport. Some countries, unfortunately, lack both good road and good rail systems, and environmental problems have made many rivers



unnavigable. This all helps to complicate the rural transport issue.

Packing systems, ranging from very simple, low-tech ones to very modern high-tech solutions are elements associated to food transport. Every possible packing option can be found throughout the region. Many traditionally and culturally rooted systems of food packing are still in wide use. Fresh produce is transported in bulk in many countries, sometimes with other materials used to divide them into portions. Units or bunches of the individual product may be combined in the transport chamber, or they may be mixed with non-food products. These are among the reasons for the high rate of post-harvest losses.

The failure of the supply chains and their correspondingly low profits can frequently be traced to the following problems. Cost-beneficial packing technologies are few, and modern packing materials imported from abroad and machinery are expensive. There are few trained personnel in the food chain, insufficient regulation of packing and labelling and machinery for their compliance, a lack of official food transport policies, and scarce technical assistance and financial services.

The comparative advantages of the region for production factors such as climate, altitude and latitude, rainfall, land quality, low labour and service costs, among others, can easily be minimized by the problems outlined above. These problems are carefully discussed in the following sections, covering those such as the great distances separating production areas and markets, poor transport infrastructure, lack of diversification and versatility of infrastructure and media, and the poor current conditions of the transport fleet.

For all these reasons, transport, especially food transport, is a key element in supply chains, commerce and national development, and also key to better living conditions, higher income and modern social development. The following studies tackle these issues from different national and regional approaches. They outline strategies and actions to find and implement efficient and effective solutions embodying holistic, coordinated, multisectorial proposals.



# Rural transport of food products in Central America and Panama

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# The situation in Central America and Panama

High-quality agricultural production is the only guarantee of product competitiveness in domestic and international markets. Production and management must be very demanding where a high-quality product meeting consumer requirements is the target. Proper management is the key to maintaining the quality of perishable food products from harvest to final consumer.

From farm-gate to market, a food product has to be transported. Farmers employ a wide range of solutions: horses, carts, boats, small vehicles, truck, buses and other means. The transport chosen requires serious consideration. High costs and losses ensue where transport is not timely and well managed. Only very few farmers own vehicles for transporting goods to market. Those living in areas far from population centres tend to combine their own means of transportation (which may be a horse, boat, or something else), with hired transport.

For people moving food to market for immediate consumption, the goal is to arrive on time. The main impact of transport on the quality of agricultural products concerns the widespread lack of awareness of the correct food management, packing and transport practices for market.

Farmers are often unschooled in the minimum technical needs of food handling and packing. What they mostly want is just to get their goods to market – the quality of the goods is secondary. What some want is to get the maximum amount of produce to market and sold. This is particularly true of farmers paying freight costs, and who want to earn as much as possible from the sale of their products.

Transport options and sales points are the twin pillars of all operations designed to deliver agricultural products to the consumer via the various marketing channels. A spiralling rise in performance is essential for the opening of new markets and the use of more highly developed means of transport or improving existing technologies.

The general condition of the means of transport in use is one of the most important issues for the transport sector. These conditions include problems with sanitation, how the product is handled for transport to ensure it arrives at its destination in perfect condition, and whether transport is available at the right time to avoid reaching the market at a time of oversupply. Poor product quality and general labour chain disorganization, which is economically disadvantageous all down the line, are further issues.

All agricultural products need to be moved from one place to another. They need to be moved from the farm or orchard to market, whether the goal is immediate consumption or industrial processing. The transport stage is a very important step in the food chain. It may seem simple, but the process of loading a vehicle and reaching the market often entails details which farmers may fail to note. On unpaved roads and poorly maintained paved roads, goods are jostled and compressed. This combines with poor farmer handling practice to alter the integrity and quality of the product. An estimated ten percent of food product losses occur during transport.

Overland, maritime or air transport are the three different modes for moving agricultural products. Which of the three is chosen depends on such factors as destination, economic value, duration, amount, local temperature and humidity, time to final destination, availability, and the cost and quality of transport. In Central America and Panama, beasts of burden are still used to reach the nearest collection centre. Trucks may cover distances of over 200 km to deliver the product to buyers for distribution among the district markets of the capital cities of the region.

The farmer copes one way or another with these factors. The usual solution, however, is for an intermediary to take responsibility for getting the goods to market and negotiating at the farm gate. When the producer transports the goods on his own, he must assume the losses of raw materials

during transport. Otherwise the intermediary absorbs this cost, covering it with his own gains.

This is why many farmers prefer to deal directly with intermediaries, at once resolving the problem of losses and the fear that their product may not be well received in the market.

This study on the Central American and Caribbean region is intended as an input for planning and decision-making by high-level technical or strategic staff and authorities involved in planning, management, support or advisory services addressing the problems and needs of improving food transport for rural communities. It may also serve as a tool for acquiring a strategic overview of how to more efficiently transport food products from farm to market (and to consumers). Lastly, it may be useful as a methodological reference for specialized country studies on the definitive factors, variables and indicators affecting rural transport of food products in Central America and Panama where improvement plans and programmes are in the pipeline.

## **METHODOLOGY**

The methodology used to prepare this study is described as follows:

- a Rapid Field Appraisal was prepared in different parts of Guatemala covering the rural transport of agricultural products (Table 1);
- a survey was carried out in Guatemala among producers, carriers and business people located in rural areas. Observation tours were also made of the collection centres for food products (Cooperativa Agrícola 4 Pinos, R.L.); wholesale markets (Central de Mayoreo, CENMA); regional markets of the municipal seats of Mazatenango, Retalhuleu, Santa Cruz del Quiché, Sololá, Jutiapa and Chiquimula, and local and district markets in the municipalities of these departments;
- the analysis was documented by photographing the food products from harvest to their transport to local markets;
- visits were made in Guatemala to government bodies concerned with food transport. These included the Ministry of Agriculture, Livestock and Food, the National Fund for Peace (FONAPAZ), the Regional International Organization for Plant Protection and Animal Health (OIRSA) and the Ministry of Economy;
- the last step was an exhaustive review of the literature relevant to the topic and or related Web pages.



TABLE 1  
Form used for Rapid Field Appraisal to evaluate rural transport of agricultural products in Guatemala

General information: _____ Date: _____		
Name of producer: _____		
Place: _____		
Type of product: _____		
Fruit	1	<input type="checkbox"/>
Vegetables	2	<input type="checkbox"/>
Pulses	3	<input type="checkbox"/>
Cereals	4	<input type="checkbox"/>
Semi-processed	5	<input type="checkbox"/>
<b>2. Product information:</b>		
Own production	1	<input type="checkbox"/>
Purchased	2	<input type="checkbox"/>
Both	3	<input type="checkbox"/>
How much do you produce? <sup>1</sup>		
1-25 q	1	<input type="checkbox"/>
26-75 q	2	<input type="checkbox"/>
76-150 q	3	<input type="checkbox"/>
Over 151 q	4	<input type="checkbox"/>
How much do you purchase?		
1-74 q	1	<input type="checkbox"/>
26-75 q	2	<input type="checkbox"/>
76-150 q	3	<input type="checkbox"/>
Over 151 q	4	<input type="checkbox"/>
How do you rate the quality of your product?		
First	1	<input type="checkbox"/>
Second	2	<input type="checkbox"/>
Third	3	<input type="checkbox"/>
<b>3. Transport information:</b>		
Own	1	<input type="checkbox"/>
Hired	2	<input type="checkbox"/>
Other	3	<input type="checkbox"/>
What type of vehicle do you use to transport your products?		
Pick-up truck	1	<input type="checkbox"/>
Truck	2	<input type="checkbox"/>
Trailer	3	<input type="checkbox"/>
Is your product refrigerated during transport?		
Yes	1	<input type="checkbox"/>
No	2	<input type="checkbox"/>
Condition of the vehicle you use?		
Excellent	1	<input type="checkbox"/>
Good	2	<input type="checkbox"/>
Fair	3	<input type="checkbox"/>
Poor	4	<input type="checkbox"/>
How do you rate the cost of the transport you use?		
High	1	<input type="checkbox"/>
Average	2	<input type="checkbox"/>
Low	3	<input type="checkbox"/>

<sup>1</sup> q = quintal = 100 pounds = 45,36 kg

TABLE 1  
Form used for Rapid Field Appraisal to evaluate rural transport of agricultural products in Guatemala (Continued)

How do you rate the transport supply?		
Good	1	<input type="checkbox"/>
Average	2	<input type="checkbox"/>
Poor	3	<input type="checkbox"/>
<b>4. Marketing channels:</b>		
Who buys your product?		
Middleman	1	<input type="checkbox"/>
Final consumer	2	<input type="checkbox"/>
Quantity purchased?		
Under 1 q	1	<input type="checkbox"/>
2-10 q	2	<input type="checkbox"/>
11-50 q	3	<input type="checkbox"/>
Over 50 q	4	<input type="checkbox"/>
<b>5. Where do you take your product?</b>		
Market:		
Local	1	<input type="checkbox"/>
Regional	2	<input type="checkbox"/>
Capital	3	<input type="checkbox"/>
International	4	<input type="checkbox"/>
Condition of market where you take your product?		
Excellent	1	<input type="checkbox"/>
Good	2	<input type="checkbox"/>
Fair	3	<input type="checkbox"/>
Poor	4	<input type="checkbox"/>
<b>6. Is your product affected by road delays?</b>		
Yes	1	<input type="checkbox"/>
No	2	<input type="checkbox"/>
<b>7. Accidents?</b>		
Very frequent?		
Yes	1	<input type="checkbox"/>
No	2	<input type="checkbox"/>
Reason?		
Speeding	1	<input type="checkbox"/>
Collision	2	<input type="checkbox"/>
Overloading	3	<input type="checkbox"/>
Lack of vehicle maintenance	4	<input type="checkbox"/>
Has your product been stolen during transport?		
Yes	1	<input type="checkbox"/>
No	2	<input type="checkbox"/>
How often?		
<b>8. Road infrastructure</b>		
Type of road on which your product is transported?		
Unpaved	1	<input type="checkbox"/>
Paved	2	<input type="checkbox"/>
Asphalt	3	<input type="checkbox"/>
Road conditions?		
Excellent	1	<input type="checkbox"/>
Average	2	<input type="checkbox"/>
Poor	3	<input type="checkbox"/>

TABLE 1

**Form used for Rapid Field Appraisal to evaluate rural transport of agricultural products in Guatemala (Continued)**

How far from production site to market?		
0 to 50 km	1	<input type="checkbox"/>
51 to 100 km	2	<input type="checkbox"/>
101 to 200 km	3	<input type="checkbox"/>
<b>9. Effect of weather on transport</b>		
Are you affected by lack of rainfall?		
Yes	1	<input type="checkbox"/>
No	2	<input type="checkbox"/>
In what way?		
Are you affected by excessive rainfall?		
Yes	1	<input type="checkbox"/>
No	2	<input type="checkbox"/>
In what way?		
<b>10. Are you damaged during transport?</b>		
Type of damage:		
Physical	1	<input type="checkbox"/>
Chemical	2	<input type="checkbox"/>
Biological	3	<input type="checkbox"/>
Extent of losses during transport?		
10%	1	<input type="checkbox"/>
25%	2	<input type="checkbox"/>
50%	3	<input type="checkbox"/>
100%	4	<input type="checkbox"/>
What do you do with the damaged product?		
Throw it away	1	<input type="checkbox"/>
Give it away	2	<input type="checkbox"/>
Process it	3	<input type="checkbox"/>
Do you believe there is some chance of developing a processing industry in your area for rejected or damaged products, or when there is overproduction?		
Yes	1	<input type="checkbox"/>
No	2	<input type="checkbox"/>
How could you help make this come about?		
_____		
_____		



# Analysis of rural transport systems for food products in Central America and Panama

## REGIONAL ECONOMIC, POLITICAL AND SOCIAL CONTEXT

The rapid pace and depth of change in Central America and Panama in recent years will have repercussions on present and future generations. The outstanding features of this change are globalization, the evolution and growth of science and technology (especially information and communications), and the growth and/or stagnation of social inequity and the gap between the haves and the have-nots. Some feel that the major challenge faced by Central America in the 1990s was the social impact of the “lost decade” crisis (1980) that played out against a backdrop of officially enacted stabilization and macroeconomic adjustment policies. For most Central Americans of that generation, the future was one of poverty, social and economic marginalization, inequity, and ecological decline. The situation was worse in countries such as El Salvador, Guatemala and Nicaragua, which also faced very unstable situations of domestic turmoil.

Existing problems of poverty, marginality, the skewed distribution of power and income, and the presence of hunger and undernutrition have only increased (though not at the same rate) throughout Central America since the “lost decade”. The Central American isthmus has lived through a time of social, economic and political transformation derived from the periods of boom and bust experienced by all these countries, though not to the same extent. In this scenario, policies of globalization, structural adjustment, stabilization and technological progress have brought about the rapid modernization of economies, a leaner and less powerful public sector, and the compression of social development initiatives: public health, food and nutrition have also undergone major alterations.

The 1990 decade consolidated a process of structural reforms in the commercial, financial, labour and social security areas, unevenly paced by area and by country. The results achieved

by the end of the decade, some positive and some negative, cannot be attributed solely to these reforms. They also reflect effects related to the international context and other regional processes that arose out of the debt crisis, and which were still having repercussions. They also depended on deep structural factors inherent in the historical framework of the isthmus, such as the high concentration of wealth and power in few hands, and its deeply segmented societies. Positive achievements in the social sphere included increased public spending, and efforts to restructure social services and improve the efficiency, accountability and effectiveness of public spending. In the political sphere, positive features included the rebirth of local life, the spread of democratic systems and the conquest of rights, visibility and recognition on the part of women.

The performance of Central American economies improved especially in 1990 and 1991. This was due to a combination of high economic growth thanks to a dynamic external trade sector, falling inflation, the reestablishment of domestic price and exchange systems, higher income levels and the correction of fiscal imbalances.

The data clearly show that many Latin American and Caribbean economies experienced recession in the second half of 1998 and in 1999, but on the whole Central America performed well. The exception was Honduras, which had negative growth in 1999. Generally speaking, the external sectors of all Central American economies have been expanding. This is fundamentally a result of the development of assembly industries aimed at the United States of America market, including traditional articles and electronic products. It needs to be pointed out, however, that the export base of Central American economies is still not very diversified.

Inflation has fallen, stabilizing at the lowest level in fifty years. Inflation fell from nearly 900 percent in 1993 to some 9.6 percent in 1999 for Latin America as a whole. Only Costa Rica and

Honduras are slightly above the regional average, whereas all other Central American countries can boast one-digit inflation rates.

Despite progress in economic recovery and major changes in such variables as life expectancy at birth, infant mortality, adult literacy and real per capita GDP (Tables 2 and 4) in the last 25 years for each and every country of Central America, one outstanding problem remains. An analysis of the food and nutrition situation reveals poverty as both a determinant and a consequence of prevalent levels of hunger and undernutrition in the subregion. The observed levels of food insecurity of large majorities of people living in the isthmus and their impoverishment are linked factors.

As indicated above, economic growth has occurred, but not at a level sufficient to breach the gap with the developed countries and do away with poverty. ECLAC calculations show that an annual growth rate of six to seven percent is necessary to reach this objective. Moreover, the domestic distribution of the fruits of this growth continues to be inequitable in all countries of the region, and the result is high rates of poverty. According to ECLAC, Latin America is the region with the least fair distribution of wealth or the “most extreme polarization of distribution in the world”, with ten percent of the richest households receiving 40 percent of all income.

It is also worthwhile to review government efforts in each country with respect to social development. One important explanation for the low levels of government investment in the social sector is the situation of the external debt with respect to the size of the economy. First we need to highlight the slowdown in growth of the external debt in these countries during that decade. In 1998 Panama with nearly 7 999 million US dollars of debt had liabilities amounting to 57 percent of its GDP. In 1999 Honduras owed the equivalent of 88 percent of its GDP and Nicaragua had a debt three times the size of its GDP. Belize, Costa Rica, El Salvador and Guatemala had manageable external debts. However, during the period 1991–1999, all countries showed an improvement in the ratio of the cost of the debt compared to GDP. Costa Rica, Honduras and Nicaragua made major efforts in this area. It is worth mentioning that the figure for debt servicing as a percentage of GDP rose from 1980 to 1988, especially in El Salvador, Guatemala, Honduras and Nicaragua (Tables 2 and 3).

The analysis of social expenditure shows that Latin America as a whole has seen a growing

TABLE 2  
Central America: per capita growth of GDP during the second half of the twentieth century (average annual growth rates)

Decade	Annual per capita regional GDP growth rate (a)	Annual per capita regional GDP growth rate (b)	Annual per capita regional GDP growth rate (c)
1950 – 1960	1.7	2.1	1.7
1960 – 1970	2.9	2.6	3.1
1970 – 1980	1.7	2.1	0.5
1980 – 1990	-2.0	-1.1	-3.2
1990 – 1996	1.7	1.1	2.0

a) Includes five countries: Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua. No information on Belize and Panama.

b) Costa Rica and Honduras (countries without armed conflict).

c) Guatemala, El Salvador and Nicaragua (countries with armed conflict)

Source: State of the Region Report, UNDP 1999.

TABLE 3  
GDP growth rate (%)

Country	1997	1998	1999
Costa Rica	3.7	5.5	4.5
El Salvador	4.0	3.5	3.5
Guatemala	4.3	4.7	3.9
Honduras	4.7	3.0	-1.8
Nicaragua	5.1	4.0	6.1
TOTAL	4.4	4.1	3.3

Source: State of the Region Report. UNDP 1999.

channelling of public spending into social expenditure, which rose from 10.1 percent of GDP in 1990–1991 to 12.4 percent in 1996–1997. This was a historical high for the region. In Central America and Panama, however, the effort would appear to remain insufficient. The data on per habitant social cost trends in the long-term clearly show that the significant rises in the 1990s allowed only Belize, Costa Rica and Panama to achieve spending levels for 1996–1997 comparable to those of 1980–1981. The figures for El Salvador, Guatemala and Nicaragua were lower than those for the early 1980s. The implication was that social expenditure in these three countries in 1996–1997 had dropped by 30 percent since 1980. The data suggest that redistributive policies in Belize, Costa Rica and Panama have been maintained at levels begun in the mid twentieth century. This indicates that these countries continue to give priority to investment in human capital as a national development strategy (Tables 4, 5 and 6).

In the specific case of the education sector (Table 7), the aggregate investment figures for education as a percentage of GDP clearly show that both Costa Rica and Panama invested three

TABLE 4  
Central America and Panama: selected social indicators

Country	Per capita GDP in 2001	US\$	Life expectancy at birth (years)	Mortality rate (per thousand live births)	
				Infants	Under five years
Costa Rica	3 652		77	14	16
Panama	3 264		75	18	20
El Salvador	1 737		71	30	34
Honduras	691		71	33	44
Nicaragua	471		70	39	48
Guatemala	1 548		66	41	52

Source: Secretariat for Economic Planning of Guatemala (SEGEPLAN), based on Human Development Report 2000 (UNDP) Gender Statistics: ECLAC 2001.

TABLE 5  
Human Development Index 2001 for Central America and Panama

Country	Human Development Index
Costa Rica	0.801
Belize	0.732
El Salvador	0.674
Honduras	0.641
Guatemala	0.624
Nicaragua	0.616

Source: Human Development Index 2001. UNDP

TABLE 6  
Social indicators for Central America and Panama

Country	Indicator		
	Poverty: % of people living on < US\$ 1.00/day	Real per capita social cost 1997 US\$ 1996–1997	Social cost/GDP 1990–1991 a 1996–1997 b
Belize	33 (1995)	237	9.3 a 10.2 b
Costa Rica	9.6 (1996)	550	18.2 a 20.8 b
El Salvador	25.3 (1996)	147	5.4 a 7.7 b
Guatemala	39.8 (1989–1998)	71	3.3 a 4.2 b
Honduras	40.5 (1996)	58	7.8 a 7.2 b
Nicaragua	n.d.	49	10.3 a 10.7 b
Panama	1.03 (1997)	683	18.6 a 21.9 b
LAC	n.d.	457	10.1 a 12.4 b

\* n.d. = No data available

Source: INCAP. Food and Nutrition Security in Central America in the XXI Century XXI. Guatemala, January 2001. Publication INCAP ME/101.

times as much as Guatemala, twice as much as El Salvador and 25 percent more than Nicaragua in 1996–1997. The data also bring out the fact that per capita public spending in Costa Rica and Panama is nearly four times that of El Salvador, seven times that of Guatemala and Nicaragua, and five times that of Honduras. Belize, while still below the levels spent in Costa Rica and Panama, spends

TABLE 7  
Educational indicators for Central America and Panama

Country	Indicator		
	Per capita public investment in education (1997 US\$) 1990–1991 a 1996–1997 b	Public investment in education (% of GDP) 1980	Public investment in education (% of GDP) 1990–1991 a 1996–1997 b
Belize	89 a 130 b	n.d.*	5.5 a 6.4 b
Costa Rica	113 a 153 b	7.8	4.7 a 5.8 b
El Salvador	33 a 50 b	3.9	2.1 a 2.6 b
Guatemala	25 a 28 b	1.8	1.6 a 1.7 b
Honduras	27 a n.d*, b	3.2	n.d*, a n.d*, b
Nicaragua	23 a 20 b	3.4	4.9 a 4.2 b
Panamá	124 a 172 b	4.9	4.7 a 5.5 b

\* n.d. = No data available

Source: INCAP. Food and Nutrition Security in Central America in the XXI Century. Guatemala, January 2001. Publication INCAP ME/101.

more than the remaining four Central American countries.

Here, though, it should be pointed out that major efforts were made in 1996–1997. The following four countries did raise the per capita outlay for education: Belize by 46 percent, Costa Rica by 50 percent, El Salvador by 39 percent and Panama by 35 percent, compared to the 1990–1991 biennium.

As for the political dimension, first and foremost the signing of peace treaties and democracy-building deserve mention, as does decentralization, with power moving from the central authorities down to the regional and municipal levels. The region is attempting to overcome the political and military conflicts which had such a critical effect on its inhabitants, forcing many thousands of

Central American families out of their homes and countries, and depriving of the most basic human rights.

Part of the process of establishing and maintaining peace in countries involved in armed conflict comprises the still incipient efforts by people and governments to achieve and strengthen the democratic process, and to promote the rebirth of regional integration in conjunction with the other Central American countries. National government policies adopted to consolidate the processes of decentralization are moreover vital for the state reform initiatives promoted since the late 1990s.

The point needs to be made, however, that civil society and central governments in each country of the region are not finding it easy to hammer out a shared vision with long-term development strategies in various fields. The attempt is causing problems concerning the lack of a joint definition of national priorities, the failure to assign clear and appropriate clear roles to the public and private sectors, and weak interinstitutional coordination. The challenge of the Central American countries is that the state needs to address the major issue of managing the democratic process and the economy even as it undergoes a relative loss of sovereignty. It also needs to carry forward the process of internal reform required to build the new society.

### SOCIOECONOMIC AND POLITICAL CONTEXT OF THE AGROFOOD SECTOR

The agricultural sector has been greatly influential in the economic and social life of the countries of Central America and the Caribbean. Agricultural modernization acted as a major stimulus to production and productivity and the evolution of the productive structure.

Guatemala's Ministry of Agriculture, Livestock and Food sets out the following text in its Agrarian and Sectoral Policy (MAGA, 1998). "The policy of incentives for productive investment and support to marketing are designed to encourage investment in activities representing comparative advantages with the potential to become competitive through technological innovation in the productive process, agroindustrial processing and the structure of related marketing channels".

Some of the support instruments for this incentive policy are:

"The Central American Agricultural Trade Policy. This is one of the sectoral and subsectoral policies. It is part of the country's commercial policy framework designed and approved by

the public and private sectors concerning the principle of competitiveness to guarantee access to international markets and participation in the domestic market, and is helping to guarantee food security for the people of Guatemala."

"The agricultural foreign trade unit under the strategic information and policy unit of MAGA, which is actively participating in the definition of national trade policies, supporting the development of the national competitiveness programme, and contributing to national capacity – building through participation in and administration of multilateral, regional and bilateral trade treaties".

### Share of agriculture and agroindustry in the GDP of the region and its countries, and in exports

Tables 8 and 9 illustrate the share of agriculture and the manufacturing industry in the generation of the gross domestic product of the countries of the Central America and Panama region. Agricultural participation in GDP is major in countries such as Guatemala, Honduras and Nicaragua, and somewhat less so in Panama. Moreover, the contribution of the sector to GDP has been falling in individual countries as in the region in the years under review.

Basic ECLAC data on the agricultural sector show that the sector has been declining in economic importance in Costa Rica, contributing only 8.6 percent of GDP in 2000, and surpassed by the manufacturing industry and trade. Agricultural GDP has registered a contraction compared to 1999, growing by an annual average of only 0.2 percent. This is mainly due to the impact of the drop in production value of export crops (coffee and banana) and in basic grains, due to falling international prices. The drop was unable to offset

TABLE 8  
Participation of agriculture, silviculture, hunting and fishing in GDP in Central America and Panama (% of GDP)

Country	At constant 1995 prices		
	1997	1998	1999
Costa Rica	12.5	12.3	11.9
El Salvador	12.8	12.2	12.6
Guatemala	21.0	20.7	20.4
Honduras	20.7	19.4	18.1
Nicaragua	34.9	34.7	34.0
Panama	7.2	7.3	7.0
Belize	23.4	22.5	23.9
TOTAL	18.93	18.44	18.27

Source: ECLAC Statistical Series for Latin America and the Caribbean 2001.



TABLE 9  
Participation of the manufacturing industry in GDP in Central America and Panama (% of GDP)

Country	At constant 1995 prices		
	1997	1998	1999
Costa Rica	20.4	21.0	24.5
El Salvador	22.1	22.8	23.0
Guatemala	11.4	11.2	11.1
Honduras	17.8	17.8	18.6
Nicaragua	14.6	15.3	14.8
Panama	8.6	8.5	7.8
Belize	13.4	12.7	12.5
TOTAL	15.60	15.60	15.50

Source: ECLAC Statistical Series for Latin America and the Caribbean 2001.

the increase from certain non-traditional crops for the livestock subsector.

The agricultural subsector in Costa Rica decreased by 0.25 percent. Crop production for domestic consumption has been shrinking for some years now. Rice yields were lower. Beans exhibited a negative trend due to the disincentive caused by trade problem and the existence of surpluses on world markets. For maize, neither the area cropped (down by 21.3 percent), nor production (down by 16.1 percent), showed positive trends. This was due to the shrinking participation of private enterprise in trade: production is in the hands of small farmers who produce mainly for home consumption.

In El Salvador, the figures for the agriculture and livestock sector dropped by 0.8 percent in 2000, contributing 12.6 percent of the GDP. The agricultural subsector dropped by 3.3 percent that same year. For basic grains, with the exception of bean at 4.2 percent and sorghum at 6.9 percent, the trend was negative, with maize down 11.2 percent and rice lower by 16.1 percent. Among the export crops, the falling coffee yields drove production down by 18.8 percent. As international prices fell, plantation owners lost interest, as yields were no longer able to sustain production costs.

In Guatemala, GDP in the agricultural and livestock grew moderately in 2000 by 2.4 percent, with a stagnation in the agricultural subsector of 1.1 percent in association with export and non-traditional crops. This behaviour is partly attributable to low international prices and problems of access to credit. Basic grains (wheat at 10 percent, maize at 2.8 percent and bean at 4 percent) showed positive growth figures. Rice, however, was down by 9.3 percent and sorghum by 0.3 percent. In these two cases the areas planted and yields were both negative. Among the traditional

crops, only banana at 18.9 percent and cardamom at 6.3 percent showed positive growth.

In the year 2000, after two consecutive negative years, the agriculture and livestock contribution to GDP in Honduras rose by 7.6 percent – outpaced only by the trade and some service sectors. The activity of the agricultural subsector grew by 7.7 percent. This was due to a rise in technology transfer, the use of improved seeds and a strong credit stimulus thanks to the laws on reactivation and financial recovery of the agricultural sector. The area under basic grains increased by only 0.7 percent. Despite this, maize yields increased by 15.8 percent, bean by 55.6 percent, and sorghum by 38.8 percent. These were the highest figures for recent years, leading to bumper harvests. Rice production, however, fell dramatically by 23.7 percent and yields by 24.4 percent.

The area under the traditional export crops grew by 2.2 percent, and this boosted production. Banana now approaches the levels achieved prior to the passage of Hurricane Mitch in October 1998. Production nearly doubled as a result of the plantation rehabilitation programme. In the year 2002, non-traditional crop exports skyrocketed. The preferred crops were melon and watermelon, which became more competitive in the international marketplace, even as production rose. For 2003, the Ministry of Agriculture and Livestock anticipates exports of 1 500 containers.

In Nicaragua the agriculture and livestock sector contributed 29.5 percent of GDP, 55.8 percent of aggregate exports, and 60 percent of job creation, all in the year 2000. The number of persons employed exceeded the national total due to the intensive use of the labour force, especially in coffee, maize and bean production. The aggregate value of the agricultural subsector grew by 7.9 percent. The area harvested grew by four percent to a total figure of 820 181 ha in the year 2000. Despite this, the production value of basic grains dropped by 1.2 percent due to falling prices for rice and beans, though bean production volumes grew by 5.3 percent. The maize harvest also grew by 24.1 percent, as did sorghum by 6 percent. Rice, on the other hand, dropped by 8.6 percent due to the effects of drought on the first harvest.

In the year 2000, the agriculture and livestock sector in Panama grew only slightly by 1.6 percent due to a drop of 3.5 percent in the agricultural subsector due to adverse climatic factors such as drought, plus the rising price of petrol and low international prices for some export crops. Basic

grain production rose by 5.3 percent for bean, 10.5 percent for maize and 2 percent for rice, contrasting heavily with a 58.4 fall in sorghum production.

### Agroindustrial Participation

Concerning the contribution of the manufacturing industry to GDP, El Salvador, together with Costa Rica, followed by Honduras registered the highest figures. Guatemala, Nicaragua and Panama have the smallest share of agroindustrial participation in GDP. It needs to be pointed out that the manufacturing industry's contribution to GDP has grown significantly in recent years in the region as a whole and in individual countries, excepting Guatemala and Panama (Table 9).

Tables 10 and 11 illustrate the behaviour of imports over a three-year period for agriculture and manufactured goods for the region. Table 10 shows that Costa Rica and Guatemala have the highest figures for this type of export products. It is important to point out the significant drop in exports of agricultural, forestry, fisheries and game export products from the region as a whole and of

TABLE 10  
Exports of goods by sector of economic activity: agriculture, hunting, silviculture and fishing, in selected countries of Central America and Panama (millions of US\$)

Country	1997	1998	1999
Costa Rica	1 726.2	1 869.6	1 491.3
El Salvador	586.1	394.8	303.2
Guatemala	1 037.2	1 072.1	1 055.1
Honduras	589.2	279.9	391.1
Nicaragua	293.7	328.6	300.1
TOTAL	4 232.4	3 945.0	3 540.8

Source: ECLAC Statistical Series for Latin America and the Caribbean 2001.

TABLE 11  
Total FOB exports by groups of products: manufactured products. Selected countries of Central America and Panama (millions of US\$)

Country	At Constant 1995 prices		
	1997	1998	1999
Costa Rica	1 667.7	2 719.5	4 269.1
El Salvador	526.6	584.3	582.4
Guatemala	708.0	846.3	837.8
Honduras	292.0	165.9	242.4
Nicaragua	161.5	42.4	40.9
Panamá	112.4	119.9	116.9
TOTAL	3 355.9	4 358.4	5 972.6

Source: ECLAC Statistical Series for Latin America and the Caribbean 2001.

each of the Central American countries during this period.

The major exporter of manufactured products in the region is Costa Rica, which accounts for more than 70 percent of all exports in this subsector. Nicaragua exhibits a significantly negative trend for manufactured exports.

The Central American region has its own common market, the CACM, a trade bloc established in 1960. CACM member countries set a fixed common external tariff that currently fluctuated between a minimum of one percent and a maximum of 20 percent *ad valorem*, for all tariff positions. There are major exceptions for agricultural and livestock products. The region is likewise involved in the ALCA talks. These negotiations are scheduled to end in 2005, at which point the entire American continent will have become a free trade area.

In the year 1993, the presidents of the Central American countries signed the General Treaty on Central American Economic Integration. The treaty stipulated that all products of Central American origin excepting those listed under Annex "A" of the Central American Customs and Tariffs Regime would remain exempt from the payment of tariffs, surtaxes, fiscal stamps and other measures of equivalent effect, and free of all tariff barriers – in a word, establishing a free trade zone within the region.

Goods requiring some sort of formality to enter Guatemalan markets are those of plant and animal origin, agrochemicals, medicines, veterinary medicines, soap and other cleaning articles, and food preparations. In the case of agricultural and livestock products such as seeds, parts of plants, plant and animal products and by-products for sale abroad, the export firm must present a phytosanitary certificate issued by the Standards and Regulations Unit of the Ministry of Agriculture, Livestock and Food. Zoosanitary certificates are compulsory for the export of animal feeds and fishery products.

### SOCIOECONOMIC CHARACTERISTICS OF THE RURAL AGRICULTURAL SECTOR

Agricultural and livestock production is a major economic activity in every country in the region, generating around 25 percent of the gross domestic product, and able to absorb up to half or more of the economically active population. It can also generate up to 60 percent or more of foreign exchange earnings for exports.

According to estimations, upwards of 60 percent of the population of Central America is living in rural areas, most engaging in agricultural activities – sectors where the highest indicators of poverty (75 percent) and extreme poverty (60 percent) also prevail. This is paralleled by high rates of illiteracy, undernutrition and poor access to public services such as medical care, drainage and safe drinking water. The basic diet consists of basic grains, mainly beans and maize. The per capita supplies of maize and bean have shrunk in recent decades due to an interacting range of factors. These include poverty due to lack of opportunity, environmentally harmful production processes, the failure to incorporate environmental conservation criteria in productive investments, and the widespread lack of awareness of environmental issues. Other factors such as deforestation also contribute to this serious decline. An estimated total of over 99 000 ha disappear every year, with soil erosion rates as high as 1 100 t/ha/yr recorded in some areas of the isthmus. The loss of biodiversity, and contamination due to the indiscriminate use of agrochemical products and the presence of industrial residues and household wastes, compound the issue.

One aspect of the rural sector in Guatemala is the lack of smallholder access to good agricultural land. There are no legal certainties and guarantees governing the use, tenure and ownership of land. This discourages investments in the sector. In other parts of the country, productive infrastructure is in short supply or non-existent. The prevalence of inappropriate technologies and unsustainable production systems makes it hard to achieve acceptable levels of competitiveness.

### **PRODUCTION VOLUMES AND CHARACTERISTICS OF SMALL AND MEDIUM RURAL PRODUCERS**

The following facts emerged from the observation visits and interviews with small and medium food producers and/or traders in rural Guatemala. Most of those interviewed were producing food mainly for and with the help of the family, on parcels yielding from 25 to 150 quintal of food products such as fruits and vegetables, pulses such as beans, and cereals – especially maize. Most producers agreed that their products were first class, and that the amounts obtained from the second harvest were often sold as second quality products at such low prices as to make harvesting barely worthwhile.

### **POVERTY**

Estimates from the 1990s, based on the poverty line method, reflect the persistence of widespread poverty in the region. Three out of every five Central Americans are living in poverty. Worse still, two out of five are living in extreme poverty or indigence (Table 12). Rural areas are those hardest hit by the phenomenon. A total of 71 percent of rural dwellers are poor compared to 56 percent of urban residents. The situation is even worse in the case of extreme poverty, which applies to half of all rural residents. The situation is particularly serious in Guatemala and Honduras, followed by El Salvador and Nicaragua.

### **EMPLOYMENT**

There is a lack of regular, comparable and timely statistics on the labour situation of the population of Central America. The national population censuses are an important source of information, but there are problems with their age and accessibility. They are generally unavailable, at least not in a form that can be processed so as to make the data comparable from one country to the next. Household surveys are not carried out on a regular basis in all countries. In addition, some household surveys have only limited coverage, such as metropolitan or urban areas. Mindful of these limitations, what follows is a brief review of the labour situation in Central America. It refers fundamentally to urban employment (Table 13).

Up to the year 1990, the economically active urban population (urban EAP) in the area included some 3.1 million people, with a rate of participation of 53.4 percent (Table 13). Individual country rates for participation parallel the regional average. In 1996 the urban EAP had grown by around one million people, due in part to an increase in the rates of participation, but also to the growth of the urban population. ECLAC figures indicated urban rates of participation of 78 percent of men and 41 percent of women in Costa Rica (1995). The rates were 84 percent of men and 43 percent of women in Guatemala (1989), 80 percent of men and 43 percent of women in Honduras (1994), and 80 percent of men and 47 percent of women in Panama. Unemployment was highest among women and young people.

Open unemployment affected 11 out of every hundred in the urban EAP in 1990. By 1996, the figure had dropped to 9.7 percent. Female unemployment is clearly much more prevalent

TABLE 12  
Central America and Panama: incidence of poverty by the poverty line method during the 1990s (percentages of poverty)

Country	Year	Total poverty			Indigence		
		Country Total	Urban Area	Rural Area	Country Total	Urban Area	Rural Area
Total		60	56	71	40	26	52
Belize	1996	33	n.d.*	n.d.	13	n.d.	n.d.
Costa Rica	1994	21	18	23	8	6	10
El Salvador	1996	52	43	65	22	15	31
Guatemala	1989	75	65	86	60	55	71
Honduras	1994	73	70	76	49	41	55
Nicaragua	1993	68	53	89	51	37	69
Panama	1994	30	25	41	12	9	20

\* n.d.= no data available

Source: State of the Region Report, UNDP 1999.

TABLE 13  
Urban Central America and Panama: economically active rural population, employed, unemployed, rate of participation and rate of open unemployment 1990 and 1996 (thousands and percentages)

Country	Urban EAP				Rate of open unemployment		
	Total	Employed	Unemployed	Rate of participation	Total	Youth	Women
<b>Region</b>							
1990	3 102.7	2 755.8	346.9	53.4	11.2	-	-
1996	4 076.1	3 682.0	394.1	54.4	9.7	-	-
<b>Belize</b>							
1990	n.d.*	n.d.	n.d.	n.d.	n.d.	-	-
1996	n.d.	n.d.	n.d.	n.d.	n.d.	-	-
<b>Costa Rica</b>							
1990	482.3	456.5	25.8	53.1	5.3	10.3	6.2
1996	561.3	524.5	36.8	52.3	6.6	13.9	7.6
<b>El Salvador</b>							
1990	982.8	884.9	97.9	55.0	10.0	18.6	9.8
1995	1 261.3	1 172.9	88.4	54.1	7.0	14.3	5.0
<b>Guatemala</b>							
1989	574.1	555.2	18.9		3.3		5.6
1996							
<b>Honduras</b>							
1990	691.6	644.4	47.4	50.1	6.9	10.4	5.8
1996	980.2	915.1	65.1	54.7	6.6	9.7	5.1
<b>Nicaragua</b>							
1990	482.3	369.7	112.6	51.2	23.3	34.2	20.8
1995	619.7	526.8	95.9	48.7	15.0		14.0
<b>Panama</b>							
1991	463.7	400.5	-	57.3	13.6	33.0	15.2
1996	653.6	542.7	-	61.7	17.0	34.8	20.5

\* n.d.= no data available

Source: State of the Region Report, UNDP 1999.

in Nicaragua and Panama. The rate of open unemployment is much lower in El Salvador, Guatemala and Honduras.

Underemployment, and not open unemployment, is the main problem in the region, as data from the Central American Monetary Council clearly show. According to their figures, open unemployment rates equal those for equivalent unemployment. The equivalent unemployment

figure for Guatemala is more than six times higher, whereas in Nicaragua the figure is only slightly lower.

## RURAL EMPLOYMENT

In all countries for which information is available (Guatemala, Honduras, Costa Rica and Panama), labour insertion figures show that half of those occupied in the rural sector are people working

TABLE 14  
Labour insertion of employed rural population in Costa Rica, Guatemala, Honduras and Panama (percentages)

Country	Costa Rica (1995)	Guatemala (1989)	Honduras (1994)	Panama (1995)
TOTAL	100.0	100.0	100.0	100.0
Owners	5.7	0.5	1.6	4.3
Employees	68.5	38.3	37.2	44.5
Public sector	9.6	2.9	4.8	11.9
Private sector	58.9	35.4	32.4	32.6
Independent and unremunerated family workers	25.8	61.2	61.2	51.3
Agricultural activities	12.2	47.9	43.4	33.5

Source: State of the Region Report, UNDP 1999.

TABLE 15  
Economically active population, by sector of economic activity and sex, 1990 (thousands of persons)

Country	Both sexes			Men			Women		
	Agriculture	Industry	Service	Agriculture	Industry	Service	Agriculture	Industry	Service
Guatemala	1 293	47.8	684	1 210	40.9	371	8.3	6.9	31.3
El Salvador	599	33.6	687	56.8	23.2	361	3.1	10.8	32.7
Honduras	611	22.1	415	57.6	17.0	244	3.5	5.1	17.2
Nicaragua	491	15.9	486	46.3	12.5	239	2.8	3.4	24.7
Panama	214	11.0	396	204	8.5	228	10	2.5	16.9
TOTAL	3 208	130.4	2 668	3 021	102.1	1,443	27.7	28.7	272.9

Source: ECLAC Statistical Series for Latin America and the Caribbean 2001.

for themselves or unremunerated family workers, mostly involved in agricultural activities. The exception is Costa Rica; there the percentage is lower because there is a large group of paid rural workers (Table 14).

Table 15 outlines the ECLAC data on occupation in the region for the EAP for the year 1990.

Notably, the greater part of the economically active population in the region is engaged in the agriculture, hunting, forestry and fisheries sectors. This is followed by wholesale and retail trade activities, restaurants and hotels in the service sector, and with a substantial portion of the EAP working in industry.

### TRANSPORT NEEDS

Most producers lack a vehicle of their own to carry their products to market. Field observations showed that more than half these producers were forced to hire a vehicle. Most of these trucks cannot carry more than 20 quintals. The roads are so narrow that only a vehicle smaller than a five-ton truck can get in, and so the load cannot all be carried in one trip. None of these producers (whether fruit, vegetable, pulse or cereal growers) use refrigeration to transport their food to market. The exception consists of one or two very special cases where exporters of fruits and some vegetables pack pre-selected goods and hold them in cold

storage at the plant for subsequent export abroad. The vast majority of producers find transport costs high, a few very high, and a few more find them adequate. Transport is in short supply in some regions and it is hard to find someone to move goods from field to market.

### ROAD INFRASTRUCTURE

A good road infrastructure is essential to facilitate internal and external integration. It is also a fundamental condition for achieving greater access to markets and the benefits of free trade for all. It is also a prerequisite for reducing the production costs for goods and services, and inherent in the search for better business and national competitiveness.

Most food producers and traders in the region are forced to use unpaved roads. On our observation tours we learned that drivers face 0 to 50 km of unpaved roads before reaching a paved or tarred road. These unpaved roads are inaccessible in the rainy season to conventional vehicles of five tonnes or more. Only pick-up trucks carrying no more than one tonne can get in. This makes the transport of food from field to market a very slow process, generating scarcity because the goods cannot arrive on time. Paved roads are also poorly maintained in the rainy season, and they soon deteriorate, as can also be seen in the highlands of Guatemala.



## TRANSPORT INFRASTRUCTURE IN EL SALVADOR

### Overland transport

El Salvador has a road network of some 12 540 km, 16 percent of which is paved. There are two main highways: the Pan-American linking the east to the west and the Coast Highway, paralleling the Pan-American Highway and running south.

### Maritime transport

El Salvador has a number of ports, primarily Acajutla, Puerto Catuco, La Libertad, La Unión, and El Triunfo. The port of Acajutla on the Pacific is the main access port. It is 85 km by highway and 103 km by rail from the capital, San Salvador. This port has a major complex for services for handling, storing and transferring container cargo and liquid, solid and fluid bulk products. From Buenaventura to Acajutla there is only one opportunity for transport, every two weeks, via Puerto Quetzal in Guatemala. The greatest drawback for this route is the long transport time of 15 to 19 days, so that exporters need to plan carefully ahead to meet the needs of their Salvadoren clients. There are more than ten shipping companies serving the Atlantic ports of other Central American Countries, all with previous maritime connections and combinations in Panama, Kingston, Jamaica or Miami in the USA, or overland connections to Central American ports such as Puerto Limón, Santo Tomás de Castilla and Quetzal. Transit times can range from eight to twenty days.

### Rail network

The rail network of 380 km is used solely for the transport of merchandise.

## TRANSPORTATION ADMINISTRATION AND LOGISTIC ASPECTS

Product temperature, moisture content and rate of respiration are all factors affecting the quality and protection of fresh food products. Very few small or medium producers in the region have access to controlled temperature transport systems. The mark of a truly professional carrier is the use of high-quality, cold storage equipment; or adherence to a strict programme of good farming and/or manufacturing processes with respect to the transport of agrofood products. Many of the producers and/or traders interviewed were completely unaware of the need for similar logistics for the food they produce or transport.

Transport is in short supply in some areas and inadequate in others due to a shortage of pick-up trucks to move products from harvest areas to local or regional markets. For longer distance conventional trucks of five tonnes or more are used. Most of the vehicles in use are poorly equipped for food transport. Trucks used to move construction materials are also used to transport food. This creates hygiene problems: the trucks are simply swept but not cleaned or sanitized. Many of the trucks used to transport food crops are also utilised to ship animals such as chickens, pigs and cattle. The owner of the vehicle simply hoses it out without drying it, and the truck is ready to transport food products. Producers are prepared to accept these conditions as there is often little demand and they frequently lack their own transport to get their products from field to market for sale.

## MARKETING CHANNELS (CUSTOMS/OIRSA EXPORT REQUIREMENTS)

The destination of almost all food carriers, comprising pick-up and regular trucks, are wholesale markets. In El Salvador, the infrastructure for the transport and sale of food products has undergone constant change. Access to local, regional and capital city markets has improved substantially: they are much easier to reach than in earlier years. This has led to an excellent market price/quality ratio, and much better packing and packaging techniques on the part of those transporting food products.

The people producing food in the countryside sell their products to a buyer at the harvest site. This facilitates transport as this intermediary has the means, transport vehicle and capital as well as a spot on the local, regional or national market (CENMA). The buyer usually sells the product wholesale or retail. Exporters comply with the regulations established by the international treaties in force.

Importation is mainly in the hands of the major distributors (who then sell to retailers), or the big department stores. Sales profits are higher for USA products, ranging from 10 to 20 percent. In El Salvador, it is important to make a careful review before choosing an agent, representative or distributor. This person will need to know how to handle the domestic regulations and formalities for the different products. Sales strategies are not very highly developed. The usual way of introducing a

new product is to give a reception in a big hotel, combined with an advertising campaign, for the product presentation. Direct marketing is an upcoming method now that telecommunications and door to door marketing (which began with the sale of cosmetics and household articles), have been privatized. It is advisable to have a good consumer support service comprising replacements and technical assistance, especially for sales to the government, for those products requiring such service.

### **Agricultural and livestock inputs, pesticides and veterinary products**

Exports of agricultural inputs, pesticides, fertilizers and veterinary products for animals for human consumption require prior registration of the firm exporting the product, or a local distributor who will take responsibility for compliance with the formal registration of the product. It is important to remember that while the requirements for introducing these products on Salvadorean markets are not very complicated, there are severe post-sale controls that need to be considered by those wishing to trade in these products.

## **GENERAL DESCRIPTION OF RURAL FOOD TRANSPORT: SWOT ANALYSIS**

### **Strengths**

- The farmer produces first-quality food products.
- Pick-up trucks are used for hauling in areas mostly inaccessible to larger trucks or trailers, facilitating transport.
- The state of transport is good.
- The supply of transport is good.
- Vehicles are loaded quickly and properly.
- A collection centre for apple growers is being built and another is now in operation providing cold storage of Chinese peas for export.
- The collection centres make it possible to export first-quality products and boost the income of the farm families producing them.
- Vegetable and fruit growers in some highland departments have organized, and this facilitates training designed to improve product quality and encourage exports.
- There is a federation of tomato, onion and chilli growers in the eastern part of the country that allows for training to improve product quality and encourage exports.

### **Weaknesses**

- Producers are dependent on others to haul their agrofood products.
- The costs of transport are high.
- They are unaware of the unit cost of the product transported.
- They receive no subsidies from governments or other bodies for the production and/or transport of their products.
- Little employment is generated during transport. Instead what is generated is under-employment in the loading and unloading of products for market.
- Food products are transported without taking GAP into consideration.
- Markets fail to apply either GAP or GMP.
- They are unaware of the term “quality” concerning the transport of their products. What matters is getting the goods to market; how this may affect the quality of their products is not considered important.
- Producers follow various schedules for transporting their products. Their own convenience and not that of the consumer determine these schedules. This has the effect of lowering sales prices.
- They pack their products in the field the same day they are harvested, lacking appropriate packing areas for this operation.
- Quality selection is by the producer’s personal criteria. For a producer, the first harvest is of higher quality. Size, colour, flavour or other characteristics are not considered important.
- Producers in some highland departments are not organized. Everyone produces and sells to the highest bidder, and they get their products to market as best they can.
- Down on the southern coast producers tend to sell their products in the field, and generally do not take them to market.

### **Opportunities**

- The international market for small and medium fruit and vegetable growers is open. Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), and possibly Hazard Analysis and Critical Control Points (HACCP) must be complied with.
- Guatemala’s capital city has a national wholesale market, the “Central de Mayoreo”. It has good installations and facilitates the sale and purchase of agrofood products.

- Producers are very willing to establish processing industries near production areas or collection centres.
- Some producers would supply land for growing and others would provide space on their property for the construction of said centre or industry.
- There is an opportunity to build collection centres or regional markets like CENMA, which would allow producers to sell to the final consumer and thus boost their earnings.
- Organized producers can be trained to learn how to handle their products and use GAP and GMP, and initiated in the use of HACCP, now that the Free Trade Treaty has opened international markets.
- Producers who have formed organizations may be eligible for transport subsidies once collection centres are available.

### Threats

- Intermediaries buy most of the output and often impose the price paid.
- Most roads they cover are unpaved, with distances up to 50 km or more to reach a paved road
- No producer utilizes refrigerated transport for food products, excepting those destined for export.
- Adverse environmental conditions such as excessive rainfall affect transport. Packing the product and loading the vehicle is done in the open, an improper procedure.
- Producers do not take their products to market and there is nowhere they can safely shelter, pack and load their products into the vehicle.
- Unpaved roads are in poor condition and paved roads are not much better, deteriorating rapidly during the rainy season.
- The sun is too hot for people to work between ten in the morning and two in the afternoon in the southern coastal and eastern areas of Guatemala, where temperatures can reach 42°C.

### AGROFOOD TRANSPORT DEVELOPMENT NEEDS

The agrofood transport sector is characteristically complex and heterogeneous. A major and general characteristic of the sector is its extensive fragmentation and the large number of firms with just one or two vehicles and very few employees (95–97 percent of the total). These firms are usually

autonomous and highly independent. For these reasons their interests are very different from those of other stakeholders in the sector. The interests of the packaging firms, for example, are not the same as those of firms supplying a supermarket chain. Food transport is totally different from the transport of dangerous or toxic products, or garbage collection.

Another important factor is new trends in marketing, such as shopping malls, hypermarkets, supermarket chains and other agents and modalities of distribution and sales.

Another major factor is the cost of transport due to heavy competition. Prices tend to go down whereas fuel, labour and other costs continue to rise. Any review of training needs in the agrofood transport sector needs to consider the following points:

- organization of urban logistics and integration in the intermodal network, which is the point of departure;
- knowledge of the logistical infrastructure (e.g. merchandising centres, urban terminals...);
- data transmission technologies and applications;
- today's logistics imply a hefty contribution from the information and data transmission sectors;
- alternative transport and transfer technologies;
- other commercial aspects that may have a bearing on better management such as maximising the use of available resources;
- environmental factors, including contamination and visual and noise pollution.

New information technologies such as the Internet are having an astonishing impact on the regular transport of merchandise. The application of computerization to the transport industry reduces delivery times, improves customer service and makes it possible to pinpoint the exact location of any given shipment. It also increases competition and creates the risk that small companies may be swallowed up by big ones.

This is a sector which has traditionally been left to cope on its own, and is subject to swift-paced technological change. If the sector is to be competitive, there is an absolute need for the development of a project to analyse current training needs to boost the qualifications of people working in this sector. The greatest potential of transport firms is the people who work for them.

A review of the latest data shows certain connections between non-agricultural rural



employment and the aggregate employment figures for specific Central American countries. One very important item is the proportion of non-agricultural employment in the countries of the region.

The main problems facing the drivers of commercial vehicles transporting merchandise from rural areas to urban areas are as follows:

- lack of space; commercial vehicles have to compete with other means of transport for parking space;
- extensive reserved parking areas for taxis;
- irregularly parked private cars impede the movement of commercial vehicles; even the loading and unloading zones are often blocked by illegally parked private cars;
- bus traffic congestion on some of the main access roads into the centre ;
- commercial vehicles often have to double-park to make deliveries, blocking narrow streets;
- there is a very small window for legal access into the city for commercial vehicles. Trucks and pick-up trucks can only enter the centre from 07:00 to 11:00, leaving before 12:00, and from 15:00 to 17:00, leaving by 18:00. These regulations apply to all transport vehicles, even though they operate in very different ways. The schedule does not correspond to store opening hours, as most do not open before 10:00. Private merchandise vans are not held to this same timetable;
- other stakeholders are not involved in solving the problem of distribution;
- those receiving the merchandise see this as the carriers' problem, and so solving it and providing the service as scheduled is up to the carrier;
- the authorities attach greater priority to attracting consumers into downtown areas. They thus pay more attention to the problems of salespeople, private cars and public transport;
- commercial vehicles are thought of as aesthetic blemishes in downtown areas;
- carriers view individualism as a positive trait, and are not predisposed to cooperative behaviour. As a result a great many commercial vehicles enter the city every day, usually carrying only small loads;
- the battery of problems faced by carriers just to do their job creates a situation that often puts them in violation of traffic regulations;

- there is insufficient logistical infrastructure to maximise loading and unloading operations and deliveries;
- pedestrian areas limit access for deliveries;
- last of all, insecurity is too great and too prevalent for drivers to leave their vehicle unattended while they make deliveries.

Given the importance of training, the following considerations deserve attention:

- the scant impact of advertising campaigns in training;
- possible lack of interest in training on the part of firms working in the sector. Some two-thirds of those asked about training answered that they had all the information they needed to run their business;
- high potential for improvement among workers.

The commercial transport sector at present can be accurately described as follows:

- good supply;
  - individualistic;
  - prices and services highly competitive; technological obsolescence;
  - low level of professional qualifications.
- Transport firms can be described as follows:
- very weak;
  - lack of internal structure;
  - lack of employee preparation;
  - high average age;
  - poor interrelatedness among firms.
- The market is under growing pressure from:
- technological evolution;
  - need for modernization;
  - liberalization of transport;
  - competitiveness;
  - appearance of big companies offering better-quality services.

## EMPLOYMENT GENERATION

Transporting agrofood products generates both employment and underemployment. Independently of explanations for non-agricultural employment generation and the problems of pinpointing or measuring data, various countries do possess information offering the possibility to relate theoretical considerations concerning this to actual behaviour.

From 1950 to 1980, non-agricultural employment in the rural labour force in Central America and Panama rose from 11.3 percent to 24.3 percent. During the same period, the share of non-agricultural employment in overall employment

rose from 15.8 percent to 20.3 percent. Figures from the International Labour Organization suggest that non-agricultural employment for the current labour force in Latin America as a whole fluctuates between 26 and 28 percent. Non-agricultural employment as a proportion of rural employment ranges from 32 percent to 44 percent. The size and potential of the phenomenon are repeated in some of the Asian countries, which are reporting annual non-agricultural employment increases of one to 1.5 percent. The links between agriculture and the market for goods and services mean that this growth entails an increase in non-agricultural activities of 0.80 US dollars for each US dollar of additional agricultural income.

A review of the most current information reveals the ratio of agricultural to non-agricultural rural employment (NARE) to aggregate employment for selected Central America countries. One very important point is the proportion of non-agricultural employment in the countries of the region. This is becoming rather remarkable, despite the differences between agricultural production and productivity indexes and the exportable volumes from these countries. There are also World Bank estimates that identify 36 percent of El Salvador's rural EAP as working in non-agricultural activities, duplicating the proportion of NARE in the 1970s. Other structural characteristics such as population patterns from one country to the next, and varying degrees of urbanization, seem to have a bearing on the differing proportions of agricultural employment, and on the ratio of NARE to total and rural employment. Countries where the proportion of rural employment has less impact on the national economy, such as Costa Rica and Panama, have higher proportions of NARE. This indicates a relationship between the extent of urbanization and the proportion of off-farm employment opportunities. Other indicators such as per capita income, the proportion of rural poverty or the occupational structure of the EAP, which differentiate Costa Rica and Panama from Guatemala and Honduras, appear to follow the same relationship. This would indicate that as economic indexes go up and sources of income and employment arise outside the sector, the opportunities for the consumption of non-agricultural goods also go up, paving the way for a relatively larger off-farm rural employment subsector.

Our observation of the situation in Colombia, which has a much bigger economy than the Central American countries do, indicates that the

characteristics of the employment situation are similar. Household surveys from the early 1990s show that off-farm rural employment totalled 38.7 percent of the labour force. Commercial and service activities led with some 12 percent in the service sector and 7 percent involved in manufacturing, with a great deal of variation from one region to another. Structural trends of NARE in Colombia differ from those reported for El Salvador, where some 30 percent were working in the manufacturing sector, 20 percent in construction, 22 percent in unskilled service sector jobs, and 5 percent in jobs requiring higher qualifications. The analysis emphasises that rural employment in Colombia has undergone structural modification to a point where there is now a high proportion of family-based non-agricultural employment. An estimated 51 percent of rural households have some sort of agricultural or livestock enterprise, 21.1 percent a non-agricultural enterprise, and 11 percent have both. Off-farm businesses operate out of the home in 74 percent of these cases. The Atlantic and Oriental regions are those with the highest concentration of home businesses and are also relatively less developed regions. Only eight percent of these hire workers outside the family, and the business occupies fewer than five people in 99 percent of the cases. The same regions report higher proportions of women in off-farm rural employment – 16.3 percent in Atlantic province and 22 percent in Oriental province.

### **RURAL TRANSPORT COSTS**

When agricultural products are produced far from consumer, export or industrial centres, the transport of these products assumes great importance. The big producers have incorporated trucks into their business. This may be because they hoped to earn more, or because they wish to maintain their independence and do not want to have to depend on third parties to ship their products.

Producers, asked about the costs of the transport system they use, mostly answer that they do not know. They usually just know how much they are charged per unit shipped. This ranges from 0.35 US dollars to 1.10 US dollars for a crate or for bulk volume. Or they may only know the cost of a truckload (from 65 to 120 US dollars per truckload for trucks carrying more than 100 quintals<sup>1</sup>). They do not keep records of actual transport costs, and are thus unaware of the unit cost of transport.

<sup>1</sup> 1 quintal = 100 pounds = 45,36 kg.



**Plate 1**  
*Arriving from the countryside into the city. Guatemala*

Transport is an important item in determining costs and time as necessary stages in getting the product to market. A product coming off the farm, ranch or plot and destined for the local, regional, national or international market place needs to be transported. The means of transport used by farmers or traders to get agricultural products to market are many and varied: beasts of burden, roads, foot travel, pick-up trucks, lorries, urban and extra-urban buses, and more (Plate 1). The mean of transport is important, considering the costs and losses incurred from poorly managed transport and delayed deliveries. Small farmers lack their own means of transport to take their goods to market. Those who live very far from consumption centres alternate shipping the product with carrying it on their own backs or on the back of an animal, or else hiring some other means of transport.



**Plate 2**  
*Transfer of agricultural products from farmer to buyer. Guatemala*

A farmer transporting his products on his own is also responsible for material losses during transport. Otherwise, the intermediary meets this cost, which he recovers out of his own earnings. This is why most farmers sell their products to intermediaries (Plate 2), thus avoiding the problem of transport losses. Intermediaries pay cash directly upon taking delivery of the product. Even farmers with commitments to farmers' organizations may decide to sell to intermediaries for a lower price so as to have the money in hand sooner. This is a regular occurrence when product prices are high, and generates scarcity for specific products.

### **Identification and description of added costs due to transport**

Fuel costs (mostly diesel), daily wages for the driver, and sometimes his expenses, are the usual items in working out the costs of transport. Expenses are figured in when the producer is the owner of the vehicle in which the food products are transported. When the producer hires a vehicle, the only item considered is the unit charge for moving the goods from farm to market. This is also true of producers who transport their products on extraurban buses from the countryside to the national markets.

### **Food transport subsidies**

These countries do not normally provide incentives for producing food products or for transporting them to consumption centres. An article published in the Guatemalan news daily *La Prensa* stated that "We have become an importer of soybean, maize and almost all grains consumed in this country, because it is cheaper to import them, due to the subsidies producer countries such as the United States of America pay their farmers, and which allow them to cut their sale prices". In Guatemala and the other Central American countries there are no subsidies for producing agrofood products or getting them to market.

### **FOOD LOSSES AND FOOD SAFETY DURING TRANSPORT**

Perhaps the most serious losses to agrofood products during transport are small bruises. These account for no more than 10 percent of losses, and some carriers opined that bruising occurs on unpaved roads, where the cargo is shaken even at low speeds, causing minor damage despite packing and packaging. Once the trucks reach asphalt the truck bounces less and the load stops shifting. The distances and time to market are below 200 km, and



**Plate 3**

*Concentration of trucks in the Mercado Municipal, Guatemala.*

carriers get there quickly enough to ensure the load arrives in good shape (Plate 3). Damaged products are thrown away, or, if relatively undamaged, are sold as seconds.

### **GOVERNMENT POLICIES TO IMPROVE FOOD TRANSPORT**

Road infrastructure is one investment component of Guatemala's National Peace Fund (FONAPAZ). "Road, highway and bridge projects are executed to provide easy access to communities. Works of this kind make it easier for populations to market their products, facilitate access to urban markets and thus help generate the conditions for economic development".



# Strategies for improving rural agrofood transport

## DESIRABLE CHARACTERISTICS OF FOOD TRANSPORT SYSTEMS

The possibility of food contamination during handling and transport is indisputable: efforts must be made to maintain the safety and integrity of harvested agrofood products during transport. They must be protected to avoid contamination or damage.

Food transport vehicles must be thoroughly cleaned, dried, and preferably disinfected before loading. Loading and unloading should preferably be done during daylight hours, away from food processing areas, and protected from inclement weather and sources of contamination. The load should travel firmly stowed in its compartment to avoid shifting during travel, which can have an adverse effect on product quality.

It is fundamental to establish a proper loading pattern. This means leaving enough space between products to ensure uniform air circulation throughout the cargo so that temperature can be brought down rapidly and maintained throughout the trip. Proper loading also increases stability, ensuring the product remains intact during the move. Lastly, consideration needs to be given to the inherent resistance of a given product to packing.

Transport vehicles should be parked away from food handling areas to avoid contamination from petrol or diesel fumes. For bulk transport it is advisable to provide dry-air ventilation of the load to eliminate moisture arising from respiration, and subsequent condensation as the vehicle moves from a warm region to a cooler one, or from a dry to a wet region, or when night falls.

It is best to establish the loading and unloading zones beforehand. The packed products should be moved gently to avoid breakage and/or damage to the product. Agrofood products need to be packed in such a way as to meet a strict set of conditions. They must be able to withstand environmental changes such as alterations in temperature, vapour pressure, relative humidity, atmospheric composition and light. The inherent dangers of

loading and unloading, and the risks of damage and bruising during transport, need to be reduced. Vibrations and movement of the vehicle during transit can cause damage. Mixed loads need to be judged for their compatibility or incompatibility during transit (odours, contamination, colour changes). There should be no toxic substances, and different temperature or humidity requirements for products also need to be factored into the equation.

Research on the impact of indiscriminate packing and loading of products show that not all agricultural products can be transported in the same load and under the same conditions. They must be compatible in terms of the recommendations for temperature, relative humidity, ethylene production, ethylene sensitivity, and the production and absorption of odours.

The condition of the various parts of the vehicle needs to be checked to ensure nothing is broken, the locks are working, no water can leak into the load, or any other defects. The truck should not be parked in the sun during rest stops. Stopping in the proximity of other fume-emitting transport vehicles or machinery should be avoided.

Another major factor in agrofood transport is the condition of roads and transport fleets. Much of the problem – and the reason why many regions are still subsistence economies – has to do with the poor condition of road networks. If we are to improve the rural transport of food products, therefore, both good road networks and proper, well-maintained transport vehicles will be needed. The upshot will be accessible transport costs for the producer. Another important aspect of better transport and better-quality food products is farmer organization.

## ANALYSIS OF JOINT INTERVENTIONS TO ADDRESS FOOD TRANSPORT PROBLEMS

Some regions have solved the problem of distance from production site to market or meeting the demands of the international market-place by building collection centres that go some way towards enhancing agrofood product quality.

This can cut losses during transport, or else allow selection of higher quality products, at higher prices. This is particularly true of organized farmers, such as the request by farmers in the Guatemalan highlands for collection centres with cold chambers for their fruit and vegetable products.

There are also private initiatives by organized farmers' groups who have built their own collection centres. Organizing farmers and building collection centres are two appropriate strategies for enhancing the quality of food products within the transport system.

### **OPPORTUNITIES FOR HOLISTIC SOLUTIONS, IMPROVEMENT OF FOOD TRANSPORT SYSTEMS AND SOCIOECONOMIC DEVELOPMENT**

The formation and development of industrial conglomerates (or clusters) offers a glimpse of how Latin America's small farmers could become competitive in the face of the new and challenging world market situation. This section explains the main advantages for enterprises to join forces, especially small agricultural enterprises. It outlines a practical methodology for implementing development processes and strengthening competitive conglomerates. Also discussed are critical factors for successfully undertaking ventures of this kind. It all goes back to the year 1995, when the Central American Institute of Business Administration (INCAE) helped to promote discussions among the presidents of five Central American countries, culminating in the signed commitment of these heads of state to back the "Central American Agenda for the 21<sup>st</sup> Century". This paper sets out, for the first time, a vision of Central America's position in the world economy. The Agenda incorporates two central concepts: *Conglomerates* and the *Business Climate*. The conglomerate concept, in particular, introduces a new way of looking at national and regional economies.

#### **First approach**

The reality faced by a business or enterprise can be viewed in any of four contexts: global, national, industrial-sectoral and business. Managers have different degrees of control in each, ranging from virtually no control in the global context to a very high degree of control over the business practices of their own enterprises. All of these contexts are important, but unfortunately a business can only make a difference in specific cases. Acting as a

conglomerate is one feasible way for businesses to become more competitive

#### **Global context**

Agroindustries mainly operate within a complex context of global competition, in particular in the market for generic products. These markets are now showing signs of maturity with respect to demand. Their growth tends to parallel that of population growth, but the supply picture is both growing and volatile. This has created highly irregular but basically downward price trends. .

In Central America, banana, coffee and sugar alone represent 18 percent of all exports and over 60 percent of agricultural, agroindustrial and forestry exports for the region as a whole. In other words, exports are concentrated precisely in the three generic markets that are frequently plunged into price and other types of crisis. Generic markets are very fluid and easy to access, the problem here is not selling the product but the price at which the product is sold.

The minimum scale of production, distribution and promotion necessary to be competitive on world markets lessens the potential for individual small farmers to do well in these markets, especially as they mostly hail from poor countries with very little influence in the international market-place. Open competition with Colombian coffee, for example, which has for decades invested vast sums on product promotion and positioning, in addition to being the second world producer and exporter, is a thankless task.

Moreover, even with the new trends for open trade on world markets, the persistence of heavily distorted world markets for agricultural goods is anticipated. This mainly involves tariffs and subsidies, especially for the so-called "sensitive" products: cereals, oilseed and sugar, among others. In accordance with the WTO agreements, the rules for the world trade of agricultural products are being agreed upon and redefined, but there are still major gaps. In very poor countries, overexploitation and unsustainable management of human and natural resources can still produce astonishingly low production costs. In the rich countries, direct subsidies to farmers and barriers to international trade distort costs and prices, and this is the environment in which the competence is developing.

In Latin America there are vast and virtually unexplored opportunities. There are environmental niche markets, for example, for which the demand

is relatively small but in which growth is very rapid, and where prices are both higher and less volatile. The problem is that it is very expensive to penetrate these niche markets. This is a medium- and long-term task, which can become a near insurmountable barrier for small individual businesses.

### National context

There is increasingly less room for manoeuvre in the national context. The influence of the global context on national economic policies, especially trade policies, and the shrinking fiscal resources earmarked for these activities, are all factors constraining the opportunities for traditional support to the agricultural sector. While traditional local support to the farm sectors now restricted by WTO agreements, such as subsidies, are being eliminated, other unrestricted aids such as public spending for research are only timidly being applied. The United States of America and the European Union, for example, invest one percent of their Gross Domestic Product of the Agricultural Sector in research and development, whereas the comparable figure for Central America is very much smaller, at 0.2 to 0.5 percent. Thus the Latin American farmer finds himself increasingly confronted with a heavily distorted international market with growing rivalry for local markets, less support, and more regulations.

### The industry situation: acting as conglomerates

There is not much room for manoeuvre in the global and national context. At the industrial level, however, improvements are possible where businesses and other stakeholders join forces to achieve common objectives and share profits. Forming into conglomerates can make progress possible, but agreements must be reached beforehand. Reaching and complying with agreements implies a clear set of rules and efforts to raise the business platform for all (or at least most of) the conglomerate's activities.

### Operation of the enterprise

The approach is the efficient and effective operation of conglomerate. The assumption is that the enterprises involved are reasonably well managed. A poorly managed enterprise cannot survive in the long run, not even one backed by conglomerates, governments or the socio-economic context.

### Conglomerates and competitive advantages

Porter (1991) defines a conglomerate (or cluster) as "geographically close groups of interconnected companies and associated institutions in a given field, linked by common and complementary elements". They may be companies providing finished products or services, inputs, components, machinery and special services, or financial institutions. They may be "downstream" related businesses such as distribution channels and customers, or providers of complementary products, specialized infrastructure, public and private training, education or information institutions, or perhaps technical support and research institutions, supervisory and regulatory agencies, or labour associations.

This new way of looking at the economy places competitive advantage largely outside the enterprise --even outside its traditional industrial sectors. It suggests that competitive advantage is inherent in the quality of the member relationship--one wherein businesses, governments and other institutions all play a permanent and active role in boosting competitiveness. The greatest competitive advantage from operating in this fashion comes from economies of scale for entrepreneurial activities. This includes materials purchases, research and development investment, information systems, distribution and storage infrastructure, promotional costs and sales. By operating as a conglomerate, an enterprise gains in efficiency and product quality through specialization. The labour and institutional response of the sector also increases significantly.

The global context is a given condition, especially for small farmers from poor countries. Global realities and resource scarcity both influence the national context, and therefore domestic room for manoeuvre is very limited at the country level. As for the industrial situation, a business working as a conglomerate can be much more competitive. The most important requirement, however, is that key protagonists reach agreement.

Conglomerates are a good competitive option for small farmers, enabling them to take advantage of economies of scale in some entrepreneurial activities such as purchases and distribution. Moreover, joint action or investment in promotion, brand consolidation and product lines facilitate the differentiation of small agricultural enterprises in small (but more profitable) market niches.

### A new concept of competitiveness

The following four fundamental changes were achieved by a key group of the region's businessmen, based on the Central American Agenda for the 21<sup>st</sup> Century and discussions on a course of action deriving from a competitiveness analysis of its conglomerates. These were:

- heightened awareness by entrepreneurs and public sector officials of the key sectors in each country that can drive competitiveness, with a obvious emphasis on the opportunities afforded the agribusiness sector;
- a better understanding of the best practices for becoming competitive in key sectors, and the introduction of improved practices for certain conglomerates such as the fishing sector in El Salvador. These may not represent huge transformations, but they do clearly indicate the potential of participant efforts in this conglomerate;
- drawing up specific agendas to improve sectoral performance validates the need for an action plan to follow up on the agreement among key conglomerate participants;
- a start – in some cases a vigorous one while only timid in others – towards implementation of the proposed improvements to the respective agendas.

The first three elements constitute the prerequisites for implementing measures designed to make a given conglomerate more competitive, and they also comprise the constituent elements of confidence in this model, as mentioned above in describing the critical factors for success.

### Training in competitiveness analysis

Specialists had to be trained to identify potentially highly competitive conglomerates in each country. They had to be immediately available for the intensive job of preparing the studies and hammering out a set of useful proposals and recommendation to improve competitiveness in each conglomerate. At the time of writing of this document, some 200 people, including officials, entrepreneurs and members of labour organizations had participated in the training workshops on competitiveness analysis. National communities now have an invaluable resource for deepening, disseminating and extending the data on competitiveness to other sectors of their economies.

The fundamental challenge in this field is to use this built-in capacity for study and analysis to

explore other sectors, in addition to those already reviewed. A second component of the learning process concerns participation and observation of the research process, and its implications for subsequent cooperation efforts and the implementation of new management practices at the individual conglomerate level.

### Requirements for enhanced competitiveness

The analysis of conglomerates and benchmark studies alone is no panacea for achieving competitiveness in a conglomerate. The process of study and implementation proved to be just as important as the content and findings of these studies. These requirements are mentioned in the section on critical factors for success as follows:

- confidence in the model;
- “democratization” of benefits;
- institutional development of critical actors;
- presence of a local stakeholder as leader;
- perseverance;
- resource availability;
- the existence of a crisis or threat to the sector;
- acknowledgement of the vulnerability of isolated efforts.

### National competitiveness committees

Greater use should be made of the existing scaffolding of national competitiveness committees in each of the Central American countries as a key resource for efforts to strengthen local conglomerates. The basic function of these committees is to act as a forum for meetings, exchanges, discussion and follow-up on commitments arising out of the Central American Agenda for the Twenty-first Century. These committees can reaffirm and ensure the implementation of the specific agendas of individual conglomerates – a potential that should not be overlooked.

### The challenge of equity

Strictly speaking, the analysis and development of conglomerates focuses on and favours, by definition, just a few sectors of the national economy: those with the greatest potential for global competitiveness. One fundamental challenge for all countries in the region will be to make use of the competitiveness model, instruments and practices in sectors that have been sidelined up to now, and which will irremediably widen the poverty gap if they continue to be ignored. We need to recognize the fact that an exclusive focus on competitiveness, especially



competitiveness in the agribusiness sector, is part but not all of the reality in the sector. There are major considerations concerning the broader concept of rural development. The challenge is to achieve a more competitive farm sector and at the same time address the current pressing social needs of the rural areas now home to nearly half the population of Central America.

## **COLD CHAINS: ONE ALTERNATIVE FOR THE RURAL SECTOR**

### **Components of economic feasibility and viability**

Post-harvest cooling of agricultural products is a necessity. Temperatures need to be brought down quickly and the product prepared for packing, storage or processing and final consumption. The point of post-harvest cooling of agricultural and livestock products is to successfully:

- suppress enzyme degradation and slow respiratory activity;
- lower or inhibit moisture losses;
- inhibit the proliferation of micro-organisms;
- reduce the production of ethylene.

Post-harvest cooling does not just protect product quality; it makes for a more flexible market situation by lengthening the time a product can be stored without losing its sensory properties. Cooling and storage will avoid the need to market these products almost immediately, which is an effective way of at once regulating both markets and prices.

In the cool highlands of Central America and especially in Guatemala, where ambient temperatures range from 10° to 15° C., some fruits and vegetables have a longer shelf life. This, however, is not enough: temperatures of 1° to 4° C are needed to conserve and transport export products, which require greater care. In the hot lowland areas of Guatemala, where temperatures above 30° C are frequent, poor product management was observed. Ignorance of or lack of interest in the introduction of new post-harvest management techniques led to a lowering of the quality of agricultural products carried to local, regional and national markets.

A number of aspects need to be considered before selecting a pre-cooling or cooling method.

- The nature of the product. Each product has its own cooling requirements. Strawberries and broccoli need to be maintained at near-freezing temperatures, whereas tomatoes can be damaged at these temperatures. Other products cannot be moistened, and so they cannot be pre-cooled with ice or water.

- A product has specific packing requirements. The selection of a cooling technique depends on whether a product is packed or not, and, if so, if it is bagged or crated. Packing design has an impact on the cooling behaviour and velocity of the technique selected.
- Flow capacity of the product. Some cooling methods are faster than others. The volume of product to be cooled per harvest, per day or per hour will affect how quickly a product needs to be cooled to cover the production of these volumes. Highly perishable products with a higher rate of respiration such as asparagus, broccoli, spinach and sweet maize need to be cooled quicker. They therefore also need to be kept at cooler temperatures and the quickest pre-cooling technique is also required.
- Economic restrictions. Construction and operating costs vary in accordance with cooling techniques. Initial outlay is usually high, especially when only small amounts of produce are to be cooled. Cooling costs need to be offset by high sale prices and other economic benefits. Factors affecting the choice and use of a given system will be influenced by the consequent market flexibility, market expansion, greater distances to be covered for transporting the product, and the farmer's capacity to invest now for later gains.

### **Suggestions for the transport of refrigerated agrofood products**

Where products are subjected to high temperatures and great distances are to be covered, trucks need temperature regulation equipment. Various suggestions for transporting refrigerated food products are listed below:

- cool the vehicle before loading to the temperature at which the product has to be stored or shipped;
- ensure the loading area is closed and cooled; individual crates and bags need to be stacked so as to ensure the circulation of cold air throughout the load;
- test the refrigerating system to ensure it meets the cooling requirements for the specific product;
- include thermographs in the load to ensure it has remained at the proper temperature during the transfer process;
- check the condition of the vehicle walls, floor, roof and doors to ensure there are no cracks

or damage that might let in heat, dirt or insects, or cause losses of cold and moisture; also check to see that all doors and vents are in good working order;

- check to see that the vehicle is clean, and that there are no residual odours, toxic or other residues from the previous load, insects or their nests, or blocked air vents in the floor, all of which can damage cargo;
- park transport vehicles well away from areas where products are handled to avoid contamination from combustion fumes.

## PROBLEM PRIORITIZATION

### Multimodal transport in Central America

- All Central American countries have door to door services using two or more means of transport, but there is no appropriate legal framework to regulate these services.
- Formalities, procedures and documentation used in the food import/export sector are unduly complex.
- Customs services are making efforts to modernize and technify. However, there are still problems concerning the lack of technical and operational capacity to address the growing demand for more efficient services to handle foreign trade in the region.
- Some Central American agreements to facilitate international commerce are only partially (or not at all) complied with. The different modes and interfaces of transport services are often inefficient.
- Lack of coordination between the various public and private sectors involved in multimodal transport within and between countries. Transport standards are not harmonized and transport policies are mostly non-existent.
- Lack of electronic exchange of data, a key element in food transport.
- Lack of regulations governing freight transport.

### Maritime transport services and ports

Various problems need to be addressed in the short-term, namely:

- technical problems of access channel depth and the availability of loading and unloading equipment;
- operational limitations and low productivity;
- institutional limitations, failure to take the long view and scant intra-regional technical cooperation;

- lack of infrastructure to meet the needs of maritime transport.

### Customs

- lengthy, cumbersome, border customs procedures;
- financial and operational limitations;
- high user costs/operation/ton;
- qualitatively unsatisfactory loading services.

### Airports and air transport

- sidewalk areas are not long enough to mobilize passengers efficiently;
- parking area problems;
- insufficient, saturated freight terminals;
- problems with increasing the number of take-off and landing strips;
- problems with increasing the number of terminal access doors.

### Rail transport

- rail infrastructure designed to meet early twentieth century requirements;
- necessary investments to establish a new, high-performance rail network only feasible in corridors with sufficient traffic density to make participation competitive.

## STRATEGIC PLANNING TO ADDRESS AGROFOOD TRANSPORT NEEDS

### Key factors for guaranteeing food availability

Central America proposes to become an economically integrated area in which goods can be shipped via intermodal transport systems from one ocean to the other with no intra-regional limitations. The various regional ports can thus offer optimum service at lowest cost. Goods can be unloaded in one port in the country, re-processed in another and leave from a third port, using the transport services of any member country.

If Central America is to make this viable, the process of integration must be strengthened. Factors such as the harmonization of macroeconomic policies and regulatory frameworks need to be freer and more flexible to promote competitiveness and development in the region.

Below some of the problems facing the transport sector in Central America are listed.

- Limited capacity, deteriorating and poorly maintained road and rail networks, ports and airports.

- Barriers to genuine access to official financing offered by international financing bodies.
- Legal and regulatory frameworks not designed to attract private capital to the sector.
- Organizational and institutional gaps at the country level.
- Insufficient regional coordination with COMITRAN and its secretariat.
- These gaps reflect, in some sense, the high operational costs of product handling, and are making the Central American economies less competitive.

The regional transport policies now being promoted in the transport sector in support of regional integration are listed below.

- Modernization of the transport infrastructure and services.
- Competence and complementarity among means of transport.
- Strengthening the state planning and regulatory role in each country and in regional coordination.
- Reorganization of public investment under the criterion of subsidiarity.
- Promotion of private management and financing of public infrastructure.
- Incorporation of environmental impact aspects.
- Helping to facilitate transport through inter-sectoral coordination.

#### **POLITICAL AND SOCIAL ASPECTS: EFFECTIVENESS OF PROPOSED SOLUTIONS**

Market structures have changed significantly in recent years. The state role in marketing and financing basic commodities has shifted from direct intervention to a new openness to private sector participation. Nonetheless, the inherent risks of the already cited instability do have a direct impact on producers and/or other local stakeholders. In this context, then, it is important to explore the various mechanisms that can be applied to find the right solutions for each country and each market. In a context of liberalization, local agents are encountering a number of stumbling blocks to accessing financing. New financing structures based on the use of raw materials as a form of collateral guarantee can substantially improve access to financing under terms that will allow the agrofood industry to develop. This section looks at several examples of price risk management and specific financing structures.

#### **Need for external service providers (quality control, insurance, and more)**

- The economic integration process has been ongoing for many years now, but the Central American market is still very far from constituting a true free trade zone. Missing is the standardization of existing regulation as well as free trade among participating countries. Some characteristics mentioned by the Costa Rican Chamber of the Food Industry (CACIA) concerning the intra-regional food trade are listed below.
- Poor economic integration of the regional market. The legislation has not been standardized, there are still no mechanisms for conflict resolution, and decisions on trade matters are arbitrary, especially for technical quality standards and sanitary records.
- There are no specified periods for prior approval and plant inspection by the Ministries of Agriculture, a constraint to regional market opportunities.
- Regional competitiveness should be bolstered using a productive chains approach.
- Problems with local market shortages lead to requests for safeguards for the importation of raw materials or inputs, and these temporarily reduced the tariff for the firm to the detriment of other regional suppliers.
- It is hard to track trade flows in the region because the statistics are so complex to process, given the unrecorded trade that goes on in the region.
- There is no strategy for regional capacity-building for food safety and standards, especially the standardization of food labelling norms, inspection and licensing.
- Information on food production is lacking in all countries.

#### **CONVERGENCE OF ECONOMIC POLICIES IN CENTRAL AMERICA**

##### **Principal convergences of regional economies**

The countries of the region have made major efforts to achieve macroeconomic stability and the convergence of economic policy based on the Peace Accords. Stability and convergence have been mentioned above as key to enhancing the business climate and attracting investment. Unsurprisingly, then, new steps are being taken in the region towards greater openness, deregulation, the transfer of government functions to the private

sector, and the transformation of investment policy frameworks. These and other efforts aim to make the region more efficient and more competitive. But the changes have not gone forward at the same pace and to the same extent in every country. The region faces substantial challenges that must be met if the objective is to achieve high rates of sustained growth and address the implied task of economic and social development.

The demands of the economic, social, environmental and institutional plan therefore represent a genuine challenge for the economies of the region. The infrastructure and *per capita* income gaps, the high incidence of poverty, and the lagging development of regional institutions are among the major constraints to tackling the problems of growth and human development, achieving stability, and consolidating a favourable climate for investment. A consolidated environment guaranteeing both the safety of its citizens and the legal security of investments is fundamental to heightened trade flows in the region.

Progress in the economic integration of Central America has been slow-paced. This is particularly true of issues such as harmonizing economic policies, and the customs union. The need to negotiate rules of internal origin clearly shows how far we still are from the framework of the Central American Common Market (CACM). Duly negotiated concrete projects, such as the Central American Logistical Corridor, for example, are not being implemented. Progress is lacking in areas such as the free movement of goods and persons, the monetary union, the unification of economic legislation, enhanced free trade areas and business facilitation, harmonization of regulatory frameworks and the improvement of regional infrastructure. One of the most worrying regional trade issues, however, especially for agricultural and livestock products, is the question of non-tariff barriers.

It is worth recalling that the issue of tariff barriers is fairly well resolved in Central America. The area could be described as a working free trade zone with some room for improvement. The multilateral commitments of countries in the region, under the FTAA and the WTO, require a revised export strategy for Central American countries based on the eventual elimination of some of the benefits of duty-free areas. This trend has been of particular importance for the region in its trade relations with the world, much more so than the eventual elimination of some of the intra-regional benefits of duty-free areas.

It needs to be pointed out that intraregional trade never stopped, even at the height of hostilities, but pacification has substantially increased trade within the region. So it comes as no surprise that businesses are working hard to regionalize. In the commercial sphere this involves supermarket chains; in industry, food, beverages and construction materials; in the service industry, airlines, hotels and restaurants; and in the financial sector, banks and financial investments. Regional institutions promoting the establishment of a unified and interconnected market for electric power, integrated fossil fuel markets and the construction and maintenance of transport infrastructure and services, among others, pave the way for progress in these sectors.

To sum up, the **business climate** has increasingly improved since the 1990s in the region. Despite the persistence of certain major risk factors, there is every indication that the countries of the region are well on their way to completing the reform process and consolidating stability, though not necessarily at the same pace. One proof of this process is the major growth in direct foreign investment and intraregional investment alike, in response to the new opportunities opening up for trade and for increased private sector participation in the economic sector. The challenges are still enormous, however, in terms of the major investments that will be needed for infrastructure and in connection with the human development aspects in the region.

### Macroeconomic convergence

Overall economic performance is one of the region's greatest challenges. Output growth rates have been less than satisfactory. In 1999 the regional average was 3.7 percent, lower than in the early 1990s. The average per capita income in the region was US\$1 518, with a major gap between Costa Rica's yearly average of nearly US\$2 900, El Salvador and Guatemala somewhere between US\$1 600 and 2 000, and Nicaragua and Honduras under US\$900. This represents a major challenge for the future in terms of opportunities for economic growth and social stability. Looked at from the standpoint of economic convergence, real output growth rates in the 1990s showed no clear growth trend. On the contrary, erratic economic behaviour fluctuating between one and two percent characterizes the period. **Inflation rates** had dropped somewhat by 1999 compared to the previous year, and were the lowest in the decade at 6.1 percent for the region as a whole. This is evidence of a general

downward inflationary trend, greater efforts to control domestic price trends and better monetary discipline and credit control in each country. It is important to point out that no negative interest rates in real terms (such as had occurred earlier in Guatemala and Honduras) were recorded in 1999, reflecting some progress in deepening of financial markets in Central America.

Convergence was also observed in exchange management. Guatemala and Honduras both adopted a free exchange regime, achieving stability through the active intervention of the central banks. The type of exchange operating in Costa Rica and Nicaragua is administered by the Central Bank under the so-called crawling peg system of minidevaluations. In El Salvador, sustained affluence from family remittances from abroad has long made it possible to maintain a type of fixed exchange and accumulate foreign exchange. More recently, in January 2001, the US dollar was allowed to circulate freely together with the local currency. The trend toward greater convergence and lesser annual variation in the type of exchange is also related to economic adjustment. Economic adjustment generally tends to reduce inflation and promote the use of more transparent exchange systems, less influenced by currency market interventions, and hence more realistic currency prices.

Concerning **fiscal matters**, the countries of the region have improved their tax collection policy through the imposition of new taxes. Major macroeconomic fiscal imbalances still persist in the region, however. Costa Rica, Honduras and Nicaragua are finding it hard to reduce their fiscal deficits: the result of past policies of increased public expenditure financed by internal or external debt. This laid a heavy burden of debt servicing and interest payments, which in the long run made it impossible to reduce public spending. So far, El Salvador and Guatemala are not looking at major debt problems, but they do need to continue their efforts to improve tax collection, make revenue earmarking more efficient, and increase the tax burden to put them in compliance with the commitments of the Peace Accords.

The fiscal deficit is clearly on a downward trend in the region, with a certain amount of convergence in terms of the direction of the deficit from one country to the next. There were years like 1994, for example, when every country except Honduras had low fiscal imbalances, unlike what happened in 1996. This can be attributed to their tax structures,

which are heavily dependent on foreign trade. Regional efforts for tariff harmonization and exemption are reducing tariff levels and tariff rate dispersion. Despite this, some products, especially agricultural products, still have high protective tariffs. This testifies to the difficulties Central American countries still face in adapting to a free trade area under a common external tariff.

The Tariff Exemption Programmes apply only to goods originating in each country participating in the trade agreement. This is particularly important where treaties involve the participation of several countries. The rule of origin is fundamental in avoiding triangulation where the levels and timetables for exemption differ from one country to the next.

### VIABLE SOLUTIONS FOR THE TRANSPORT OF FOOD PRODUCTS

Among the existing solutions for solving food transport problems, the following deserve mention.

- Establish an infrastructure that can link the most remote hamlet in the interior anywhere in the region with the big regional markets and the rest of the world. This would serve to reduce operating expenses, make these remote areas more competitive, and broaden access to the benefits of free trade. The goal is to turn the region into a highly attractive investment and trade centre, given its geographical location, providing an optimum infrastructure, accountable and efficient institutions, qualified human capital and good business sense.
- Lease the services of El Salvador's International Airport, rail network and the Port of Acajutla, approving the necessary legislation, to provide a more competitive framework.
- Build and/or rebuild those roads identified as crucial for national development in line with the needs identified by the government, the National Plan and the Plan Puebla Panama. This would include the north-running highway, the interoceanic highway from the ports to the Atlantic, the highway to Santa Ana, the highway to Quezaltepeque, the Pan-American highway to Oriente, the coast highway from San Miguel to La Unión, the Santa Ana-Metapán-Anguiatú road and the San Salvador ring road.
- Continue the second phase of the project "Sustainable Rural Roads", to develop regions



with few connections to the remainder of the country, such as the access road from the northern trunk road to the town of Las Pilas, Chalatenango and the road between Ilopango and Santiago Texacuangos that links the Pan-American highway to the freeway leading to El Salvador's International Airport, among others.

- Revise, formulate and modernize the legal framework for overland freight and passenger transport, creating the underpinning for sector competitiveness.
- Approve the Special Law on Mandatory Insurance for Motor Vehicles.
- Establish and maintain a systematic study of regional and international legislation on overland freight transport so as to harmonize local legislation.
- Establish overland freight transport reciprocity mechanisms with other Central American countries and ensure compliance.
- Develop the original project to reform collective transport for passengers.
- Take the necessary steps to ensure competitive market prices for air and sea transport of freight and passengers.
- Monitor the internal operations of the freight transport service to avoid unfair competition by carriers from other countries.

### FORMULATION OF STRATEGIES AND POLICIES TO IMPROVE THE TRANSPORT OF AGROFOOD PRODUCTS

The presidents of the Central American countries, spurred by the growing globalization of the world economy and by progress in democratization and pacification in the region, agreed to formally relaunch the Central American integration process. The new basis for integration would make the national processes of external openness compatible with a renewed process of regional integration in a context of open regionalism.

The proposal of the Central American transport sector "Global Frameworks for Regional Transport Infrastructure and Components of a Regulatory Legal Framework" suggests:

- accelerating change in legal frameworks and institutional modifications; components of loans or technical cooperation to finance this type of efforts are already operating in the countries of the isthmus;
- integrating individual country efforts, identifying successful reform experiences

in the region or in other Latin American countries, and promoting short-term workshops and visits;

- creating road maintenance funds;
- promoting leasing legislation to allow private sector investment for the rehabilitation and operation of existing infrastructure;
- applying re-engineering in ministries and autonomous bodies working in the sector, stressing long-term planning, streamlining and upgrading, and the awarding and execution of work contracts;
- harmonize and step up a regionally-oriented process of legal, regulatory and institutional reform in the various countries.

Financing the regional master plan will enable precise definition of new regional projects and their funding needs, in light of interaction with specific ongoing national projects. As the integration process evolves, the necessary regional mechanisms for implementing the works can be clearly defined:

- proposals of the regional master plan;
- provision of services to the six urban areas generating industrial production for intraregional trade, as well as the electronic assembly plants and the garment industry;
- attention to the major agroexport production zones;
- general services for the main centres of tourist, archaeological, historic, folklore and recreational interest;
- provision of services to certain lightly populated areas on the Atlantic side.

Measures to improve the transport services:

- institution-building studies;
- legal and leasing studies;
- design and regulation manuals;
- transport infrastructure studies;
- project monitoring profiles;
- transport facilitation studies.

### REDUCTION OF POST-HARVEST LOSSES Sociological, economic and institutional consequences of post-harvest food losses

Material losses occur at various phases from crop maturity to the point of final consumption. These losses can be reduced at any stage of the post-harvest process by improving harvesting, drying, storage, processing, and/or handling techniques. These processes and operations are inter-related, however, and all are affected by the prevailing environmental conditions, be these climate-related,

sociological, economic, agronomic, cultural or ecological considerations.

Any steps taken to reduce post-harvest losses must be both economically justifiable and practical with reference to the predominant post-harvest system. A clear and detailed analysis of how the system operates under specific concrete circumstances is an essential pre-condition to reducing (or even evaluating) post-harvest losses. Only then can constraints, problems, and possible solutions or improvements be identified.

In some countries rice is precooked, which improves its nutritional content. This is why consumers are willing to pay a little more for it. Precooking also makes it easier to process rice. And where processing equipment is quite minimal, there are fewer broken grains and fewer losses. However, in some countries people consider precooked rice an inferior product, and prefer to pay more for highly processed white rice with a lower percentage of broken grains. The introduction of the precooking process might not receive widespread acceptance, therefore. Factors such as cost-efficiency, the institutional framework, labour availability and consumer preferences need to be reckoned into the equation.

Post-harvest loss prevention will only be undertaken if it represents a benefit for the producer. In a subsistence economy, prevention might entail the storage of cereal grains or tubers, with the benefit consisting of the fact that the product remains edible longer. There is usually just one harvest and so any part of the harvest that is not consumed immediately accumulates, and has to be stored somewhere if it is not to be lost.

In a mixed subsistence/market economy, or in one where products are grown only for sale, producers will introduce into the post-harvest process only those changes they believe will contribute to and boost their income. These changes will only be adopted, however, if the operation is cost beneficial, and markets can absorb larger amounts at cost-effective prices for the producer.

Many factors affect the cost of post-harvest loss prevention. Usually post-harvest loss prevention projects include such activities as the introduction of techniques to reduce material losses and boost the income of small-scale farmers. Such projects tend to improve the handling, storage and pre-processing of cereal grains, pulses, roots and tubers, and to introduce techniques to preserve the quality of fruits and vegetables. Storage structures

at the farm and village level have also been supplied to support these activities. Storage sheds and small-scale dryers have been provided, and processing equipment improved (from rice threshing to fruit and vegetable grading and packing). Rodent and insect pest control measures have been enhanced and training undertaken on all aspects of all phases of post-harvest loss reduction. It is important that the initial cost-benefit analysis is seen to be positive. According to some reports, a cost-benefit ratio of 1:1.5 is not good enough to persuade farmers to accept the risk of introducing a change in post-harvest loss prevention activities. On the other hand, a 1:2 ratio will probably provide sufficient incentive. This approach can be a meaningful guideline for post-harvest loss reduction planners, project managers and those responsible for training activities in this field.

Storing cereal grains in metal drums on the farm or village will probably reduce grain losses, but the initial cost of the drums can be too high with respect to the amounts saved in the short term to appeal to farmers. On the other hand, when the cost is quite low, the innovation will be replicated, as in the case of a storage container made of clay and straw combined with insecticide use. In this case the only outlay is for the insecticide, whereas the straw and clay can be found *in situ* and the container built with family labour. Some farmers store rice in wooden bins, and many houses have such bins. They measure about 2 x 1.5 m, and are built out of readily available hardwood. They are rodent-proof and often comprise an integral part of the home. The initial outlay is negligible, and the bins last for many years.

Another factor to bear in mind in making a cost/benefit evaluation is whether the product is intended for home consumption or for sale. If the improvement affects a product for home consumption, and concerns product quality, producers are reluctant to shell out money for the innovation. The introduction of simple crop dryers aroused interest even for crops for home consumption even though they produce discoloration and a bad taste. The situation changes for crops intended for sale, especially where sale prices fluctuate markedly in accordance with the moisture content or the content of additional elements. A producer will usually want to take steps to reduce imperfections and get a higher price, although the price differential is not always sufficient to impel the producer to invest in the improvement.

Those responsible for cereal purchase price-setting should consider that offering a price incentive to farmers for well-dried grain, and promoting efficient on-farm drying, means that the authorities will not have to bear this cost. Drying will be faster, and a viable activity of post-harvest loss prevention for the producer developed, cutting material losses and at the same time greatly reducing official operating costs.

An important factor in the cost-benefit ratio is to anticipate the substitution of capital goods. The storage tools, machinery or installations provided in connection with post-harvest loss prevention will need to be repaired, maintained, and replaced. These are factors to consider in the initial cost estimates of post-harvest loss prevention.

An important aspect of cost-benefit analysis is to proceed as precisely as possible. It is easier to determine costs than to quantify benefits. Unforeseen costs may arise, so costs need to be overestimated. Benefits are usually based on the estimated future sale price, unless the product is to be sold to an agency, such as a market board, where the purchase price for the upcoming season has been declared in advance.

### The labour force

All development projects with a strong component of technological change have an impact on employment. Post-harvest loss prevention projects are no exception to this rule. A study done in Asia, a traditional rice-growing area, observed that the introduction of the pedal thresher and rice processor caused significant labour displacement, even when food losses were not successfully reduced. The innovations were, in fact, introduced as labour-saving devices.

It is important to maintain the demand for labour because it is fundamental to demonstrate that the proposed innovations will neither increase or diminish the demand for labour even when labour shortages or surpluses are anticipated for a given crop or processing technique in other areas. The histogram describing the labour needs of an average farm family for one year is a widely used method for analyzing the distribution of labour.

### TRAINING PROGRAMME

The objective of a training programme is to ensure that all staff at every stage of the process are fully aware of good hygiene and farming practices, and of their own role and responsibility in maintaining the safety, quality and hygiene of the agrofood

products intended for human consumption in which they are directly involved.

Training is fundamental for any food hygiene system. Insufficient training in hygiene-related matters for staff directly involved in food handling implies a high degree of risk for food safety and its fitness for consumption.

Supervisors are needed for constant supervision and monitoring of the handling of inputs, procedures and harvest products. Employees need to be sufficiently well-informed about their own job, whatever that may be, at every stage of the fresh produce chain, and take due responsibility for safeguarding this produce against contamination and damage.

### Training and refresher training

The most important training components to consider include:

- training staff for supervisory duties, and to detect and correct errors;
- implementing periodic training and refresher training in compliance with job development;
- designing training to foster a better understanding of the importance of specific product handling practices, particularly sanitation or personal hygiene, as well as sanitizing the means of transport in use;
- joint training for staff working at the various stages of the production process;
- training programmes need to be periodically revised and updated as required for each specific process;
- once staff have received training they should be subjected to periodic controls. Supervisors will need to have a good grounding in the principles and practices of food hygiene. They need to know enough to evaluate potential risks and adopt the necessary measures to remedy any gaps.

### Records and control

Records and controls, though often disregarded by small businesses, should instead give consideration to the basic importance of documenting and recording the relative data on the goods they ship: quantities, general condition of the product, ripeness index, and other considerations.

### Tracking products in the market

Packers should ensure they have some efficient way of tracking products so that they can be quickly located and withdrawn in case of



possible threat to consumer safety. The products should be accompanied by the necessary detailed information for tracking and investigation. The packers' data should match the data supplied by farmers, so that the products can be back traced from the distributor to the field, allowing produce suspected of contamination to be retrieved. Every product recipient should be permanently marked so that container and lot can be identified. Products representing a possible threat need to be kept under supervision until they can be eliminated as required.

### **TRANSPORT COST/BENEFIT RATIOS**

The estimated cost of developing the road infrastructure programme in Central America amounts to US\$ 4 650 000 000 (four billion six hundred fifty million US dollars). This would promote development in the area, make transport more mobile, and facilitate freight transport throughout the isthmus. The figure comes from the Sectoral Board of the Commission of Ministers of Transport (COMITRAN).

The benefits deriving from the application of this programme would be many. Regular transport of agrofood products from farmgate to market and industrial centres would reduce the value losses of products marketed by many of the region's producers.

The positive results anticipated from upgraded channels of communication in the region include:

- stepped-up production for traditional activities;
- lower production costs from adjusted transport costs (fleets);
- the construction of highway infrastructure will benefit many families in the region, in light of the existing labour pool available for work on these projects.



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# Conclusions and recommendations

## CONCLUSIONS

- Modernize the legal, organizational and regulatory framework of the transport sector in each country, for a more efficient performance from the public sector and enhanced private sector participation.
- Strengthen the machinery of regional coordination to ensure that institutional reform and planning in each country answer to a coherent and long-term regional vision and strategy.
- Modernize long-term regional planning, incorporating aspects of environmental sustainability.
- Improve the load-carrying capacity of road surfacing (pavement).
- Improve the load-carrying capacity of bridges.
- Improve geometric design.
- Develop self-financing road maintenance programmes.
- Develop marketing infrastructure for agricultural and livestock products at different sites in each country, such as CENMA in Guatemala and La Tiendona in El Salvador.
- Privatize most aspects of the design, inspection, construction, operation and maintenance of road networks.
- Strengthen the planning and regulatory functions of the Ministries of Public Works and Transport.

## RECOMMENDATIONS

- Bring regional transit operation up to a minimum standard of comfort, safety and efficiency.



# **Food transport in rural areas of Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay (Expanded MERCOSUR)**

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## The current situation

Transport can be defined as the movement of persons, goods and information, by any means and for any purpose, from one place to another (origin to destination). Transport normally involves two complementary components: transport infrastructure, also called “fixed plant”, and transport services, or “mobile equipment”. Neither component can be productive without the support of the other (Gannon and Liu, 2001).

For food products, the transport function adds “place utility” to products through their transfer from production areas, where there is no opportunity for surpluses to meet needs, to urban areas, where they become accessible to consumers. The simple transfer from one place to another adds value to production (Mendoza, 1991).

An efficient transport system is necessary to develop and facilitate economic growth. It fulfils many functions:

- *it provides physical access to resources and markets, thus favouring the marketing of agricultural products, industry specialization and the expansion of production and employment;*
- *it helps to open up new markets, promoting domestic and international trade;*
- *transport improvements reduce transaction costs (inputs and products), leading to economies of scale and specialization;*
- *investments in the transport sector contribute to economic diversification, making a country less vulnerable to adversity.*

Improved transport can help to reduce poverty by facilitating economic growth, thus backstopping specific interventions and fostering rural development. It alone cannot alleviate poverty, however. Poorly planned transport policies and investment programmes can have a negative impact on less privileged sectors, diverting scarce resources from other poverty reduction efforts (Gannon and Liu, 2001).

Transport is highly influential in the overall development of the food chain. The existence of accessible, acceptable, efficient transport is a pre-condition for bringing remote farm areas far from consumer centres into the agricultural

production process. It also enables production and post-harvest technologies requiring new inputs, the long-distance transport of highly perishable products, compliance with very exacting quality standards, the collection of enormous volumes of merchandise, the use of appropriate packing and packaging and the timely delivery of products in good condition.

This paper seeks to set out guidelines for improving the rural transport of food products. These guidelines are intended as a basic input for decision-makers, advisors, researchers, and sectoral and macroeconomic policy planners in the Expanded MERCOSUR countries (Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay).

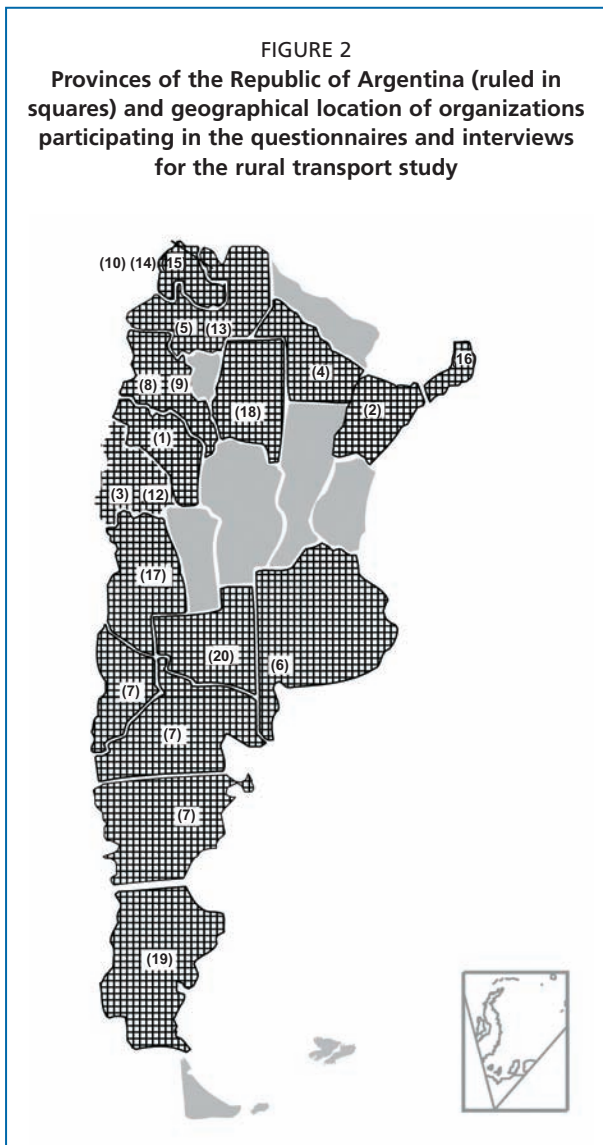
It further intends to make a detailed strategy analysis of rural transport systems for agrofood products, and identify policy and strategy formulation guidelines for improving these systems.

### METHODOLOGY

This work is based on a compilation, review and synthesis of reference materials concerning transport systems in the Expanded MERCOSUR area, and their overall context. It also draws inspiration from a survey of primary data deriving from systematic surveys and interviews with technical advisers to smallholders' associations in Argentina.

The field survey covers various areas of Argentina's provinces. These include Catamarca, Jujuy, La Rioja, Salta and Santiago del Estero in the Northwest; Corrientes, Chaco and Misiones in the Northeast; Chubut, Neuquén, Río Negro and Santa Cruz in Patagonia; Mendoza and San Juan in Cuyo; and Buenos Aires and La Pampa in the Pampas region. Figure 2 maps the geographical distribution of the interviews. Figure 3 correlates this with the location of smallholders.

A second section analyses the desirable characteristics of rural transport systems for food products, opportunities for holistic solutions, the main problems, the political and social constraints to holistic solutions, the necessary resources and means, institutionality, and desirable benefits of viable solutions.



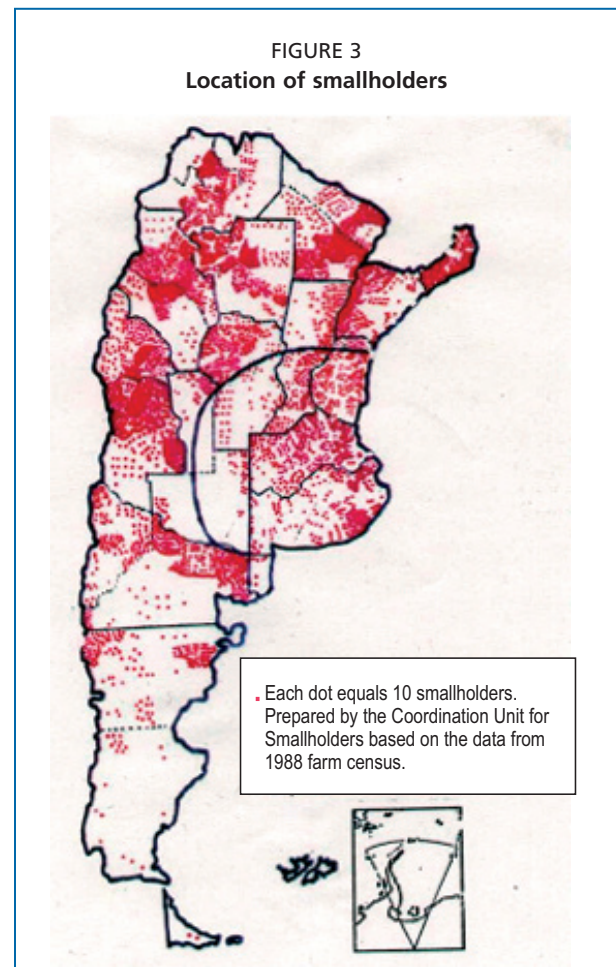
The study begins with a presentation of factors in the transport of food products as they relate to economic growth and poverty. The importance of transport systems in the agrofood chain is described, along with the objectives and methodology used to develop the paper.

This is followed by an analysis of rural food transport systems in the Expanded MERCOSUR countries. It describes the overall socioeconomic and political context of the food sector. It goes on to discuss the socioeconomic characteristics of the rural agricultural sector in general, and of small and medium rural producers in particular. It describes the demand for food transport, the road infrastructure and how it has evolved, and the condition of roads and railways in each country and in the subregion. It covers the main logistical components of food transport and changes in the

marketing channels for small-scale production. Lastly, it looks at the characteristics of food transport in the Expanded MERCOSUR area in terms of the big issues and with reference to small and medium producers, especially in Argentina.

After this, strategies for improving the rural transport of food products are outlined. The desirable characteristics of agrofood transport systems are pinpointed, interventions for addressing its problems analysed, and opportunities and means of promoting improvements for these systems identified. These embrace cold chain viability and feasibility, the key factors in strategic planning, how the success of the response can be conditioned by social and political factors, and the desirable benefits of viable solutions to food transport problems. The factors thus identified are then used to formulate guidelines for food transport strategies and policies.

Lastly, a set of concrete recommendations for improving the rural transport of agrofood products is proposed.





# Analysis of rural food transport systems

## REGIONAL ECONOMIC, POLITICAL AND SOCIAL CONTEXT

The Expanded MERCOSUR subregion covers a vast land area of 12 666 000 km<sup>2</sup>, with a total population of 238 982 000.

The number of rural inhabitants as a proportion of total population is declining in all countries. The figure has dropped by 44 percent in Paraguay, 18 percent in Brazil, 14 percent in Chile, 10 percent in Argentina and 9 percent in Uruguay.

The overall GDP for the region according to the data for 1998 (ALADI, 2000b) totalled 1 117 188 million US dollars, with a per capita GDP of US\$ 4 949. The GDP is distributed over the countries of the region as follows: Brazil 64 percent; Argentina 27 percent; Chile 7 percent; Uruguay 2 percent and Paraguay 1 percent. The GDP is divided as follows: 22 percent for the manufacturing sector, 19 percent for community, social and personal services, 13 percent for financial and commercial services and insurance, 12 percent for agriculture, 11 percent for commerce, 9 percent for transport, 7 percent for construction, 5 percent for electricity, water and gas, and two percent for mining.

The World Bank figures from 2001 show positive average growth in GDP for the subregion as a whole in the 1990s: 5.3 percent in Argentina, 2.8 percent in Brazil, 7.0 percent in Chile, 3.3 percent in Paraguay, and 2.3 percent in Uruguay. Growth was not sustained, however. There were major fluctuations, and, in some years, negative growth rates or growth of less than one percent, especially in the last five years of the decade.

Internal income distribution is quite inequitable. In Argentina the aggregate income of the richest 10 percent of the population is 28 times more than that of the poorest 10 percent. This proportion has swelled steadily since 1991, when the average figure for the richest was just 14 times greater than that of the poorest.

The political context was characterized by the growing liberalization of commerce and foreign trade. The new policy orientation has entailed a cutback in government intervention with the

private sector playing a new and broader role. Tariffs and the differences between tariffs were reduced, on the whole, and administrative obstacles and non-tariff barriers to trade dismantled.

According to FAO (2002), the year 2001 marked a period of stagnation or recession for most Latin American and Caribbean economies. Sluggish economic growth and unstable financial markets were joined by internal problems linked to weak national demand, macroeconomic imbalances and political instability. These factors translated into a substantial slump in economic activity, with a depressive effect on wages, employment and effective demand for food. The upshot was a big step backwards from the food security standpoint.

The slump in economic growth in all countries produced a pronounced reduction in trade. As demand grew weaker and the prices for export products fell, the region experienced a marked drop in export income. It also cut back on imports, though not to the same extent.

In Brazil, following initial signs of economic recovery in 2000 and early 2001, the country suffered the consequences of a grave power crisis and a worsening economic environment.

In Argentina, undergoing its fourth consecutive year of recession, the economy suffered a severe setback with the complete disappearance of external financing, and faced the complex problem of reducing the fiscal deficit and servicing the public debt. These events cast a very long shadow on Argentina's prospects for achieving a quick recovery, and aroused deep concern for their repercussions on trade and finance throughout the MERCOSUR countries, and in all of South America.

Uruguay also found itself in very difficult circumstances, with a growth forecast for 2001 of less than one percent.

Chile, despite a relative slowdown, will probably maintain a growth rate of some three percent.

The contribution of agriculture to GDP has followed a downward trend in Argentina and Chile in recent years. The figures for 2000 were

4.8 percent in Argentina and 8.4 percent in Chile, whereas slight upward trends were recorded in Brazil (8.9 percent), Paraguay (9.3 percent), and Uruguay (6 percent) that same year.

Various non-tariff barriers to trade such as sanitary and phytosanitary regulations, plus the traditional tariff barriers, are increasingly acting as a brake to agricultural exports in the subregion. Hefty farm subsidies in the industrialized countries are also seen to reduce the region's competitive position in the international market place.

According to ALADI (2000b), production in the subregion in the last five years averaged 1.86 percent of aggregate production for WTO member countries. The output broke down as 33 percent for soybean, 13.3 percent for honey and honey by-products, 11.5 percent for foods of animal origin, 9.2 percent for coffee, 7.8 percent for industrialized goods, 6.3 percent for sugar, 5.8 percent for oilseeds, 5.3 percent for meat, 4.7 percent for wheat and 3.1 percent for clothing.

Some of the main characteristics of intraregional and international overland trade flows in the MERCOSUR countries are identified below:

- trade flows in the region are highly heterogeneous;
- demand is unbalanced, not sustained, and dominated by heavy and highly irregular, undocumented traffic;
- total intrazonal trade by road from 1996 to 1998 averaged some 20 750 000 tonnes/year, whereas intrazonal trade averaged some 6 500 000 tonnes/year;
- the traditional trade flow in the region comprises 63 percent primary products (heavy tonnage and low value added), and 37 percent manufactured goods (low tonnage and high value added). High value-added goods tend to move north and southwards, whereas high-tonnage goods tend to move east or westwards;
- Argentina is the country with the highest volume of trade in terms of tonnage, whereas Brazil has the highest volume of trade in terms of value added;
- the greatest volume of trade within the subregion in terms of both tonnage and value added is between Argentina and Brazil;
- Argentina's main trading partner is Brazil, followed by Chile, and Brazil's is Argentina followed by Chile. The main trading partners for Chile, Paraguay and Uruguay are Argentina and Brazil;

- the main volumes of freight involved in trade flows in the subregion are preferentially and comparatively shipped by sea. This accounts for 49 percent of freight volume, with road transport accounting for 31 percent; river transport 15 percent; rail transport three percent; and air freight two percent.

### **SOCIOECONOMIC AND POLITICAL CONTEXT OF THE RURAL AGRICULTURAL SECTOR**

Niemann (2001) estimates a total of over 6.5 million agricultural and livestock production establishments in the MERCOSUR area. Of these, half are under 10 ha, and almost 90 percent under 100 ha. Some 10.1 percent are in the 100–1 000 ha category, but only 1.1 percent of all establishments are classified as 1 000 to 5 000 ha. Two situations predominate at the country level. In the first (Brazil and Paraguay), one out of two establishments is under 10 ha. In the second situation (Argentina and Uruguay) one out of five is under 10 ha. Table 16 shows the distribution of agricultural establishments by size in the MERCOSUR countries.

In recent decades, and especially since the latter half of the 1990s, growth in the volume of agricultural trade has strikingly outpaced the growth rate of agricultural production. Agricultural exports account for over 60 percent of Paraguay's total exports, half of Argentina's, 30 percent of Brazil's, 53 percent of Uruguay's and only 17 percent of Chile's.

Despite the solid growth in agricultural trade over most of this period, the share of this sector as a proportion of total trade has constantly shrunk with respect to the aggregate trade figure. Meanwhile, the export of other products, especially manufactured goods, has gained in relative importance.

Exports have diversified, widening the product base and increasing value added. Soybean and soybean cake production has developed so much in Argentina and Brazil that Argentina is now the second world producer of soybean, and Brazil the third.

The geographical distribution of trade has also shifted. The European Union and the United States are still the prime destinations for Latin American and Caribbean exports, but the relative position of the developing countries has improved.

Considerable growth in intraregional agricultural trade began in the 1990s. Argentina, Brazil, Paraguay and Uruguay registered one of the major geographic shifts in agricultural trade between the

TABLE 16  
Farm distribution, by size and by country, MERCOSUR region

Country	Farmsize (ha)	Amount	Percentage
Argentina	Under 10	88 737	23.5
	from 10 to 100	146 209	38.6
	from 100 to 1 000	115 956	30.6
	from 1 000 to 5 000	21 254	5.6
	from 5 000 to 10 000	3 339	0.9
	over 10 000	2 862	0.8
	Total	378 357	100.0
Brazil	Under 10	3 064 822	52.9
	from 10 to 100	2 160 340	37.3
	from 100 to 1 000	517 431	8.9
	from 1 000 to 5 000	44 748	0.8
	from 5 000 to 10 000	3 538	0.1
	over 10 000	2 125	0.0
	Total	5 793 004	100.0
Paraguay	Under 10	181 393	60.6
	from 10 to 100	105 319	35.2
	from 100 to 1 000	9 307	3.1
	from 1 000 to 5 000	2 356	0.7
	from 5 000 to 10 000	533	0.2
	over 10 000	351	0.1
	Total	299 259	100.0
Uruguay	Under 10	11 051	20.20
	from 10 to 100	22 760	41.50
	from 100 to 1 000	16 975	31.90
	from 1 000 to 5 000	3 811	7.00
	from 5 000 to 10 000	195	0.49
	over 10 000	24	0.10
	Total	54 816	100.00
MERCOSUR	Under 10	3 346 003	51.3
	from 10 to 100	2 434 628	37.3
	from 100 to 1 000	659 669	10.1
	from 1 000 to 5 000	72 169	1.1

mid-1980s and the end of the 1990s, with a surge in agricultural trade within this bloc. Agricultural exports from Argentina to other MERCOSUR countries shot up from 10 to 15 percent during the 1980s to nearly 25 percent in recent years. At the same time Brazilian exports to other countries in the bloc went from negligible to nearly 10 percent. In Uruguay, exports within the trade bloc rose from 40 to 60 percent. The only downward trend was in Paraguay (down from nearly 60 percent to 50 percent), and this is still quite a high figure.

Agricultural imports also tend to be concentrated within specific parts of the MERCOSUR area. Brazil's exports to countries in the bloc rose from 27 to 45 percent. The trend upward also sharpened in Paraguay and Uruguay during the latter part of the 1990s.

The situation from one country to the next is heterogeneous, as is true of the social strata within

countries. However, a number of analyses (IICA, FAO, ECLAC) indicate a rise in technification and sectoral productivity, growing concentration within the food sector, and a burgeoning presence of international capital in agro-industry and commerce (Echenique, 2000).

Restructuring of agroindustrial markets is cited as a major change for food systems in the Expanded MERCOSUR area. Its characteristic features are an infusion of capital investments with new industrial plants and advanced technology from the big multinational agrofood producers and marketers.

The strategy for world brands to consolidate in the regional market through acquisition, mergers or alliances with local firms has implied very intense competition in the domestic agroindustrial sector, and the disappearance of small and medium food suppliers. Their declining number is expected to shrink still further in the near future.

A downward trend in the farm population, the expulsion of the most marginal producers and the presence of vast sectors of small, subsistence farmers in critically unprofitable situations is now being observed in most countries.

In terms of the environment, negative impacts linked with the intensification of production and the short-term outlook of the new operators can also be seen. The presence of international firms offering machinery, equipment, and chemical and biotechnological products acts as a spur to forms of production that may be inappropriate for local conditions.

Despite this, the agroecological approach has been the rural development approach promoted. The agroecological productive strategies of small producers are thought to hold out significant ecological and economic promise, given the expanding market for organic foods.

#### FOOD PRODUCTION CHARACTERISTICS OF SMALL AND MEDIUM RURAL PRODUCERS

Echenique (2000) offers a qualitative and quantitative description of family farming in the subregion. Family farm systems account for the great majority of all agricultural establishments. The proportions are 93 percent (287 000 units) in Paraguay; 89 percent (44 319 000 units) in Brazil, 85 percent (220 000 units) in Chile, 75 percent (310 000 units) in Argentina; and 60 percent (33 163 units) in Uruguay. There are three distinct types of family farmers:

- the so-called marginal or poor farmers, lacking agricultural potential, borderline, in decline, or semi-salaried workers; this group focuses mainly on home consumption, has the least available land, and not enough income from their own production to ensure the subsistence and welfare of the family;
- the transitional group, classified as intermediary, or true family farms, i.e., capable of simply meeting reproduction requirements but not of generating surpluses;
- the so-called consolidated, capitalized, or integrated producers, capable of accumulating surpluses.

Fully 44 percent of the first group of family farm households in the subregion are living in poverty, with low potential. A further 23 percent are classified as intermediary, and the remaining 33 percent as in a situation of relative accumulation. The first group is proportionally greater in Paraguay with 68 percent of the national total and in Chile with 57 percent. The figures are comparatively lower in Brazil at 41 percent, Argentina at 34 percent and Uruguay at 27 percent. Table 17 quantifies family farm units by type.

Agro-ecological heterogeneity is great in the subregion, as at country level. There are, however, relatively homogenous areas within the subregion:

- the highlands (Argentina, Bolivia, Chile)
- the Chaco (Argentina, Bolivia, Paraguay)
- the Patagonian region (Argentina, Chile)
- the Pampas (Argentina, Brazil, Uruguay).

The predominant products produced by family farmers in each country are as the following:

- Argentina – cotton, yerba mate, tea, tobacco, citrus fruits, vegetables, sugar cane, vines, olives, walnuts, peppers, sheep, goats, cattle (breeding and fattening), honey;
- Brazil – maize, bean, vegetables, fruit, cotton, sisal, coffee, cocoa, soybean, goats, dairy and beef cattle, pigs, poultry;

- Chile – fruit, wine grapes, vegetables, flowers, sugar cane, tobacco, maize, potato, rice, dairy and beef cattle, goats,
- Paraguay: cotton, rice, sugar cane, oranges, vegetables, soybean, tobacco, fruit, cereal grains, yerba mate and tung;
- Uruguay – vegetables, fruit, soybean, dairy and beef cattle.

Table 18 lists in detail the various production systems of family farmers in the MERCOSUR countries.

A certain downward trend in rural poverty is probably best attributed to the decline in the farm population and the exclusion of the most marginal, who have gone to swell the ranks of the urban poor. Country studies ranging from rapid surveys to in-depth studies all clearly reflect the critical profit/loss situation caused by the drop in international prices for the main sectoral products, and the hard competitive situation of family farmers.

Neiman (2001) describes the production trends of small and medium producers in the MERCOSUR countries as follows.

The switch from direct production to contract production in Argentina represents a growing trend among small farmers, and among capitalized family farmers in the Pampas region. This trend has been paralleled by the spread of pluriactivity to address the crisis and as a strategy for adapting to the new context. Smallholders or small farmers outside the Pampas area (who mostly work to supply the sugar, tobacco or cotton agro-industries), are those most vulnerable to expulsion from the sector. They are in no position to address the process of production reconversion due to technological innovation, production changes or new forms of organization.

Small and medium farmers in Brazil are also finding it hard to react to change in a uniform way. Some, induced by agro-industrial firms, are implementing technological change. Others, however, are too specialized to adopt such a strategy on their own initiative, and differentiate so as to access markets. Their chances of competing are thus minimal.

Establishments under 100 ha in size generate most items in the basic food basket. They account for 87 percent of cassava production, 79 percent of the bean crop, 69 percent of maize, and 37 percent of rice. They also account for 65 percent of the cotton crop, 46 percent of soybean and 26 percent of the cattle. The contribution of smallholders (under 10 ha) has been declining in recent years. Subsistence wheat and soybean farmers are concentrated in

TABLE 17  
Number of family farms by type

Country	Poor	Intermediate	Capitalized
Argentina*	107 000	103 000	100 000
Brazil	1 793 000	950 000	1 576 000
Chile	130 000	55 000	35 000
Paraguay	195 349	47 536	44 460
Uruguay	9 075	18 735	5 350

\*Assuming one-third of poor and of capitalized farmers as intermediate

Source: Echenique (2000)

TABLE 18  
Main family farm productive systems or products in MERCOSUR countries

ARGENTINA	CHILE
<p><b>North-eastern region</b></p> <p>Predominant systems: yerba mate and tobacco, yerba mate and tea (small and medium holdings), yerba mate, citrus fruits, simple agriculture, breeding cattle, cattle for fattening and wintering, diversified tobacco, diversified cotton, vegetables.</p> <p><b>North-western region</b></p> <p>The following predominate: mixed extensive ranching, vines, walnuts, olives, vegetables, mixed cotton/livestock, sugarcane, lemons, burley tobacco, blond tobacco, peppers, and vegetable and fruit growing.</p> <p><b>Cuyo and Alto Valle</b></p> <p>The three main systems are viticulture, horticulture and fruit growing.</p> <p><b>Patagonian region</b></p> <p>The most representative system is extensive sheep raising, with associated variations: sheep/cattle, and cattle alone.</p>	<ol style="list-style-type: none"> <li>1. Fruit growing for export</li> <li>2. Fruit growing domestic market</li> <li>3. Wine grapes for pisco or fine table wines</li> <li>4. Horticulture and flower growing domestic market</li> <li>5. Industrial crops: sugar beet and tobacco</li> <li>6. Cattle and traditional crops</li> <li>7. Annual crops: maize and potato</li> <li>8. Rice</li> <li>9. Dairy cattle</li> <li>10. Dryland wine grapes</li> <li>11. Goats</li> <li>12. Cattle</li> </ol>
BRAZIL	PARAGUAY
<p><b>Southern region</b></p> <p>Consolidated: maize/bean, maize/bean/pigs, vegetables/milk, maize/poultry/pigs/bean, maize/cattle/milk/meat, and maize/milk/pigs/poultry/beef cattle.</p> <p>Transitional: maize/bean, maize/bean/vegetables, maize/bean/milk, maize/bean/pigs, and maize/bean/milk/pigs.</p> <p>Borderline: maize/bean for subsistence and small commercial surplus</p> <p><b>South-eastern region</b></p> <p>Consolidated: fruit growing (grape)</p> <p>Transitional: cattle/fruit</p> <p>Borderline: cattle/cotton</p> <p><b>Centre/West region</b></p> <p>Consolidated: soybean/maize</p> <p>Transitional: dairy cattle</p> <p>Borderline: subsistence</p> <p><b>North-eastern</b></p> <p>Transitional: sisal/goats</p> <p>Borderline goats/sisal</p> <p><b>Northern region</b></p> <p>Consolidated cacao/cattle</p> <p>Transitional: coffee/cattle</p> <p>Borderline: cattle</p>	<p>Intensive: Annual crops (cotton, tobacco, home consumption); permanent crops (bitter orange), multi-annual fruits (banana, pineapple), horticulture (beets, tomato, carrot), cattle.</p> <p>Capitalized: annual crops (cotton, soybean, maize, home consumption) permanent crops (yerba mate, orange), horticulture (melon, watermelon), multi-annual fruits (banana, pineapple).</p> <ol style="list-style-type: none"> <li>1. Borderline: annuals (cotton), home consumption (cassava, maize, kidney bean, groundnut) vegetables (tomato, watermelon and hot peppers)</li> <li>2. In decline: annuals (cotton and rice), permanent (sugar cane, oranges), home consumption (traditional crops).</li> <li>3. Farmer: grains (soybean, sunflower, wheat, maize), permanent (yerba mate and tung)</li> </ol>
	URUGUAY
	<ol style="list-style-type: none"> <li>1. Capitalized: breeding cattle with improved pasture, agriculture/high performance cattle raising, cattle/high-performance agriculture, high-tech dairy cattle in the south, dairy cattle in the rest of the country, high-tech, mechanized horticulture, mechanized fruit growing.</li> <li>2. Intermediary or true farmers: skilled livestock breeders without improved pasture, average livestock breeders without improved pasture, less skilled breeders/farmers, soybean and other farmers, low-tech dairy farmers in the South, dairy farmers in the rest of the country, low-tech, fruit and vegetable growing without tractors.</li> <li>3. Semi-salaried/unsalaried: microholder livestock breeders (&lt;20 ha), microholder farmers/livestock breeders (&lt;20 ha), microholder dairy farmers (&lt;20 ha).</li> </ol>

the southern and south-eastern regions. These farmers do have opportunities for adopting and implementing modern production techniques.

A socioeconomic differentiation of small farmers was observed in Paraguay in the 1980s, together with a fall in the comparative numbers of unremunerated family members. Off-farm hiring also expanded, with increasing proletarianization and deteriorating living conditions. There are basically three groups of small farmers. In the central part of the country most farms are under one ha in size with a clear trend toward off-farm

hiring in labour markets in urban centres. In the central-western part of the country, farms of one to five ha predominate, and these households live off their agricultural output. In eastern Paraguay, farmers in the same situation grow cotton and food crops (agricultural diversification and animal husbandry).

The situation in Uruguay is also diversified with respect to agricultural chain competitiveness and producer capacity to cope with the new conditions imposed by the newly opened and deregulated markets. Small family farms with a low level of



technology are prominent in the dairy, vegetable and fruit-growing sectors. They represent 76 percent of the dairy sector, and 40 percent of all farms working in these three subsectors. Almost all their output is intended for the domestic market, and in recent years they have faced a drop in demand and increasing competition from imported goods.

There is a mostly positive correlation between favourable development projections for small-scale farming and the most intensive crops. This is more relevant for some countries, such as Chile and Paraguay (and, for certain items, Uruguay). The main categories are vegetables, fruit and viticulture (Argentina and Chile), and specific tubers. In certain favourable situations where farmers are an integral part of the agroindustrial chain, milk and specific grains such as maize and soybean also look promising.

As for technology and infrastructure, family farmers in the MERCOSUR countries are best described as lacking appropriate technology for family farming, with very little technology available for the subsistence sectors. Technology is generated and disseminated in packages by various public and private agencies, and there is not much room for technology adaptation.

The constraints to technological change on small farms are basically structural in nature. They concern limited access to land and water, declining natural resources, a deep lack of infrastructure, and isolation (poor access to roads, energy, storage, and transport). The markets are far from perfect and farmers have very little bargaining power. Cultural factors and scant opportunities for education and training complete the picture (Echenique, 2000).

In some situations the incorporation of technology has not produced the expected results. This is mainly attributable to constraints on the full potential of technology. One example is the introduction of technological packages despite the presence of hydric stress, and the consequent economic losses.

Surveys and interviews were carried out in Argentina among qualified informants to gather data on small farmer problems with rural transport. The survey adapted a model prepared for a similar study in Central America adapted to the special features of the MERCOSUR study area.

These surveys report on small farmers in different regions of Argentina. They covered fruit growers (25 percent of all cases in the survey), vegetable farmers (30 percent) and producers of semi-processed foods (45 percent). This last

category included all producers with some potential for value added, or whose activities were diametrically opposed to the others. This included honey producers (18 percent), sweet-producing agroindustries (9 percent), industrial crops such as cotton (18 percent), and a fringe of goat farmers (46 percent of the category). It emerged from the survey that *all producers transport their own output where volumes exceed 150 quintals/yr*. In response to the question on the quality of the goods they produce, *every informant reported that the quality of their production was good*.

### TRANSPORT DEMAND

Current national and international trade trends have now restructured the demand for transport. Specialized services and better management of transport services (and of all related services such as storage, customs, distribution and delivery) are now demanded.

Present-day transport service demands include the provision of integrated logistics combining science, technology and computerized services to ensure safe and timely delivery. The service provided has to be fast, flexible, reliable and safe to comply with the requirements of the distribution chains.

For small and medium producers, the basic needs for rural food transport concern access to transport from the areas where products are grown, collected or packed for transit, to the areas where they are marketed or processed. These needs include:

- road transitability;
- accessible costs;
- good service quality and availability;
- safe, reliable service;
- good vehicle quality;
- transit times appropriate for the type of product.

Needed improvements in rural transport concern upgraded infrastructure and the provision of services to reduce costs and maintain product quality up to delivery at the market or processing plant.

Transport is often the highest-cost item in the marketing chain. The transport needs of fruits and vegetables vary in accordance with the distance to market, the scale of production, perishability, and product value. The vehicles most in demand for food transport are pickups and open trucks with fixed or canvas tops. Natural ventilation is usually sufficient to prevent overheating of the load.

Data from the surveys and interviews conducted in Argentina identified the transport needs next described.

Most small farmers must hire transport to carry their products: only 25 percent of respondents owned some means of transportation to move their goods to market. Some 65 percent hire a vehicle for this purpose and the remaining 10 percent use some other means such as collective transport or buses.

Producers contract for transport through a middleman. This is a trader who purchases goods at the farm-gate or smallholding, collecting it for later sale, using his own transport. These middlemen normally provide other goods used by farmers but not produced on the farm, such as clothing, utensils and inputs, for which the farmer pays at harvest-time.

The price for the farmer's output is usually very low with respect to the market price. Because middlemen provide a range of services, farmers are heavily dependent on them to buy and market their output.

The demand for transport is highly diverse. Product type and volumes plus the distances covered and potential producer access determine the demand for transport. Survey respondents reported that the vehicles most in demand were pick-up trucks (60 percent), followed by trucks (35 percent), and some other type of vehicle (five percent).

The distances from production zone to market ranged from under 50 km (20 percent of respondents), to 51–100 km (40 percent), and over 100 km (the remaining 40 percent). In other words, products travelled distances greater than 50 km in 80 percent of these cases.

Fundamentally, there are two concrete demands for transport. The first is to carry products from field to town, and this can be met with smaller vehicles. The second is for vehicles to carry the goods to larger markets with a bigger consumer base, and this requires conventional trucks.

Taking the case of onion growers in the province of Buenos Aires, for example, the local transport demand is for highly manoeuvrable, four-wheel drive vehicles with low fuel consumption and medium load capacity. Transport from towns to the big markets calls for trucks that can carry big loads, run at regular times, and offer either ventilation or refrigeration.

Until quite recently rail was the ideal mode of transport for reaching population centres. But now many production zones cannot be reached by rail, even though this mode of transport is probably superior to any form of motorized transport in terms of function, quality, environmental friendliness and safety.

In other cases the demand is undifferentiated. This is true of less perishable products such as dried fruits from Belén and Pomán in Catamarca. In Castelli in the province of Chaco, a high-demand area, the vehicles in use are *whatever is available* (cars, vans, tractors used for towing loads). In the more isolated areas of northeastern Argentina the demand for transport is closely linked to the volume of production and the price paid for the product by the buyer. Producers will not harvest unless they are satisfied they will be paid a good price.

Livestock production, e.g. live or slaughtered kids, requires transport that can meet the requirements set by the relevant oversight agency. The standards are very strict, especially for federal transit, i.e., moving goods from one province to another throughout the country, and even abroad.

## ROAD INFRASTRUCTURE

ALADI (2000b) reports that transport accounts for 7.8 percent of GDP in the subregion. Road transport accounts for 31 percent of this figure, taking into account the tonnage carried by road and its FOB value.

Road transport is the most active participant in intraregional trade among the MERCOSUR countries. It also plays an important development role in most of these countries, as it is easier to run roads in all directions than to adapt to river or rail transport.

Deep and continent-wide deficiencies in the provision of infrastructure services had become apparent by the early 1990s. By then the growth of interzonal trade began to exert pressure on the material infrastructure as a whole, particularly on transport infrastructure. Recent World Bank estimates report that up to 15 billion US dollars would be needed every year up to the year 2005 to rehabilitate road networks and expand the transport system.

The transport system in the subregion is best visualized as a set of transport corridors starting from the big ports of Buenos Aires, Montevideo, Río de Janeiro, Santos, and Valparaíso, with few exceptions, and gradually penetrating into the interior.

In the last thirty years, countries such as Argentina and Brazil have tripled the length of their road networks. Almost every other South American country has doubled the length of their paved roads. This expansion, however, did not improve the regional transport system as a whole,



because the most travelled highways received most of the investment. Furthermore, the development of connecting highways between one country and the next was uncoordinated.

The road network in the MERCOSUR region totals 320 000 km of paved or otherwise surfaced roads. According to ALADI (2000b), this transport network can be described as follows.

- Some 14 percent of the road network is paved: in Argentina 27 percent, in Brazil 9 percent, in Paraguay 9 percent, in Uruguay 23 percent, in Chile 14 percent, and in Bolivia 4 percent;
- Paving seems to have been earmarked preferentially for the main roads of each national network. The provincial and rural roads often remain unpaved. The percentage of paved roads breaks down as follows. The best are stretches with top-grade paving (concrete and/or an asphalt layer, accounting for 31 percent of the total). Next come ordinary roads with bitumen or primed surfacing comprising 42 percent of all roads, with the remaining 27 percent comprising improved and/or dirt roads.
- Generally speaking, all roads in the network are passable year-round except in the winter months of June, July and August, when certain stretches are very hard to cross or impracticable due to flooding or snow. The roads mostly sustain heavy traffic in good condition. At cross-boundary junctions, particularly, congestion is sizeable. Some 72 percent of the roads in the network are two-lane surfaced roads, fairly well-maintained and of sufficient capacity.

Intercontinental rail freight transport serves very little of the continent. The same is true at the country level. Some 62 percent of all freight in Brazil is carried by road; the total in Chile is 92 percent. Only 20 percent of Brazil's freight is shipped by rail and only five percent of Chile's. It is worth pointing out that a significant proportion of all freight is transported by rail in the developed countries. In the United States, for example, the rail sector, earlier considered depressed, has grown in the last 20 years to become one of the most competitive means of transport. Roughly 40 percent of all freight (tonnes/km) is now shipped by rail and only 35 percent by road. (ECLAC/UN, 2002a).

Thompson's 2001 analysis of the institutional development of Latin American transport in the last 25 years is summarized below.

- There has never been nor is there now state ownership in the road transport sector (trucking).
- Domestic freight transport in Latin America has at times depended on quotas, or the obligation to belong to an officially recognized union. However, state intervention in fleet establishment or in clearly commercial measures is not usual.
- The current situation with respect to road transport regulations has remained basically unchanged in the last 15 years. Short-term measures are taken in response to joint pressure from truckers' unions at times when economic performance fails to meet expectations, and has a depressive effect on trucking fleets. In 1999-2000 in Argentina, Brazil, Chile and Uruguay, unions asked for and obtained the adoption of specific measures to promote road transport. These included lower road tolls, lower prices for diesel fuel, and a freeze in the number of transport vehicles.
- Up to the mid-1960s, the public railways were all state-run (except for FCAB in Chile). This weighed fairly heavily on the budget of some public sectors. Almost all privatization of the railroads occurred in the early 1990s. By the year 2000, there were five privately run rail freight companies in Argentina, 10 in Brazil, and four in Chile.
- The privatization of rail freight has mostly been a positive experience. Private operators are not subsidized by the government, and in most cases traffic has increased compared to the final years of state administration. The negative aspects, however, are that some companies have not become profitable enough to ensure compliance with some of their contractual obligations *vis-à-vis* governments.

Argentina's road infrastructure consists of 38 484 km of national roads, 192 611 km of provincial roads and 280 000 km of municipal roads. Thirty percent of all national and provincial roads are paved, 21 percent are improved and 49 percent are dirt roads.

Road surfacing differs according to who has administrative jurisdiction over the roads. Only five percent of all national roads are dirt-surfaced, 14 percent are gravelled/improved and 81 percent are paved. The provincial network consists of

57 percent dirt roads, 23 percent improved, gravelled roads, and only 20 percent of paved roadway. Indeed, it emerged from the analysis of the data at hand, that long stretches of provincial roads are still unpaved. Most (65 percent) of Argentinean provinces fall into this category, accounting for over half of the total length of Argentina's dirt roads. There are provinces such as Chaco, Formosa, Jujuy, Santa Cruz, Santiago del Estero and Tierra del Fuego where over 80 percent of the network consist of dirt roads. In others, such as Córdoba, Corrientes, Entre Ríos, Neuquén and Santa Fe, over 70 percent of the network consist of dirt roads. Strikingly, these are almost always the northern and southern provinces of Argentina, where most small producers live and work.

Although the total length of paved national highway in Argentina rose from 73 percent in 1985 to 82 percent in the year 2000, the percentage of unpaved national roads is still significantly high in some northern provinces. Unpaved national roadway totals 47 percent in Formosa, 30 percent in Chaco province and 24 percent in Misiones.

The national road network has 21 031 km of paved roads not under concession management. Of this total, 59 percent are in good condition, 27 percent in fair condition, and 14 percent in poor condition. In provinces such as Chubut, Formosa, Neuquén and San Luis, the situation is worrying. Over half the length of the rural road network there is rated as only fair or poor. And in certain provinces such as Buenos Aires, Córdoba, Río Negro, Santa Cruz, Santa Fe and Salta, over 40 percent of the roads are deemed only fair or poor.

Corridor roads under concession management cover a total length of 8 877 km. Although these corridors have changed for the better since 1991, only seven out of a total of 19 were rated as good.

Investment by the National Highway Administration in Argentina dropped from 544 million US dollars in 1985 to 226 million US dollars in the year 2000. Meanwhile, the concession management of roads (which dates from 1991) increased, peaking at 311 million US dollars in 1999, at which point the figure began to decrease.

As emerges from the survey data, the road network on which food products are transported is comprised of 40 percent dirt roads, 35 percent improved roads, and 25 percent paved roads. These data underscore the importance of unpaved roads in the rural transportation system, even today. As

to the condition of the roads on which these goods are transported, 65 percent are in poor condition, 30 percent in fair condition and only five percent in good or excellent condition.

It can be concluded from the foregoing that Argentina's rural development potential in terms of trade and getting the rural producer's products to the big consumer centres is severely limited by the state of rural, local and provincial roads, the dearth of paved roads and/or the lack of road maintenance.

## TRANSPORT MANAGEMENT AND LOGISTICS

Today, transporting food products involves much more than simply moving a load from origin to destination. It also includes shipping and distribution, with a major technology component. The traditional carrier needs to rethink his job in response to new demands. Nowadays freight is picked up at the production site and delivered anywhere in the world in an integrated, door to door, service package. Shipping companies pack the load, arrange for the transport vehicle and insurance papers, make the necessary freight transfers, stow the load in containers and remove it at the other end for delivery at the consumer's door. ALADI (2000b) identifies the main components of transport logistics and management.

- a. Logistics has become a strategic working concept, indeed a business concept, in the last fifty years. As a result, the traditional definition of logistics has altered considerably in content and scope.
- b. Modern logistics is not a tool for simply handling the flow of materials. It has become a regulatory instrument bringing order into the confusion brought by the evolution and transformation of the transportation sector in the last two decades.
- c. Logistics looks systematically at the full gamut of activities directly or indirectly linked to the flow of both materials and data.
- d. It comprises a series of material pre- and post-processing operations on merchandise, combined with the processing and transmission of the relevant data on these material operations, which include transport.
- e. The fundamental purpose of logistics is to enhance service performance, customer satisfaction, competitiveness and cost

cutting. To achieve this objective, logistical performance must combine technology, quality and maximum coordination of resources and activities to meet the new management challenges.

The 1989 FAO Agricultural Services Bulletin on post-harvest handling of fruits and vegetables indicates specific provisions for a good transport service. These are valid for any sort of transit or product:

- careful loading and unloading operations;
- shortest possible journey;
- protect products susceptible to physical damage;
- reduce shifting and jolting to a minimum;
- avoid overheating;
- restrict moisture losses;
- once good product preservation conditions have been met they must be constantly maintained, especially with respect to temperature, relative humidity and air circulation.

A well-stowed load will avoid breakage, excessive shifting about, and delays in loading and unloading the goods. There is a growing trend in domestic markets to transport fruit and vegetable products on platforms. This technique is now being adopted by small and medium productive enterprises. There are limitations to use of the technique by small farmers, however. These include the (small) scale of production and the scant supply at some links in the marketing chain of the complementary components needed to handle platforms, such as autolifts and appropriate transport (Buenos Aires Central Market, 1997).

The surveys produced the following findings:

- products were stowed in 60 percent of cases;
- in response to the question "Materials used to package the products" 45 percent of respondents reported that they used crates, five percent used platforms and 50 percent used other materials;
- to the question "When do you protect your product?", 70 percent answered "from when goods are picked up at the farm" and 30 percent "during transit or transfer";
- concerning the "time of day goods are shipped" 85 percent said in the morning; only 15 percent answered at dawn, in the late afternoon or at night;
- there was a great variety of answers to the question "type of packing materials used to transport products": burlap sacks were used by 30 percent, wooden crates by 20 percent,

plastic sacks by 10 percent, plastic baskets by five percent, 5 percent wrapped their products in leaves, and 30 percent used some other kind of packing materials;

- in response to the question on how long it took to load the vehicle with the merchandise, 40 percent reported two hours for the loading operation and 60 percent said under one hour;
- to the question "How are your products loaded in the vehicle?" 95 percent answered "By hand", and only 5 percent answered that the goods were loaded mechanically.

From these surveys may be concluded that a considerable proportion of small producers do not stow their products, and that the time of day and duration of loading and unloading operations are not always appropriate. Products are not always protected from the outset and the packing materials used may not be the most appropriate.

Interviews with technicians indicated room for improvement in loading and unloading operations. Aspects needing improvement included close packing or stowing, the use of packing materials compatible with the product, loading and unloading operations management, protection and ventilation of the load, load distribution, and use of space in the vehicle. Technicians also commented on the dearth of information on transport services, such as the cost of trucking fleets, and the necessary procedures and documentation required for food transport.

## MARKETING CHANNELS

Production and marketing have become at once more complex and more specific. The following trends are characteristic:

- a. growing social and productive diversity with changing patterns of consumption;
- b. technological innovations in food production and processing;
- c. changes in the make up and structure of the food chains, with new markets for products differentiated in terms of quality, degree of processing, nutritional value, origin, presentation and other factors.

Agriculture, at the same time, was progressing toward new kinds of cooperation with the food production and processing stages, losing some of its original identity and coming to share attributes with other sectors in market insertion, diversification and becoming part of investment packages and business associations.

The emphasis on production supply was inverted in favour of market demand with a network of links between primary production, industry and marketing.

Food marketing and distribution were transformed. This was due to the development of the cold chains, of course, but also the sizeable expansion of the marketing sector through the creation of supermarkets and hypermarkets. The growing importance of supermarkets and their concentration in chain markets upped their bargaining power and the ability to impose increasingly demanding terms of trade at every link in the chain.

Small and medium farmers are poorly positioned to deal with the supermarkets. They can only compete if they organize, which would allow them to guarantee large volumes of quality goods and regular deliveries, boosting their bargaining power in the buying and selling of their products and by-products.

A tendency to upscale production is paralleled by a growing trend toward differentiated markets, sales channels, and market niches served by speciality items aimed at specific consumer segments, such as naturists, vegetarians, ecologists, and the like.

There is a backlog of regional experience among small and medium farmers' associations, which have developed productive and or marketing strategies to make the most of the growth trends in organic or ecological markets. Argentina, in particular, has recently experienced a boom in local markets and food fairs served by this producer segment.

## GENERAL DESCRIPTION OF RURAL FOOD TRANSPORT: SWOT ANALYSIS

Road transport of food products in the MERCOSUR countries and Chile tends to be highly fragmented. Characteristically, it comprises a great many small, family-owned businesses and many independent truckers. ALADI (2000b) reports a marked and growing road transport trend in the subregion towards market segmentation into three major categories.

- a. Simple carriers, whose functions are limited to hauling. Their services may occasionally include loading and unloading the truck. The marketing services they offer are quite precarious and they may offer the goods they carry to either final consumers or other transport firms contracting their services on an *ad hoc* basis.

- b. Medium and large sectoral businesses which offer not only carrier services but also subcontract other firms for such accessory operations as warehouse reception of the load, and completing the necessary formalities. These firms normally maintain medium and long-term relationships with their clients, and either informal agreements or formal contracts. This category also includes companies that specialize in one particular product item. They tend to offer a product-oriented service in terms of transport, loading and unloading and storage equipment, as in the case of refrigerated products. The management and programming of their services, which are designed and periodically adapted with their habitual clients, are also product-oriented.
- c. Companies subcontracting for intermodal transport service. These are usually highly capitalized businesses under long-term contract to their clients. In addition to transport, they offer a full range of services, from packing, storing and processing the commodity to ensuring final distribution and delivery to the target market.

Ballast fleets are very common in the region, given the problem of access to return fleets. The yield and production of those shipping companies qualified for international transport are hampered by their characteristic features of non-standardized equipment, age, and inadequate weight to power ratio.

Highway networks in the region have deteriorated greatly due to a general lack of resources, a marked absence of maintenance policy planning and development, and major operational gaps throughout the network that caused huge bottlenecks.

The main problems of international road transport are bookings for transport space in different units that necessitate freight transfers, high costs and delays at boundary crossings, and asymmetric taxation or varying qualification requirements. Delays arise in international rail transport at boundary crossings due to rolling stock problems owing to the different track gauges in use in different countries.

There are major road capacity problems in the MERCOSUR corridor due to the juxtaposition of regional trade flows and increasing local traffic. In some sections of the corridor the mean daily transit per year has reached very high levels for these two-



lane roads, especially in southern Brazil. Crossing the Andean corridor is a serious problem when the winter snows close off the passes.

The border blockade imposed at one time by Argentinean truckers sent out a red alert on the fragility of the circulation of goods at times of economic tension. The grievances of the Argentinean truckers arose out of an economic crisis that prevented them from competing on an equal footing with their counterparts in other countries, given the inflexible economic model in force in Argentina at that time.

Another road safety problem is mentioned in the initial conclusions of a World Bank study that brought out the high cost to society of preventable deaths and damage which better road standards, road education and public education might have prevented.

Rural transport affects small and medium agricultural producers at the farm level in the subregion as follows:

- poor transport lowers the prices paid to farmers for all agricultural commodities. The effect is most keenly felt, however, on prices for perishable goods and goods from the most remote areas; high transport costs shrink the amount of planted and/or harvested area in certain remote zones, with the consequent underutilization of resources;
- cost is not the only factor affected where transport services are inappropriate for the type of product transported: increased damages and spoilage also reduce opportunities for selling the product and the seasonal nature of agricultural production also sparks a seasonal demand for transport services which affects price rises;
- in product reconversion, the competitive viability of a new product in consumer markets is largely dependent on transport services, infrastructure and costs;
- when middlemen or other traders are the sole providers of transport, as in many marginal areas where small farmers live, the effect on the rural market is to monopolize it;
- product differentiation, an increasingly popular strategy, is constrained by the lack of access to specialized transport services that allow a farmer to comply with specific quality standards.

A closer look at the case of Argentina for a more exhaustive review of the transport issue follows.

Argentina's transport infrastructure is limited, and highly dependent on road transport. This restricts domestic markets, limits export growth, and inhibits the development of regional trade and distribution centres in frontier areas. The remaining means of transport are only used for specific commodities and markets. The only food products shipped by rail, for example, are sugar, soybean and cereals.

World Bank studies show that the prevailing transit patterns in Argentina involve high-tonnage freight and a predominance of point to point transit. This type of goods could be more efficiently shipped in 1 500-ton boats or trains carrying 6 000 tons, or 15 000 tonnes when fully loaded. Despite this, the least efficient mode of transport is used to ship this kind of industrial and agricultural goods: trucks with a carrying capacity of only six to 20 tons. This is the predominant mode of transport in 90 percent of the freight market. Only seven percent of merchandise is shipped by rail, and river transport is the least used means of transport.

The trucking industry in Argentina does not mobilize huge capital resources, and persistent fragmentation continues to be reported. The historical non-existence of legal and technical barriers to entry in the sector has created a situation where trucking has become a refuge for independent workers with very little management training and expertise in the sector. Automotive freight transport comprises a fleet of 350 000 units spread among 150 000 companies, most owning just one or two trucks. There are only 51 companies with a fleet exceeding 100 trucks in the entire country. On the basis of the available information, it is fair to say that there are very few large-scale transport firms offering freight transport services by road (Pasteris and Giner, 2000).

The railway sector includes five private companies, which are subsidiaries of big export firms that are themselves the users of this rail network. The companies that obtained the concessions were not highly capitalized.

Border administration and customs regimes are hobbling the development of multimodal transport. One example is the obligation and responsibility of service providers to collect VAT for export.

Müller (1999) analysed the Argentinean transport sector, indicating the critical points.

The decisional and regulatory aspects of state management are inadequate. This has been a

frequent source of error in terms of regulation, investment and other sectors.

Road infrastructure, except for the toll corridors under management concession, is seriously lagging behind in terms of road maintenance and rehabilitation. Some 46 percent of the road network is only fair or in poor condition. Toll concessions have been very onerous for road users, and at the same time a huge state debt has built up for subsidized payments based on toll charges. Lastly, the possibility of expanding the capacity of some 800 km of sections of the national network should be evaluated.

The deepest restructuring in rail transport concerns the privatization of a whole set of state activities. As to freight, however, progress has gone no further than a recovery of the levels of the 1980s, despite vigorous growth in production and in bulk and container traffic. At the same time, the actual network has been reduced given the dubious current financial viability of most operators and this has been accompanied by considerable failure to comply with earlier agreed investment plans. Preliminary evidence suggests that the present situation is neither commercially nor economically sustainable. Meanwhile, a much higher share of the relevant freight would increase the viability of the rail sector with a greater scale to density ratio. As to the function of territorial accessibility, the set of services on offer is fairly small, and could perhaps be maintained with low-cost technologies.

According to INDEC (2000), the total number of registered freight companies in Argentina is 119 436, whose fleet totals 269 423 vehicles with an average age of 19 years.

The total number of authorized international freight shipping companies is 1 289. The number of vehicle permits (some for transit through more than one country) is 31 079, and the number of vehicles 15 207. The total freight capacity of this fleet is 196 030 tonnes.

Competition from foreign fleets has appeared since Argentina joined MERCOSUR, and fleets serving domestic and foreign markets have been separated, with the best equipped used for cross-boundary transit. The most modern vehicles in the Argentinean fleet are those working in the international markets. Some companies, despite uneven existing costs, manage to renew and increase the size of their fleets and retool their management systems. There was a very reduced investment rate, especially during the 1980s, during which the trucking fleet aged greatly. By 1992 the

average age of the vehicles in the fleet was 18 years. This hinders the efficiency of the service on offer and has a knock-on effect on competitiveness in the sector (Pasteris and Giner, 2000).

With some highs and lows, the total number of registered commercial vehicles in Argentina was 1 459 862, peaking at 1 573 564 in 1992 and a low of 1 203 903 in 1995. By the end of the decade there were 1 507 339 commercial vehicles.

There is one estimated commercial vehicle for every 24 inhabitants. The figure is considerably less in provinces lying outside the pampas which have dense concentrations of smallholders. The ratio in Misiones is 1 to 33, in Río Negro 1 to 36, in Corrientes 1 to 37, in Tucumán 1 to 42, in La Rioja 1 to 44, in Formosa 1 to 49, in Santiago del Estero 1 to 63, and in Catamarca 1 to 73.

The demand for freight transport has risen steadily in recent years from 181 million tonnes in 1985 to 239 million tonnes in the year 2000. The share of automotive transport grew from 91.73 percent to 93.53 percent. Meanwhile, rail transport declined from 8.27 percent to 6.99 percent (INDEC, 2000)

Prices are extremely flexible and very much open to negotiation. Each trucking fleet contracts on an individual basis, and there is quite frequently a range of prices for the same service. One special situation is domestic transport. Service in this sector is highly fragmented and there is significant differentiation in the prices charged, which depend on the weight, volume and type of commodity shipped, in addition to the chosen route; and also the characteristics of the company offering the service.

It should be stressed here that price-setting policies have never been applied to overland transport, and that this is the one sector that has never been publicly owned. Nor has the sector been subsidized. It has faced competition from subsidized rail transport under general economic conditions that have a significant impact on transport. These include the high cost of fuel due to the behaviour of the distribution market and the burden of specific fees, the regulation of the labour market, which also drives up costs, and the heavy tax burden on the sector (Pasteris and Giner, 2000).

The main farm-level problems of small producers emerging from the interviews and surveys included the following.

- a. Most small farmers and their organizations do not own their own vehicles. They produce

small volumes (though production is regular and sustained). They have no chance of acquiring and maintaining a vehicle scaled to their own needs, such as a van, pick-up truck, car with trailer, jeep, or some such. Only 25 percent of those farmers in the survey owned some means of transport for moving goods.

- b. The lack of proper, accessible transport is currently a major problem, and often a barrier for the implementation of any activity, or marketing goods through certain specific channels.
- c. The poor state of the roads and lack of regular carrier services – such as the rail network that once covered the entire country – drives up the price of transport and is a factor that needs to be weighed in opting to adopt a productive or commercial activity.

In answer to a question about the state of the roads on which their goods travel, 65 percent of survey respondents qualified them as poor, 30 percent as fair, and only five percent as good or excellent.

Transport problems affect the quality, quantity and profitability of sale products. They result in damage to the products shipped, and losses at the central markets as goods are discarded or confiscated. And they complicate the processes of product reconversion and quality upgrading that could lead to the development of more profitable alternatives.

In response to the question on damaged goods, about 45 percent of survey respondents reported some damage during the move to the collection and/or marketing sites. Most of those who reported damaged products reported that 55 percent of this was physical damage and 45 percent biological damage.

Commonly reported damage was due to jolts (butternut squash, for example), high temperatures, or poor ventilation of packed goods.

The further these farms are from urban centres or main roads, the lower the prices to the farmer; in some cases prices were less than half the normal price.

One of the main reasons producers sell their output to the collection agents or middlemen who regularly swing by their farms is that they lack their own transportation. This is true of small walnut farmers in Catamarca, onion growers south of Buenos Aires or pepper growers in Salta, for example.

As to the supply of transport vehicles for moving their products, 65 percent rated the supply as adequate and 35 percent as scarce. No one reported an oversupply of transport.

The availability of transport also depended on how long an area had been producing the good in question. Where there was a long history of production the problems had been solved, whether through sale to the farmers' customary middlemen, or because farmers had organized to contract for transport services as a group with their neighbours. Where products are new to an area and there is still no established marketing chain, the situation of product placement is even more critical. This is true, for example, of summer lettuce in the hinterland of Catamarca province.

Transport is even more of a problem in the mountainous areas of northeastern Argentina. In Molinos, in the province of Salta, a trip to the provincial capital means covering 160 km of gravelled road. Buyers of traditional products normally serve the area only when they can get a good price for the product. Otherwise producers are forced to come to some agreement with carriers in nearby villages. These carriers are the larger-scale farmers or warehouse owners who have capitalized and bought trucks. In Purmamarca in the province of Jujuy, small farmers use the extraurban buses. In the hill country of Zenta, 60 km east of Humahuaca, the 150 local families have no regular bus service, and are forced to hire some passing pick-up truck to move their goods.

For the Mohair Project underway in the southern provinces of Chubut, Neuquén and Río Negro, smallholders have no independent transport for their products, and no way to reach the farmers meetings they wish to attend. They are dependent on the vehicles of the project technicians or those of some local cooperative or association. They pay the fuel costs and contribute to repair costs. Governments normally assign a vehicle in such cases but do not pay for maintenance. Or they may have recourse to an official truck belonging to the province or municipality. The public bus lines offer service only on the main roads. Anyone living many miles away needs to move around on horseback or by some other means.

In the Cuyo area, the Chepes Sur cooperative, located in the southern part of los Llanos de la Ríoja, has no access to adequate local transport for the live or slaughtered kids they sell.

The transport problems faced by cooperatives or smallholder associations for marketing their goods



in regional, national and international markets are described in detail below.

### **PRODUCTION-RELATED PROBLEMS**

The prices charged by carriers are usually quite high compared to what small farmers are paid for their products, and also because of the distance between production zones and markets.

In answer to the survey question concerning the biggest problems with rural transport for their products, 100 percent of all respondents replied that transport costs were very high.

One decisive factor has been the rising cost of fuel and lubricants (oil, regular gas, premium gas and diesel). This is made very clear by comparing the inflation index for last year (2002) with the general price index, and contrasting this with the 340 percent rise in the cost of diesel compared to annual inflation.

The fuel cost hike – 0.40 pesos/litre in December 2001 to 1.53 pesos/litre in December 2002, drove up the production costs of raw materials and processed goods purchased by consumers at the various points of sale – stores, markets, supermarkets. Another factor is the constant rise in the superhighway tolls paid by the various means of transport, and which are based on the number of truck axles.

Transport costs also increase with auxiliary operations such as loading and unloading. In answer to the survey question on cost for loading your product, 95 percent replied that they did the loading themselves to avoid paying this cost. On the other hand, 60 percent reported paying for unloading operations at destination. In no case had respondents received any form of transport subsidy.

Further should be remembered that easy access to transport demands a certain volume of output and this is not usually an option for smallholders. Loads usually have to be made up by a group of farmers, and are assembled by the carrier. These small volumes translate into a lack of bargaining power for smallholders vis-à-vis buyers and carriers. Shipping very small volumes means problems with finding transport and paying a very high price for the service.

In the case of onions exported to Brazil, for example, during a journey that begins south of Buenos Aires and ends in Brazil, the temperature of the product rises, and the onions may well sprout. So the price of onions, originally quite competitive, becomes much less so due to the distance. Often

enough, the cost of transport and the value of the product are more or less equal.

There are also safety problems, given the antiquated condition of the trucking fleet serving certain areas.

### **ORGANIZATION-RELATED PROBLEMS (PRODUCERS' GROUPS OR ASSOCIATIONS, COOPERATIVES)**

In general, producers have not banded together to market their products, and face serious problems getting their products to market. This task is greatly facilitated where farmers have organized. The bonds of organization encourage them to act as one – to defend their land, devise sales strategies, or pool their tools and equipment. And they also enjoy the social benefits available locally, not to mention the trust and affection that ease the burden of work.

### **SOCIOECONOMIC PROBLEMS**

There is widespread discrimination among truckers against the smallest of the smallholders, who lack equitable access to markets. This only adds to the management problems small farmers have with market supply and product placement, and their lack of working capital to cover marketing costs.

The economic crisis in Argentina has also reduced the purchasing power of almost everyone, and this has dampened the prospects for selling certain differentiated or value added products.

### **LEGAL/REGULATORY PROBLEMS**

Small producers are rarely in a position to comply with the prevailing norms, and thus sell their output at lower cost. Sometimes their products suffer delays in transit due to the lack of proper certification.

This is the case of slaughtered kids that have to be shipped in refrigerated trucks for federal transit, and onions for export which require a certificate of origin issued by SENASA, and which must be packed in an authorized, registered warehouse, which drives up the costs.

### **ENVIRONMENTAL PROBLEMS**

Because most rural roads are dirt-surfaced, transitability depends on how often it rains and whether or not road consortia are available for road maintenance. In some areas such as Valles Calchaquíes in Salta, the roads are cut off in the summer due to heavy rainfall; rivers are harder to cross, and transit becomes risky.

## PROBLEMS WITH ROAD INFRASTRUCTURE AND PHYSICAL ACCESS

Road infrastructure is minimal in rural areas, and roads are poorly maintained. These are dirt or, at best, gravelled roads, and may be inaccessible when it rains.

Road consortia run by the producers themselves are found in some areas. Such consortia take responsibility for rural road maintenance in their own area, but lack of funds make this a critical point.

Many roads deteriorate with the passage of heavy trucks, especially at times of heavy rainfall. The absence of a conservationist sentiment is also a problem here.

Excessive rainfall was cited by 70 percent of the survey respondents. The possibility of finding themselves isolated because the roads have been cut off is a very real one for them, as are all the attendant risks.

Problems concerning the availability, quality and cost of transport services are listed below.

- Transport service quality ranges from fair to poor, with high costs for small volumes of output, which is why certain products are not competitive.
- No local service is available in many of the areas where small farmers live. As specified earlier, 35 percent of our survey respondents rated the available supply of rural transport as poor.
- Taking the example of onions in the southern part of Buenos Aires province, for example, producers are often forced to sell their goods urgently because it is the rainy season or the onions are beginning to sprout. It is very complicated for them to access adequate transport. The technicians working in the project may have to supply their own vehicle to move the product to market or to some point providing access to a long-haul truck from another city.

## SWOT ANALYSIS

The following SWOT analysis was prepared from primary information from interviews and surveys, and secondary information from a bibliographical review.

### Strengths

- The agroecological approach of small farmer productive strategies demonstrated considerable economic and ecological potential.

- Producers are now receiving technical assistance and training through specific programmes for small farmers. These programmes could incorporate rural transport-related activities.
- Productive and commercial small farmer organizations have recently been promoted by almost all specific programmes, and there are now a great many such at various levels of association.
- Some farmers' associations and cooperatives have a sufficiently sturdy organizational base to assume responsibility for rural road maintenance.

### Opportunities

- Rising volume of agricultural trade in MERCOSUR, even outpacing production growth.
- Considerable increase in intraregional trade of agricultural and livestock commodities.
- Diversification of exports in MERCOSUR bloc countries, with a greater variety of products and increased value added.
- Positive trends in differentiated marketing and market niches, together with the growth in ecomarkets now offering potential new commercial opportunities for small producers.
- Favourable development of various initiatives to improve road infrastructure (concessions, maintenance paid through tax contributions, establishment of road funds, maintenance agreements per level of standards, training for road maintenance microbusinesses) in several countries.
- Certain current projects aim at increasing the share of freight carried by rail.
- The growth in trade through MERCOSUR is putting pressure on countries and international agencies to implement action to solve problems related to infrastructure and transport.
- A number of transport-linked events have been carried out and progress has been made in sub-regional policy-making, legislation and standard-setting.
- A number of institutions share the commitment to undertake action in the subregion with a common vision of the transport sector.
- A number of initiatives for institution-building and development are taking shape in the region.

- Planning currently embraces a broader vision of sustainable development and a more participatory approach.
- Some countries have made progress in funding road maintenance efforts, with the approval of laws establishing specific contributions.

### Weaknesses

- Transformations in the food marketing and distribution sectors have put small and medium-scale producers at a disadvantage.
- Very intense competition in the domestic agroindustrial sector; the disappearance of small and medium food suppliers; small subsistence farmers already hovering on the verge of bankruptcy.
- Few small farmers and their organizations own their own vehicles.
- The price of hauling goods is usually quite high compared to the prices small producers are paid for their output, and because production zones are so distant from markets.
- In many of the areas where small producers live and work, there are no local transport services.
- High transport costs shrink the area planted and/or harvested in some remote zones.
- Poor transport lowers the producer prices of all agricultural and livestock products, but the greatest impact is on output from the most remote areas, and on perishables. The further the farm lies from urban centres or main roads, the lower the price paid to the producer – in some such cases they are more than halved.
- Where the transport vehicle is inappropriate for the type of product, cost is not the only item affected. Products are also more likely to suffer damage and spoilage, dampening the prospects for sale.
- The lack of proper, accessible transport is a problem (and often an obstacle) to any activity whatsoever, and for marketing products through specific channels.
- Poor road conditions and the lack of regular trucking services drive up the cost of transport. This is a factor that needs to be reckoned into any decision to undertake a productive or commercial activity.
- There is a dearth of accessible, specialized transport services that would allow producers to meet specific quality standards.
- Transport problems affect the quantity, quality and cost-effectiveness of the products marketed. They cause damages that may cause a product to be discarded or confiscated upon arrival at the central markets. They also complicate the process of product reconversion and quality improvement that would make it possible to develop more profitable alternatives.
- One of the main reasons why producers sell their output to middlemen or others who regularly swing by the farms and take responsibility for hauling farm produce, is that the former lack their own transportation.
- Easy access to transport services demands a certain volume of freight, and this is not usually an option for a small producer on his own.
- There is a lack of producers' associations for marketing, which usually entails major problems in getting a product ready for transport to market.
- Small producers have management problems with supplying markets and product placement. They also lack the working capital to cover marketing costs.
- There is a lack of farm-level training in the logistics and management of transport.
- Small producers are often unable to comply with prevailing norms, and therefore sell their products at lower prices. They may well suffer delays in transit due to a lack of proper certification.
- The dirt or (at best) gravel-surfaced roads common in rural areas are often impassable in the rainy season.
- Trucking consortia administered by producers operate in some areas. They are responsible for rural road maintenance but a critical point here is their lack of resources.
- Many roads deteriorate with the continued passage of heavy trucks, especially at times of abundant rainfall. A lack of awareness of the importance of road maintenance makes itself felt here.

### Threats

- Tariff and non-tariff barriers to trade are a constraint to exports.
- Very intense concentration and competition in the domestic agro sector, with the disappearance of small and medium food businesses.

- Negative environmental impacts due to the intensification of production.
- General lack of appropriate technologies for family farming, and technology for the subsistence sector in very short supply.
- Grave deficiencies in the infrastructure services. The growth of intrazonal trade as of 1990 began to exert pressure on the physical infrastructure in general and the transport infrastructure in particular.
- Lack of common standards and guidelines for a sustainable development model.
- Not enough funding to implement road infrastructure projects.
- Transport sector decision-making and discussion is scattered among various different bodies, agencies and negotiating fora. This is as true at country level as within subregional integration processes.
- Lack of state encouragement for the development of services offering a combination of road, rail and river transport.
- Lack of state supervisory and advisory services for transport, maintenance and infrastructure expansion.
- Lack of state promotion and strengthening of bodies enjoying the active participation of representatives of local communities, users and the private sector with reference to financing, construction and operation of transport projects.
- MERCOSUR countries have expanded the length of their road networks in recent decades, but investments have been earmarked mainly for the most heavily trafficked highways, and not enough attention has been paid to roads connecting countries.
- Only a small percentage of the total length of roads is paved. Priority is given to paving the main roads in each national road network, to the detriment of provincial and rural roads.
- Scant resources and a lack of maintenance policy planning and development have conspired to bring about a deterioration of road networks.
- There are severe problems of road capacity in the MERCOSUR countries, with regional trade superimposed on local traffic.
- The main problems of international transit by highway are:
  - Abundance of ballast fleets given the difficulty of securing loads on the return trip, and the fact that the characteristics of the international transport fleet conditions their yield.
  - Delays and high costs at cross-boundary crossings.
  - Bookings for transport space in different transport units that make transshipment necessary.
  - Asymmetric taxation or varying qualification requirements.
- In the case of shipping by rail, delays may occur at boundary crossings with difficulties arising in the exchange of rolling stock.
- The demand for intrazonal and international transport in the MERCOSUR countries is neither sustained nor regular, and the traffic is both heavy and undocumented.
- Certain sections of the network are very hard to transit at certain times of the year, as in the case of snow or flooding.

# Strategies for improving rural food transport

## DESIRABLE CHARACTERISTICS OF TRANSPORT SYSTEMS

The desirable features of an efficient, satisfactory food commodity transport system can be summarized as follows below.

**Basic access:** can be defined as road infrastructure accessible year-round to motor vehicles. Rural road improvement and maintenance ensure non-stop transit of agricultural commodities from the farm-gate to market or processing plant.

**Accessible services:** refers to the presence of a local transport service; i.e. timely access to transport for moving products.

**Low costs:** those that are amply covered by income from the sale of the product.

**Quality:** referring to the type and times of transport services, with a guarantee of the physical integrity and sanitary and organoleptic properties of the product, and ensuring the packing materials also arrive at destination intact.

**Safe service:** refers to accidents on the road and theft of merchandise.

## ANALYSIS OF JOINT INTERVENTIONS TO ADDRESS FOOD TRANSPORT PROBLEMS

The following ongoing initiatives intended to enhance road infrastructure deserve mention.

- a. Road concessions are apparently regaining interest. A relatively lethargic performance in recent years was followed by signs of new life in the issue of road concessions starting in 2001. On the one hand, the concession process showed a certain continuity in Chile and Uruguay. Chile has a well-structured system that has gradually extended its coverage under a clearly defined and dynamic medium-term-bidding programme. Uruguay has also followed a systematic approach to road concessions, with its profitable routes under concession and deriving income from road tolls. Two concessions were granted in 2001. One covers nearly 1 300 km of roads with insufficient transit to recover all

costs, and thus with road maintenance costs subsidized by the National Development Corporation, an autonomous state body. In Brazil, the first wave of concessions, initiated in 1995, was over by 1998. The basic principles for awarding concessions were reviewed in 2000, and preference given to a system whereby the State invests – normally through resources from multinational banks – in infrastructural improvements, the management of which is subsequently awarded as a concession (ECLAC/UN, 2002a).

- b. Significant (though as yet incomplete) progress has been made in Chile and Uruguay in covering road maintenance with tax contributions. The two countries are exceptional in the region in this respect.
- c. In Brazil the federal Constitution was modified to include a law stipulating a fuel tax. Part will be earmarked for transport infrastructure programmes, including road maintenance. The State of Goiás also set up a road fund, a type of financial body found in four Brazilian states. In the State of Mato Grosso do Sul, the laws creating this fund were passed in 1999, with subsequent legislation approved to set up the Mato Grosso and Paraná funds. The funds are partly financed by fuel taxes, meaning that road users are paying for road maintenance. An innovative measure in Mato Grosso do Sul was the concept of rounding out the income from fuel taxes with taxes on just a few profitable livestock and agricultural items. Unlike pre-existing funds, the three Brazilian funds receive their resources directly from the tax-holders (ECLAC/UN, 2001).
- d. In Uruguay, an interesting innovation was introduced when the National Highway Authority signed two agreements with two internal road maintenance units, each of



whom undertook to maintain some 730 kms of highway under contracts per level of standards. With this experiment, over 60 percent of the national road network of about 8 600 km is now being maintained up to standard (ECLAC/UN, 2002a).

- e. Uruguay's national Highway Authority contracted directly with companies set up by former officials who opted for voluntary retirement. Thus, workers who used to perform maintenance tasks in an administrative capacity have formed micro-enterprises specializing in routine maintenance of roads, traffic signalling and street lighting. Although small firms may seem to be precarious in business terms, their performance in this area has been excellent and they have been effective in organizing road maintenance operations. The evaluation shows that users have better roads at their disposal than in the past, since contracts lay down strict conditions, and these are being respected. The National Highway Authority pays less for routine maintenance than it did previously for administration. The new contractors have seen a substantial increase in their income.
- f. Current World Bank assistance to the transport sector in Argentina covers three aspects of development and administration. The first concerns a sustainable approach to federal and provincial road rehabilitation and maintenance. Under the new approach, these jobs will be contracted out to the private sector, with a goal of achieving acceptable road quality for the federal network of paved roads by 2004. Total congestion is increasing, however. Nearly 4 000 km of paved roads need an extra lane and a number of bridges must be replaced. The second aspect concerns Bank approval of the Provincial Roads Project, which is helping several provinces modernize their road systems. The third aspect is to reform and consolidate sectoral regulation, especially the regulation of multimodal transport. The problem of multimodal transport is held to be the next major policy topic for the transport sector in Argentina, after privatization of the railroads, ports and main highways. This is particularly important in terms of making Argentina more competitive and enhancing integration with its MERCOSUR partners.

With respect to rail transport-related projects, the following deserve mention (ECLAC/UN 2002a).

- The most viable railways have already been leased, so few activities of interest for the private sector remain. At present there are a number of plans to increase freight shipping by rail.
- In 2001 the reopening of the Trans-Andean Railway via the central corridor from Argentina to Chile was proposed. An advisory firm did a pre-feasibility study with two 1 500 hp locomotives pulling trains of 600 net tonnes (the equivalent of 850 gross tonnes) over the high mountains. If this solution were to prove viable, it could offer a yearly shipping capacity of three million tonnes.
- There is an existing project to connect the wide-gauge rail networks of Argentina and Chile in the south between Neuquén and Victoria.
- Another of the new plans emerging in 2001 was the idea of connecting Brazil and the northern coast of Peru via a Trans-Andean railway.
- A feasibility study was done in 2001 on privatization of Paraguay's railway, but no progress has been made on this. There is a chance that some of the railways now under concession might be returned to the State.

An analysis based on the ongoing initiatives mentioned above revealed several positive experiences in various countries, as summarized below:

- contracting for the services of micro-enterprises of road companies and workers, especially to improve routine road maintenance;
- setting up road maintenance funds appears to be the most valid means of solving infrastructure problems. In several cases these funds are partially derived from fuel taxes. In other instances the funds are bolstered by taxes on specific, profitable, agricultural and livestock commodities. The most favourable situation would seem to be road funds financed directly by tax-holders, as the most effective collection method;
- road maintenance contracts per level of service or standards, where the criterion for payment is the good condition of the roadways, based on objective parameters, rather than the volume of work executed. Past experience

- has shown that this is a viable way of keeping roads in good condition, reducing operational costs and providing genuine job creation;
- some countries have a carefully structured system of concessions with a medium-term-bidding programme or else systematic approximations of concession plans;
  - supervision is one aspect of concession programmes that needs improvement, since in some countries controls are weak and do not guarantee full compliance by contractors; quality assurance, which generally leaves much to be desired, could be improved by the application of ISO 9000 standards; although complex to set up, this method is effective for systematizing and improving procedures and the results of maintenance, and for introducing self-regulation mechanisms for firms;
  - the introduction of concession contracts in the provision of road infrastructure has also changed conditions for transport operators, who have become the clients of these enterprises and not simply users of their services, introducing a significant element of interaction. It also affords an opportunity for clients to participate systematically in the evaluation of these services;
  - in other experiences, the state invests in infrastructure improvement through financing provided by multinational banks; the World Bank carries out programmes embracing a sustainable approach to federal and provincial road rehabilitation and maintenance, through the introduction of a new system to outsource these jobs to firms working in the private sector and actions to regulate multimodal transport are also underway;
  - as for shipping freight by rail, there are several projects in the pipeline to rehabilitate national and bi-national rail networks.

#### **OPPORTUNITIES FOR HOLISTIC SOLUTIONS, PROMOTING THE IMPROVEMENT OF FOOD TRANSPORT SYSTEMS AND SOCIOECONOMIC DEVELOPMENT**

The growth of trade among the Latin American and Caribbean countries, and especially the MERCOSUR countries, has spurred states and international agencies to implement action for development, and address infrastructure and transport problems.

Many events have been held with the participation of officials working in the field of

transport, with some progress in establishing policy, legislation and standards for the subregion. Several institutions share the commitment to undertake action, with a common vision of the transport system embracing the subregion as a unit. Some of the main institutions providing technical and/or financial support for these activities are ALADI, the World Bank, IDB, ECLAC, and, specifically, Sub-Group 5 of MERCOSUR.

The Conference of Ministries of Transport, Communications and Public Works was set up to promote economic and social development in the countries of South America, encouraging greater integration through common policies and strategies.

In the year 2000 the Heads of State of 12 countries of the subcontinent met in Brasilia to launch an action plan for the physical integration of South America in the fields of transport infrastructure, energy and telecommunications. Several financing mechanisms of the IDB, the Andean Development Corporation (ADC), and the Financial Fund for the Development of the River Plate Basin (FONPLATA) would participate in the programme for implementation of this plan. It revolved, in the short term, on the undertaking of detailed feasibility studies. This would be followed by the immediate execution of projects and international transport services embracing infrastructure along six corridors or major intracontinental trade routes and their links between the subregion and the rest of the world.

Institutional changes are, undoubtedly, the most complex to promote. For this reason it is encouraging to note that various initiatives are materializing in Latin America in this area. At the Second Provincial Seminar of the Americas, the Board of Directors for Highways of Iberia and Ibero-America showed interest in promoting the use of indicators of institutional performance and the road condition. These values would make it possible to appreciate the development of service provided by road agencies and would help authorities and the general public to assess the quality of the work carried out. Some institutions are already starting this practice.

The new state role fundamentally has to do with regulation, planning and financing infrastructure and infrastructure services. This constitutes a challenge that can also represent an opportunity. Planning now embraces a broader vision of sustainable development, using a more participatory approach. This new paradigm can



steer investments toward more effective results by favouring integration among countries through the corridors linking them, and at the same time promoting community development in the individual countries.

Some progress is being made in financing maintenance through road maintenance funds, as and when laws are approved to establish taxes on fuel or on certain agricultural outputs. Funds set up in three Brazilian states will collect resources directly from the tax-holders, who are required to deposit them in the relevant bank accounts. In other words, the money does not go through the tax system, thus reducing the time involved and ensuring that it is received.

Interesting innovations in road maintenance agreements are being introduced in some countries. Road maintenance contracts per level of service or standard are now very widespread in Latin America and the Caribbean. Although the process is lagging somewhat in some of the nine countries using such contracts, by 2001 over 40 000 km of roadways were thus serviced, though with significant variations from one country to the next. Contracts covering a further 25 000 km were in various phases of preparation. With the experience of Uruguay, this is the first time in Latin America that the concept of a contract per level of service has been applied to work done by administration.

User participation is a theme that has received great emphasis in recent years. Users are the recipients of action, and at the same time they finance action with their contributions. Users, and the public in general are no longer the passive recipients who accept with resignation what others do, but, on the contrary, have become actors who demand to be taken into account in a special way. The Provia Seminar mentioned above established that an effective road system demands the participation of users as third parties with well-defined rights and who interact harmoniously with other actors.

Likewise the creation of micro-enterprises for routine road maintenance has generated very satisfactory results for all parties concerned.

Another potentially favourable aspect for infrastructure development is increased direct foreign investment. This assumes the state is complying with its function as a regulator and planner. While such investments have not received much response from the overland transport sector or produced many new projects, the MERCOSUR

countries have made efforts in this sense to attract investments backed by regional agreements.

### **COLD CHAINS: AN ALTERNATIVE FOR THE RURAL SECTOR**

The development of cold chains including controlled temperature transport and containers has helped to transform food marketing and distribution.

According to FAO (1989), the *cold chain* concept includes the rapid post-harvest cooling of products at the lowest possible temperature to avoid damage to the product. The temperature is then maintained constant at every stage of post-harvest management, from packing, storage, transport and marketing, to final display in retail markets.

The use of cold chains for marketing products is feasible with the participation of large, integrated organizations that can control every aspect of post-harvest management, and for large volumes of products.

It is unlikely that progress will be achieved in this field in the next few years, especially for small and medium producers. On the one hand there is a general lack of marketing and transport infrastructure for small-scale productive systems. On the other, the volume and value of the output of small producers is too low to cover the investment costs. The use of refrigerated vehicles is feasible for certain highly perishable products where justified by sale prices.

Refrigerating equipment installed on trucks varies with the cooling capacity of the system used. Most are just used to maintain the temperature of products pre-cooled by other means. They have low-capacity ventilators to cool the air warmed by the slow respiration of the cooled product. Some form of ventilation may be necessary on long trips to avoid losses of oxygen and the build-up of carbon dioxide. Some refrigerated vehicles, such as trailer trucks equipped with refrigerated containers, can rapidly cool a warm product by forced air circulation – normally an exceptional technique due to its high cost. Using refrigerated trucks with relatively low cooling capacity to pre-cool products for export is not usually recommended.

In any case, producers require a certain amount of experience and training to make good use of a refrigerated transport service and profit from its potential advantages. Fruit shipped in a refrigerated truck can reach market insufficiently cooled because it has not been properly stowed

– or it may have contracted *Botrytis* rot because an ethylene absorber was not used as a complement to refrigeration.

The need for refrigerated transport is clearer at certain seasons and for specific products that arrive at the Buenos Aires Central Market in very degraded condition. Sweet maize ears, for example, deteriorate rapidly and easily. This is why sweet maize is now beginning to be shipped in pallets rather than in bulk (NEA/IFAD/IDB GOA Programme, 1997).

Interviews in Argentina revealed that refrigerated transport is used mainly by larger producers for marketing high-value fruits such as apple and pear, and certain early vegetables in northeastern Argentina, such as tomato and peppers, which fetch good prices in the big city markets.

The interviews showed that most small producers lack access to refrigerated equipment for economic reasons, even though this would be an appropriate solution to the problem of damage to highly perishable products, or products susceptible to sprouting or certain diseases.

This lack of access is linked to the scarcity of services in most areas, and to the very high cost of such services for small production volumes, and low producer prices. There are also problems with the working capital needed to finance this type of fleet.

The surveys showed that while an important proportion of respondents (45 percent) recognize that their product suffers damage – mostly physiological damage – during transport, 100 percent of those interviewed reported that they do not use refrigerated vehicles.

### PROBLEM PRIORITIZATION

A detailed description of issues linked to agrofood transport was presented earlier under the heading “*General description of rural transport of agrofood products – SWOT analysis*”

The priority macroeconomic, political and social problems of small and medium producers supplying mainly local or domestic markets are summarized below.

- Very intense concentration and competition in the domestic agricultural sector.
- Intraregional cross-boundary delays and costs.
- Tariff and non-tariff barriers to trade that limit exports.
- Lack of financing for road infrastructure.
- Failure to expand the length of paved roadway – the main roads in national road networks

take precedence over provincial and rural roads.

- Poor road conditions due to lack of road maintenance.
- Failure to promote microenterprises and consortia for road maintenance.
- Timely, adequate transport services unavailable in some areas.
- High cost of fuel and tolls compared to producer prices.

At the local and farm level, the priority problems are as follows.

- Most people lack their own means of transportation.
- High cost of transport compared to scale and value of production.
- Producers insufficiently organized to upscale production and marketing, and/or initiate road maintenance consortia.
- Lack of training and resources for the application of good agricultural practices linked to transport.
- Lack of financial resources for marketing expenses in general and transport in particular.
- General unavailability of adequate transport services.
- Lack of information on transport services and regulations.

### STRATEGIC PLANNING TO ADDRESS FOOD TRANSPORT NEEDS

#### Key transport factors to ensure adequate food availability

As indicated by ECLAC (2000), the goal of a strategic vision should be an economically and socially stable South America, committed to poverty reduction and enhanced educational and employment opportunities, with environmentally sustainable economic and social growth.

Summarized below are the basic principles of strategic planning for the solution of transport needs, based on our analysis of the bibliography and primary survey data.

- Planning organized at country and subregional level, based on the identification of regional development and integration thrusts for more efficient investments.
- Harmonization of regulatory and institutional frameworks, policies and plans amongst the countries of the subregion, with the development of common criteria for project design and technical, economic and environmental project evaluation.

- Enhanced national level integration and accessibility for relatively less developed regions, to promote the competitiveness of regional economies.
- Reform and modernization of regulatory and institutional systems governing the use of national infrastructure to permit the development of new investments and maximize existing ones.
- Establishment of a policy framework to ensure financial sustainability with a new vision for the definition and financing of infrastructure projects and road network maintenance.
- Policy definitions to direct and encourage long-term investment such as freight transfer stations, to encourage and foster complementarity of highway and rail transport.
- Enhancement of the environmental and social components of projects from the planning stages onwards, based on a holistic, enriching approach to projects, as opposed to simply mitigating harmful environmental impacts.
- Incorporation of mechanisms to promote the active participation and consensus of target rural communities and of the private sector, with respect to project financing, construction, operation and maintenance.
- Development of interaction among all sectors involved in the transport of agrofood products, and identification of effective, feasible public measures to reconcile the needs of small and medium producers (comprising the majority in all countries of the subregion) with the need for long-term, sustainable, economic growth.
- Guaranteed availability of the food produced by small and medium producers (whose products often fail to reach market for lack of access to transport) demands policies, programmes and projects with sufficient technical and financial support and coverage to ensure:
  - product development tailored to market demand;
  - institution-building of farmer's organizations to upscale production and enable them to compete in a range of markets;
  - linking inaccessible areas with regional economic centres;
  - rehabilitating and maintaining rural and secondary connecting roads;
  - increasing road access to broaden the market for agricultural and livestock products;

- reducing transport costs, including service costs and those from damages and losses in transit;
- strengthening consortia and other rural road maintenance and upgrading organizations.

## **POLITICAL AND SOCIAL ASPECTS OF THE PROPOSED SOLUTIONS: TAKING DECISIONS AND EARMARKING RESOURCES**

### **Institutional arrangements and capacity – a common response**

As indicated by ALADI (2000a), the subregional road network issue is linked to the absence of three basic elements of efficient coordination:

- common standards and guidelines for a sustainable development model;
- consolidation of elements favouring the development of intermodality, maximizing the advantages of each mode for a more economical transport system;
- the necessary financing for project implementation by international or regional credit agencies, including attracting private investors.

There is a lack of specific guidelines favouring dual integration of the modes of transport and of the networks for a sound, efficient infrastructure.

Discussion and decision-making stages of the transport system and its infrastructure currently involve a whole series of bodies, agencies and negotiating fora. This situation obtains at the country level as within the subregional integration process. There is an urgent need for institution-building in the sector so as to foster continuity in the application of general policies, and spark regional technical coordination.

There is a history of insufficient resources to cover the demand for road maintenance and reconstruction, with resources frequently squandered on road expansion works of questionable usefulness. Paving the main routes of each national road network has taken priority over the rural and provincial roads.

There is a long tradition of public funding of transport investment projects. Recently, however, the emphasis has shifted to include greater private sector participation in the targeting of resources. The presence of the public sector in the economy has altered substantially with its declining role in the provision of infrastructural services.

Admittedly, governments have been fairly effective in regulating markets where deregulation might easily have produced excessive costs for externalities such as competitive bidding for

infrastructure works subject to monopolistic tendencies, with subsequent regulation of the chosen concessionaire. However, they have sometimes failed to meet the challenge of identifying anticompetitive tendencies in deregulated transport service markets, or in taking the necessary steps to correct these tendencies. In some cases, deregulation of a subsector has been taken to imply the withdrawal of government concern for that subsector. In others, the government has ceded to pressure from influential marketing entities, and taken decisions that offered short-term solutions but created other problems in the medium or long-term (Thompson, 2001).

On the other hand, there is a need for increased State supervision and evaluation of both the transport services and the work of maintenance and expansion of the infrastructure.

Concerning state supervision, decision-making, and the earmarking of funds: governments need to promote and strengthen bodies enjoying the active participation of representative organizations from the target communities, users and the private sector involved in transport project financing, construction and operations.

The failure to maintain rural roads can almost always be traced to inappropriate institutional organization, financing and responsibilities. Road consortia or microenterprises responsible for road maintenance can play a fundamental role here. Financing, technical assistance and training should be earmarked for these entities.

The long-term participation of rail freight is crying out for definition. ECLAC/UN (2002a) points out that the announced plans and projects including rail transport as a link in the international transport chain are proliferating faster than real action on the ground to implement them.

As for transport logistics ALADI (2002a) finds that with very few exception, the structure of the logistics chain in the subregion falls far short of the habitual parameters for international trade and transport among industrialized countries.

Market realignment due to the development of MERCOSUR increasingly demands transport intermodality, combining the services of road, rail and river transport. This situation is now changing, however, with the introduction of concessions in the provision of road infrastructure services. Freight truckers have become the clients of road concessionaires. There are now negotiations underway between service providers and their clients. In other words, if the big rigs want to

travel on roads not designed to bear their weight, the concessionaire will evaluate the alternative of upgrading the standard, perhaps by resurfacing the road in question, and offering this service via payment of a toll corresponding to the investment. A whole series of aspects stand in the way of a level playing field for competition between rail and road transport modes. The State should perform and perfect its regulatory and institutional role here, and correct these distortions. As explained, there are unquestionable advantages to road *vs.* rail transport and *vice versa*, depending on the type of freight and the characteristics of the market. Hence the urgent need for enhanced complementarity of the two modes, which would maximize all variables involved. Crucial here is the establishment of state policies offering clear and constant incentives to the private sector to invest in and provide efficient intermodal services.

Environmental issues have not yet had much impact on policy, but their growing importance in infrastructural planning is bound to produce changes in transport scenarios. This is especially true of the choice of transport mode, and here railways offer distinct advantages. It must be remembered, however, that rail freight alone is mostly unable to satisfy demand, and needs to be combined with the other modes of transport.

Problems such as the excessive offer of trucking services that arose as a result of redundancy, and the series of sectoral problems that spawned these issues, also urgently demand attention in light of their high social cost.

## DESIRABLE BENEFITS OF VIABLE SOLUTIONS TO FOOD TRANSPORT PROBLEMS

An efficient transport system favours and facilitates economic growth by promoting domestic and international trade through geographic integration.

Transport provides a *horizontal* service. This means a service that can either benefit or harm the economy as a whole. It is a secondary activity of the production process. Its cycles follow those of the economy in general, and at the same time amplify them, because rising GDP in a country will always precipitate disproportionate growth in the demand for transport (ALADI, 2000b).

Investments to eliminate transport bottlenecks can have major cost benefits, plus the added benefit of reducing environmental pollution. Considering the externalities (accidents, noise, pollution and CO<sub>2</sub> emissions), the costs of shipping cargo by



road are much higher than for rail freight. Rail transport CO<sub>2</sub> emissions are tiny compared to those from shipping by road, and energy efficiency is three times as high. In Brazil, highway transport accounts for 90 percent of CO<sub>2</sub> emissions from all modes of transport. Rail transport is responsible for only 0.4 percent, even though the railways move 21 percent of all cargo compared to the 64 percent shipped by road. The energy needed to ship one tonne of cargo by rail is one-third that of shipping by road.

At the local and farm level, improved transport systems can make the following contributions:

- cost benefits in the form of lower fees and shorter trips, or higher net prices for harvest products at the farm-gate;
- expanded markets and the development of new marketing channels;
- opportunities for selling new products, e.g. more perishable commodities or goods for which there are no intermediaries available for collection at the farm-gate;
- reduced spoilage due to transport inadequacies or delays in transit;
- enhanced income provided some of the aforementioned conditions are met, and also, as a consequence of overall transport cost reduction; gains in terms of money, time, energy and efforts, reliability, safety.

According to Gannon and Liu (2001), improved transport directly and indirectly improves the well being of less privileged segments of the population, depending on the type of activity thus enhanced. The direct effect arises when transport is a complement to other specific interventions: such as the provision of clinics, schools and extension services, for example. The indirect effects concern transport interventions designed to enhance the efficiency of both producer and consumer as a contribution to economic growth. The key to defining rural-poverty-linked benefits is to grasp how outputs in the transport sector are tied to the four major dimensions of poverty: *creating economic opportunities and capacities, facilitating empowerment, and enhancing security as a buffer to economic reverses and natural disasters.*

*Economic opportunities and capacities* concern basic access to markets, information, employment (e.g., unskilled labour, seasonal work, off-farm employment, and even employment outside the area), extension services, education and health. The capacity of an individual to generate income is decisive here.

Infrastructural improvements that extend basic access will put economic opportunities within the grasp of less-favoured rural people. Improved transport not only benefits the rural population through viable, low-cost access to a wide range of socioeconomic opportunities; it also indirectly benefits consumers and producers by lowering the cost of the goods and services delivered.

*Enhanced security* takes the form of a transport network that provides basic access roads, traversable year-round, enabling a country to respond to economic adversity and natural calamities, and correct geographic imbalances in basic needs (e.g. food and medicine), especially in emergencies. The impact of adversities, that affect the poor most, can be reduced where a country or region has the capacity to move food from surplus areas to food-deficit areas.

*Empowerment* has to do with the improvement of rural roads and tracks that can favour the capacity of rural communities to express themselves and voice their opinions, enhancing their access to governmental offices and social assemblies. Geographical isolation prevents poor communities from participating in social and political processes, barring access to more equitable treatment and political representation.

Another direct benefit is the impact on employment generation. Basic road maintenance and construction imply labour-intensive techniques mobilizing large numbers of workers, offering income-earning opportunities for the rural poor.

## STRATEGIES AND POLICIES TO IMPROVE THE TRANSPORT OF AGROFOOD PRODUCTS

### Decision tree for the viability of efficient, sustainable options for the rural sector

Road and transport policies need to embrace a vision of future development, with a strategic plan for achieving the objectives set. This is the key to the improvement and uninterrupted maintenance of food transport systems.

National and international territorial integration policies should constitute the framework for evaluating transport system improvement. Promoting adequate retention and replenishment of active existing policies, and expanding segments representing bottlenecks or delays in replenishment, should be part of this framework.

Increased institutional effectiveness and better management of the agencies responsible for the transport system is a top priority. The national transport policy framework needs to clearly set

out the functions of the public and private sectors, delegate responsibility to the corresponding official agencies, and design a regulatory structure to cover economic, safety and environmental issues.

It is essential to coordinate agriculture and infrastructure sectoral policies to maximize resource use, and provide a regulatory framework to substantially improve rural food transport.

Adequate guidelines for private sector participation are also very important. Care must be taken to ensure concessions do not entail windfall profits or unnecessary risks.

Road maintenance policies need to be carefully defined, avoiding the consequences of deficit policies that can mean road damage and the subsequent need for road rehabilitation, increasing vehicular operating costs and heightening the risk of accidents.

Roads in poor condition drive up the operating costs of motor vehicles by 30 to 50 percent or more. An effective road maintenance programme can avert this at significantly lower cost. Estimates in various countries point out that direct losses from defective roads can be as high as two percent of GDP (ECLAC/UN, 1997).

Intermodality is an effective criterion for evaluating transport policy decisions, especially with reference to the role of rail transport. Railways, which have oriented their transport services to accommodate large volumes of cargo, offer significant advantages over shipping by road. Including externalities, their cost is way below that of road transport, their emissions much smaller, and their energy efficiency much greater.

The development of a multimodal system is highly important for enhancing the operating efficiency of domestic markets and guaranteeing the competitiveness of primary exports. The World Bank refers to *seamless multimodal transport*, defined as contract transport services including two or more modes whose runs, delivery times and number of lots per load are especially designed to lower delivery costs per unit of product. The promotion of intermodal transport services should also embrace integrated production and distribution, advances in transport technology, and information systems designed to monitor operations.

A built-in policy for financing the transport system needs to be defined. Adequate, timely and sufficient resources must be earmarked to ensure efficient action.

Cost-reduction operations also need to be made more efficient. There are many forms of intervention

that can be considered low-cost, of course. They include contracting services to the private sector, boosting the capacity of public-sector agencies and local private sector concessionaires, and giving user groups more control over the use of funds derived from fees (e.g., through road councils).

Sustainable road improvement should be the common goal of all transport interventions. To achieve this goal will require action and commitment on the part of users, enterprises and governments as concerns the institutional, operational and legal issues. Sustainability will also require setting up a financing mechanism for rural road maintenance that is immune to political influences, such as a road fund administered by an independent road council.

Every transport project has some environmental impact, and this must be borne in mind in the design of sectoral policies. Transport infrastructures generate spatial segregation, have a visual impact, and modify land use. Operations have an impact on the quality of life of the local population in that they produce noise, vibrations, accidents, and air and water pollution. Projections also show that oil consumption will continue to increase in the transport sector.

Local-level institutional, technical and administrative capacity needs to be bolstered through the development of small and medium enterprises to administer and carry out minor improvements and maintenance on rural roads. To ensure the equity of transport policies and the development of the sector, local bodies need to provide an efficient response to the demand, ensuring that groups at every income-level have basic access, and choosing transport services that operate efficiently, and, if possible, competitively.

## SURVEY RESULTS

### Objectives

The study on rural transport based on surveys and interviews (Figure 2) had three specific objectives:

- collect information from officers in charge of smallholder-targeted projects, and get their views, based on the surveys and interviews, on the issue of rural transport;
- supply qualitative information on the subject of transport;
- collect quantitative information reflecting the current state of affairs.

As already mentioned, Argentina currently has about 400 000 production units, of which about

300 000 in the smallholder and mediumholder sector. Of this subtotal, just about half are considered smallholders (Figure 3).

Rural poverty in Argentina, as in the other MERCOSUR countries, is linked to the high incidence of smallholdings and to small-scale production in this agrarian sector (see Tables 17, 18 and 19).

This production system is typical of over half of all agricultural establishments in the regional economies. Figures 2 and 3 show the distribution and concentration of the smallholder sector and smallholders in Argentina. Each red dot represents 10 farm families.

The defining conditions of these production units are:

- scarcity of natural and economic resources;
- small parcels compared to family size;
- precarious land tenure;
- very little remuneration for family labour;
- lack of adequate professional advice and technology;
- inadequate access to credit;
- scant bargaining power in markets;
- weak farmer organization.

### Qualified informants

The aim of the study was to collect basic information underlying the issue of rural transport, based on surveys and interviews with qualified informants, along the following lines, in accordance with:

- the limited time available;
- the geographical coverage of the study;
- the possibility of quickly and effectively reaching the most remote zones in the countries allowing a more representative sampling of the sector and of the problems in question.

Given the large number of official and NGO smallholder-targeted development projects, active interaction was established with project officers in every province. The principal criteria for eligibility as a *qualified informant* were ability to respond responsibly and knowledgeably to the questionnaire, and in follow-up interviews, where applicable.

These criteria were:

- responsibility for an ongoing development and/or productive project;
- minimum five years experience in the field;
- background in technical assistance and marketing activities;

- aptitude for the participatory solution of collective problems.

Personal knowledge through employment background of government structures and programmes, and of private and provincial bodies, favoured the selection of *qualified informants* among the teams and groups of colleagues scattered throughout the country.

The set of tools and criteria utilized ensured:

- a thorough x-ray of the national situation with respect to territorial expansion;
- a broad diversity of production conditions and meaningful representativeness due to the great many smallholders represented in the survey on rural transport.

### METHODOLOGY

The first methodology used for the study was the *survey* and the second the *interview*.

#### The surveys

From the outset an appropriate survey model prepared for another region of Latin America was used, adjusted as appropriate for the examined country.

The objective of the survey was made clearly explicit at the time the surveys were sent to respondents. The questionnaire was sent to over 50 *qualified informants*, with the request that they return the completed forms within 25 days. This was later extended by 15 days.

A total of 25 responses were received, of which three were eliminated as incomplete. The information from 20 surveys was processed and the data systematized for later analysis.

#### The interviews

Once the surveys had been received and processed, five cases from different *qualified informants* and project officers were selected for field visits. This was to check the answers for veracity and exactitude through interviews with the project officers and with heads of the organizations involved.

Throughout the interview, every effort was made to ensure an amenable and cordial exchange with the interviewees. This dialogue was facilitated by the clearly stated objectives of the interview and of the agency responsible for conducting it. There was no reluctance to divulge information, and, importantly, those interviewed were assured that the data thus obtained were confidential, and not to be disclosed to media sources.



This technique was chosen for data collection because:

- an open interview makes it possible to gather a great wealth of intensive, holistic and contextual information, in the interviewees' own words and with their own approaches;
- it smoothes the way to new directions in research, clarification and follow-up on the questions and answers, within a more direct, personalized and flexible framework;
- it is ideal for the initial phase of a study, revealing new hypotheses and guiding the search for new documental information;
- it offers contrasts and nuances that can be compared with numerical data;
- more than other qualitative techniques, it can access information most easily obtainable through the intervention of an interviewer or the dynamics of group interaction;
- use of these kinds of qualitative interviews allows a topic to be explored in greater depth and be compared to other sources, reveals a greater wealth of data, and includes nuances, new hypotheses, reconstruction of past action, oral histories, and other valuable element.

The *text or script followed for the interviews* can be compared to the survey questionnaire. Generally speaking, all in-depth interviews follow a text. This contains topic and subtopics to guide the interview, but at the same time neither formulates the questions nor suggests answers.

In this particular case there was an outline with the items to be covered, in no exact order, the idea being to generate a flow of information peculiar to the individual being interviewed, so as to capture unscripted answers. The goal was to confirm and/or expand the results of the surveys. Topics were thus established on which to proceed during the course of the interview. Once the five case histories had been selected, the interview was agreed upon.

Various tactics were employed in the interviews to maximize the outcome of interpersonal communication. Silences, for example, are useful to allow the interviewee time to remember or to elaborate on some fact. This is especially true for rural smallholders, smoothing any anxiety arising between the question and the answer, in accordance with the rhythm of rural life.

Interview tactics such as drawing out the interviewee, comments, nodding the head, waiting, or asking for a more detailed answer, allow the interviewee greater liberty of expression,

being attuned to his or her personal manner of expression. Reaffirming or repeating what the interviewee expressed in his or her own words, without asking for further clarification, is a way of showing interest in what is being said.

## Results

Data were received from 23 qualified informants heading development and/or production projects. Of this number 20 were selected for the study, and three were rejected as incomplete (not containing the minimum required information).

This analysis does not claim to be conclusive or to have exhausted all possible explanations. However, it is of value from several standpoints, and can be seen as a preliminary proof that data and indications can be obtained on how the problems of rural transport relate to smallholders.

Table 19 covers the specific responsibility of the technician responding to the survey, geographical location, province, productive systems, number of producers involved, and the overall volume of production. The last column contains economic information derived from the data supplied, indicating the gross value of production in global terms and suggesting the true potential of small-scale production.

## PRODUCTION CHARACTERISTICS, VOLUME AND ESTIMATED VALUE

### Analysis of the results

A number of observations concerning the universe studied emerge from the analysis of the survey findings.

### Small producers

A brief description of small producers follows. Though not specifically targeted by the survey, they deserve mention due to their number.

The 20 surveys analysed embrace a sizeable portion of the country. It is important to note here that the responses refer to farmers' associations with fairly large memberships: the sample covers 7 744 families.

Figure 4 shows the percentage-wise geographical distribution of smallholders in the five main regions of the country covered by the study.

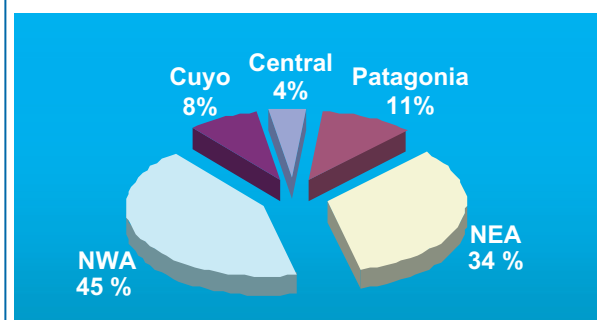
The map of the provinces participating in the study together with the map showing the distribution of smallholders indicate the high incidence of smallholdings in the country, the location of ongoing projects, and the number of families involved.

TABLE 19  
Case studies in detail

N° cases	Title	Site	Province	N° of producers	Product type	Product volume	Estimated value (in pesos)
1	Coordinator	Aimogasta	La Rioja	264	Olives	2 400 t olives	1 440 000
2	Tech.Asst.	Goya/ Corrientes	Corrientes	1 350	Cotton/vegetables	60 t cotton, 100 t vegetables	181 000
3	Coordinator	San Juan	San Juan	160	Honey/preserves	30 t	180 000
4	Tech.Asst.	JJ. Castelli	Chaco	860	Cotton/vegetables/ honey	10 t cotton, 2 t honey- 20 t cassava	32 500
5	Tech.Asst.	Seclantas	Salta	150	Horticulture	10 t onions, 10 t tomato, 200 t peppers	339 700
6	Tech.Asst.	H. Ascasubi	Bs. Aires	150	Horticulture / apiculture	6 000 t onion, 50 t butternut squash, 10 t honey	2 545 000
7	Coordinator	Bariloche	Neuquén/ Río Negro/ Chubut	690	Goats/horticulture	50 000 kids, 80 t vegetables	1 330 000
8	Coordinator	Ancasti/ Andalgalá	Catamarca	600	Goats / honey	5 060 kids, 10 t honey	186 500
9	Tech.Asst.	Pomán	Catamarca	400	Walnuts	675 t nuts	4 050 000
10	Adviser	Quebrada H.	Jujuy	150	Horticulture/ flowers	90 000 flowers, 150 t vegetables	1 635 000
11	Technician	Chepes	La Rioja	80	Goats	9 600 kids	240 000
12	Coordinator	San Juan	San Juan	400	Seeds, Vegetables	300 t seeds, 50 000 jam fruits	7 200 000
13	Coordinator	Cafayate	Salta	150	Horticulture	200 t peppers	320 000
14	Adviser	Perico	Jujuy	40	Strawberry	100 t strawberry, 40 t tomatoes, 90 000 passion fruit	
15	Adviser	Tilcara	Jujuy	200	Horticulture	200 t vegetables	2 000 000
16	Adviser	Cerro Azul	Misiones	400	Fruticulture	700 t mandarins, 500 t peaches, 300 t oranges	1 255 000
17	Adviser	Gral. Alvear	Mendoza	90	Jam	100 000 flaks/year	350 000
18	Adviser	Los Juries	Santiago	1 300	Cotton/goats/ maize	10 000 t cotton , 4 000 kids, 3 000 t maize	14 800 000
19	Coordinator	Los Antiguos	Sta. Cruz	150	Cherries/peaches/ jam	235 t cherries, 90 t peaches/jam fruits 50 000 flaks/year	1 227 500
20	Adviser	Puelen	La Pampa	200	Goats	19 800 kids	495 000
				<b>7 784</b>	Equivalent to	<b>US\$</b>	<b>40 231 000</b> <b>12 572 187</b>

Note:(\*) title of interviewee, location of organization, number of smallholders involved (Information supplied by INTA)

FIGURE 4  
Geographical distribution of smallholders surveyed



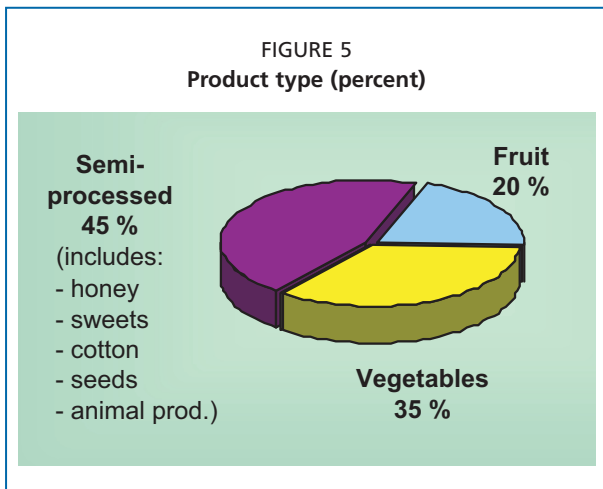
### The products

Figure 5 shows the assessment of the different types of products obtained by smallholders in Argentina.

These products are grouped as follows:

- fruit
- vegetables
- pulses
- cereals, and
- semi-processed goods.

This last category includes all products with some degree of value added due to processing. A total of 45 percent of smallholders fall into this category and prominent among them are the producers



of honey (18 percent), the sweets agroindustry (9 percent), seeds (9 percent), industrial crops such as cotton (18 percent), and a major group of goat producers, accounting for 46 percent of the category of semi-processed goods.

**Product-related information**

The answers to the four questions contained in this section were virtually uniform.

Firstly, all survey respondents reported that *they transport their own goods, produce volumes greater than 150 quintals, and do not purchase merchandise for resale.*

Secondly, in answer to the question on *product quality*, all respondents rated the quality of their output as very good.

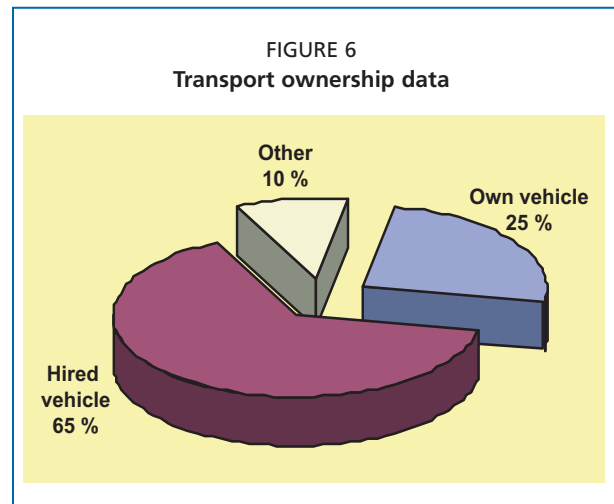
**Transport-related information**

This section sought data on *ownership vs. leasing of the means of transportation.*

As Figure 6 shows, 25 percent of those surveyed own some means of transportation for hauling goods.

A further 65 percent hire transport, and the remaining 10 percent use some other means such as extraurban or local buses.

With reference to the large majority hiring some means of transport, the arrangements are made with an intermediary. In other words, the trader who buys the goods at the farm or ranch picks up the merchandise with his own transport and then sells it. This intermediary is the same person who supplies the producer with goods not produced on the farm, such as clothing, utensils and other inputs. The producer later pays for these goods with a portion of the harvest



**Vehicle types**

This question was designed to determine what *kinds of vehicles* are used to move goods to market. As Figure 7 shows, about 60 percent of the vehicles used are pick up trucks.

**Refrigerated trucks**

This question was designed to determine what percentage, if any, of smallholder products is shipped by *refrigerated transport*. Everyone in the survey answered this question in the negative.

**Condition of the transport utilized**

Concerning the *condition of the transport* utilized, a high percentage (65 percent) rated it as good, and about 30 percent as fair or poor (Figure 8).

**Transport costs**

About 60 percent of the survey population found the *cost of transport* high, compared to 40 percent who felt it was adequate (Figure 9).

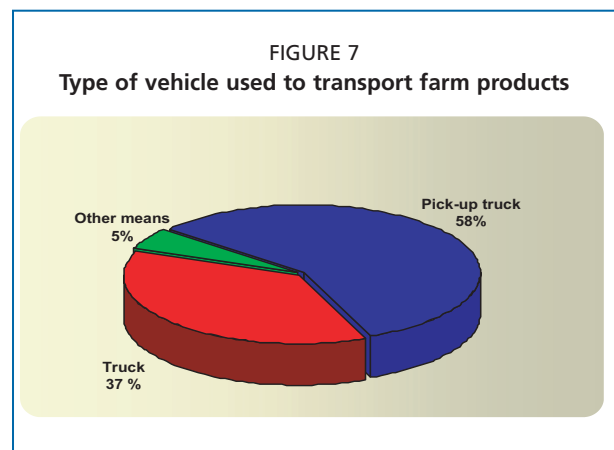


FIGURE 8  
Condition of transport utilized

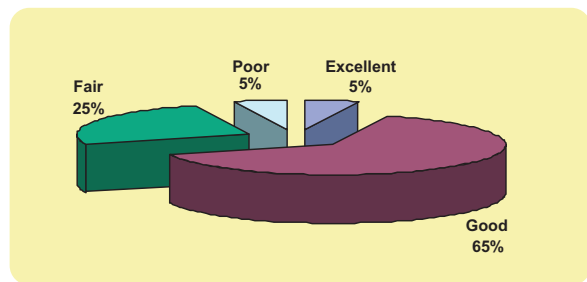


FIGURE 9  
Cost of transport utilized

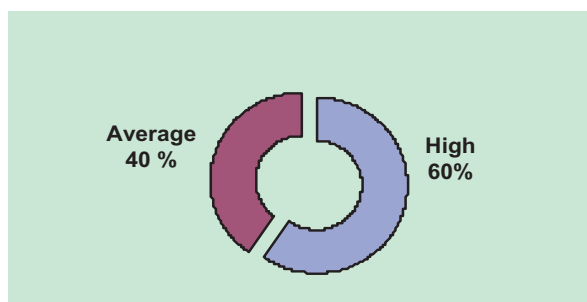
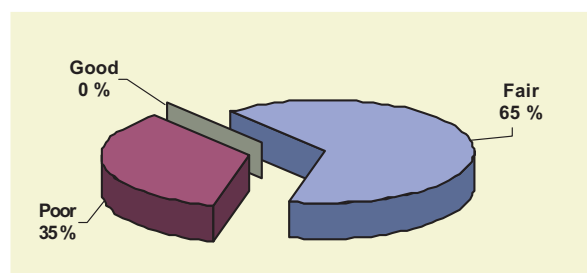


FIGURE 10  
Transportation supply



### Transport supply

There were three possible answers for the question on *transport supply*. The answers showed that 65 percent of the survey respondents found the supply of transport adequate, compared to 35 percent who did not (Figure 10).

### Marketing channels

Important considerations with reference to marketing channels (buyers and markets) are summarized under the following subheadings:

### Who buys the product?

Of all those covered in the survey, fully 90 percent sell their output to intermediaries, and only 10 percent have access to the end consumer. In other words, both those with their own means of transportation and non-owners sell mostly to local traders.

### Product destination

The findings in Figure 11 do reflect the answers of the survey respondents, but the questionnaire did not cover every type of situation. This is because most of the people interviewed sent their goods to different places, thus diversifying the sale destination, which ranged from local, to zonal, to provincial to regional and/or national.

### Transport management and logistics

The data on logistics and management emerging from the surveys included the following details.

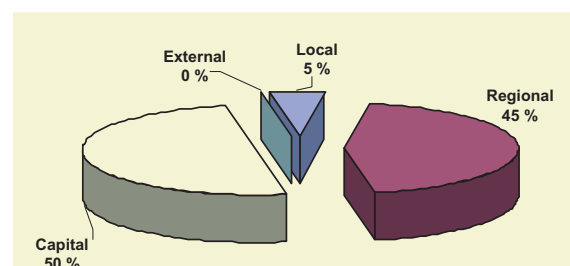
In answer to the question “*Is the product stowed?*” about 60 percent of respondents answered in the affirmative, and the remaining 40 percent in the negative.

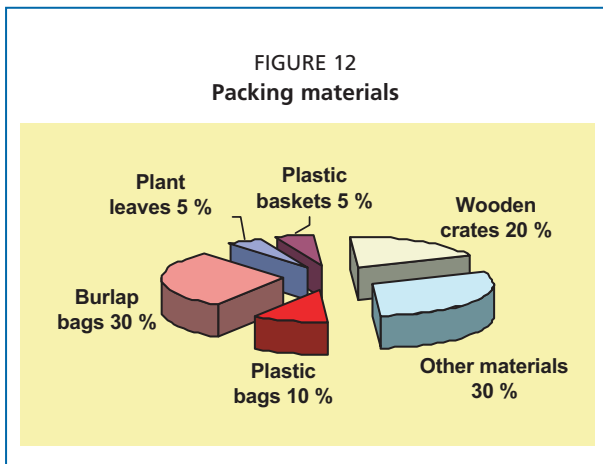
In answer to the question on *materials used to pack the products*, 45 percent reported that they used crates, five percent platforms, and the remaining 50 percent baskets, leaf wrappings, and plastic or burlap bags (Figure 12).

In answer to the question “*How is the product protected?*” 70 percent replied that the product was protected from the outset of transport when the product was picked up at the farm, and the remaining 30 percent referred to protection during the journey and/or transfer.

In reply to the question on the *time of day goods were transported*, 85 percent reported that the goods were transported in the morning. Only 15 percent replied that the move took place at dawn, and in the late afternoon and/or at night.

FIGURE 11  
Product destination – markets





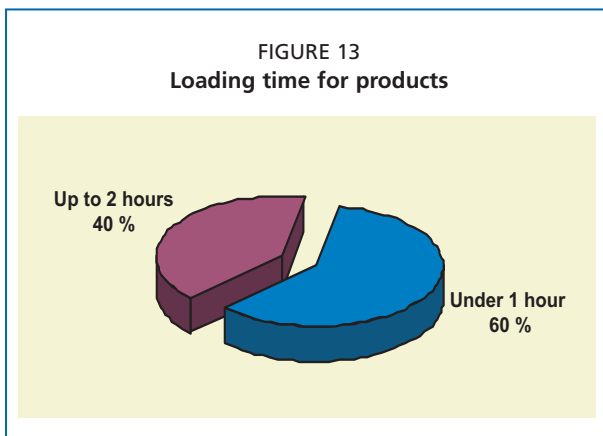
Concerning *the type of packing used for shipping the goods*, a great variety of packing materials were reported.

Concerning the question on *how long it took to load the vehicle* most replied between one and two hours (Figure 13).

Lastly, in reply to the question “*How are the products loaded into the vehicle?*” 95 percent replied that the products were loaded manually, and five percent reported mechanical loading processes.

**Principal problems during transport**

Concerning *transport costs*, all respondents agreed that transport costs were high. Costs ranged from 0.60 to 0.70 pesos per km of travel. The exchange rate at the time of the survey was 2.9 pesos/one US dollar, whereas by the time these data were processed, the rate had gone up to 3.2 pesos/one US dollar, and so the current cost of transport is considerably higher. Highway tolls have also risen substantially, further driving up the cost of transport.



Concerning the *cost of loading the product*, nearly 95 percent reported that they avoided payment for this service by loading their products themselves. However, 60 percent reported that they had to *pay for unloading the products*.

Lastly, on the question of *transport subsidies*, every single respondent reported that they received no transport subsidies whatsoever.

**Road infrastructure**

There were several questions on road infrastructure, as follows:

*Type of road*

The information supplied by the farmers’ associations indicate that the road network in rural areas is inadequate, with nearly 75 percent of the network consisting of dirt and/or improved roads (Figure 14).

*Road condition*

It was concluded local and provincial roads in rural areas are in no condition to support the development potential of rural people for marketing and access to the big consumer centres (Figure 15).

*Distance and travel time from production zone to market.*

A large percentage of farm output is transported more than 100 km from the point of origin (Figure 16).

*Impact of weather conditions on transport*

Some 70 percent of respondents reported that excessive rainfall did affect transport. There was a very concrete possibility of road washouts isolating the affected population, with all that implied in terms of risk (Figure 17).

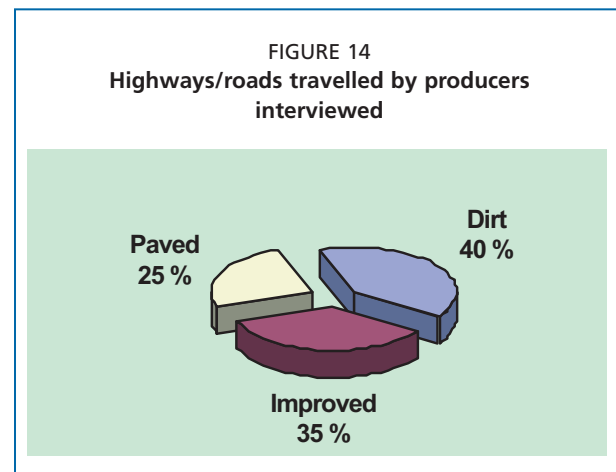


FIGURE 15  
Road conditions in the opinion of producers interviewed

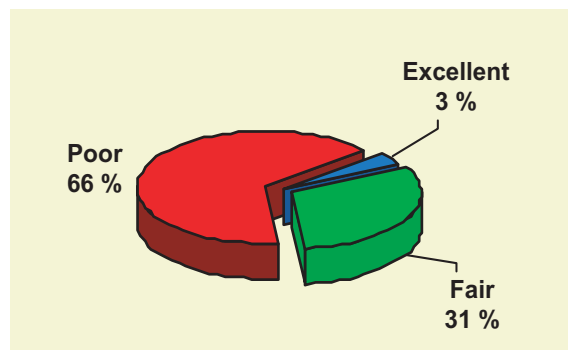
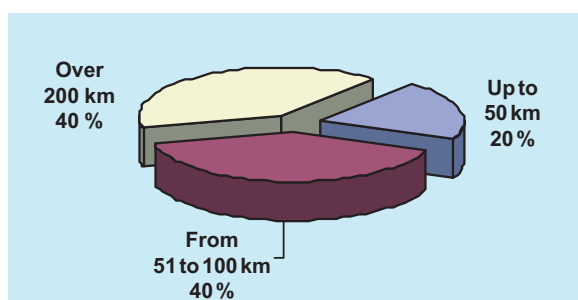


FIGURE 16  
Distance from production zones to market

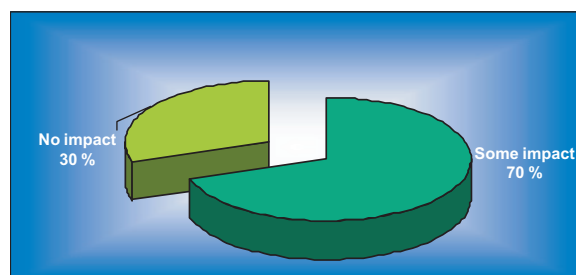


### Damage during transport

About 45 percent of respondents reported that some damage occurred during the shipment of their products to the collection or marketing centres.

Of this 45 percent, 55 percent reported that the damage was physical (products packed in bags were not well protected, and physical damage to

FIGURE 17  
Impact of excessive rainfall

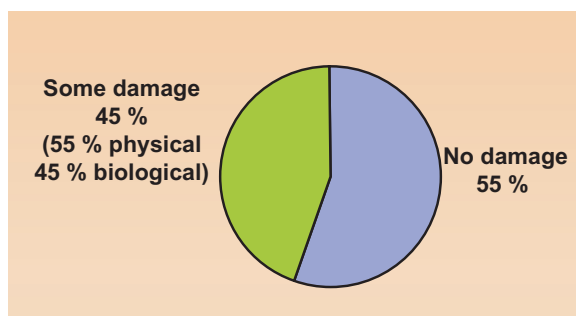


produce occurred as the contents shifted during transport). Biological damage rates of 45 percent were reported (Figure 18).

In conclusion, an estimate was made of the value of physical production declared by the organized farmers represented in the survey (Table 1).

The 7 784 families produced output valued at 40 231 million pesos (roughly US\$ 12 572 187 at the exchange rate of 3.2 pesos/one US dollar. This means an annual income of US\$ 1 615 per family.

FIGURE 18  
Damage occurring in transit





## Conclusions and recommendations

There has been a certain amount of development in the rural transport sector with respect to agrofood products, and there have been several innovative features, especially systems for operating and maintaining the main trade and travel routes. But in view of the complexity, variability and diversity of the situations encountered in the subregion, most reflecting problems of climate, geography and logistics, there is ample room for improvement throughout the system. This applies to connections within the subregion, as, eventually, with the rest of the hemisphere.

The strategies outlined in the previous chapters should become part of national development plans and policies in the Expanded MERCOSUR context, thus establishing a uniform set of standards to regulate and foster trade in products of agricultural and livestock origin. These food products are often highly perishable, and require special handling to ensure timely and satisfactory delivery of a quality product to the final consumer.

The following recommendations, emerging from our analysis of the various aspects of this topic, address various levels of participation.

### FOR INTERNATIONAL, REGIONAL AND SUBREGIONAL AGENCIES

- Promote and organize subregional meetings to facilitate the trade and transport of products of agricultural and livestock origin.
- Formulate subregional cooperation projects to harmonize transport regulatory measures and juridical regimes, particularly with reference to customs problems.
- Encourage improvements in the conditions operating at boundary crossings, eliminating unjustified phytosanitary and customs delays.
- With international agencies, promote project formulation actions designed to develop transport for the least-favoured segments of the rural population.

### FOR STATE GOVERNMENTS

- Re-tool public policies, including regulatory strategies and mechanisms, public and private

investment programmes, taxes, and financing incentives and policies for the construction and maintenance of roadways and other works.

- Introduce modifications in the regulatory, institutional, operational and labour-related aspects of transport systems so as to enhance the efficiency of operations, and tend to reduce costs.
- Promote institution-building. This does not necessarily imply establishing new bodies, but rather maximizing both the performance of existing bodies and the resources available to them.
- Promote adequate financing of road services by means of specific, sector-generated, resources, so as to ensure continuity within the road agencies. An investment fund might be established for the sector as a short-term measure, through State-subscribed canons.
- Divide concessionaire activities into: financing, building and maintaining/operating roads, so that these functions can be assigned to different agents through successive transfers. Alternatively, compulsory quality thresholds might be imposed on concessionaires. Non-compliance would incur economic sanctions, or else the early withdrawal of the concession.
- Create an adequate legal framework for the operation of multimodal transport, delineating the responsibilities of service providers. Likewise, ensure reciprocity among the various countries providing multimodal services, facilitating cross-boundary travel.
- Conduct interinstitutional action among the various programmes targeted at small farmers and their output for integrated development of activities linked with production, transport and marketing, especially in the least-favoured and most remote regions.
- Rehabilitate and strengthen the rail network in the light of its aptitude for transporting very large loads over medium and long distances. This should be a gradual but steady process.

- Conduct studies to define the optimum role of rail transport within the overall transport system, and the state position with respect to this role.
- Promote the modality of road maintenance contracts per level of service or standard. Experience shows that such contracts have been successful in maintaining roads in good condition, reducing operating costs and generating genuine employment.
- One possibility for improving the effectiveness of maintenance by administration is contract simulation. This technique consists in identifying the staff units that carry out such work and, using written documentation, in treating them as contractors in various areas such as work scheduling, achieving goals, compliance with specifications and deadlines, inspection and reception of work.

#### **FOR PROVINCIAL AND/OR MUNICIPAL GOVERNMENTS**

- Raise the investment in and technological level of infrastructure, incorporating intensive evaluation of projects designed to expand the system.
- Intensify the work of rehabilitation and maintenance of basic existing infrastructure.
- Expand the capacity of the high-traffic sections of the road network. This would involve creating new lanes, paving berms, and other similar work.
- Prioritize the construction or improvement of rural access roads in accordance with standards guaranteeing basic, year-round transitivity for motorized vehicles.
- Strengthen road consortia and other rural road improvement and maintenance organizations through specific programmes and resources.
- Build institutional capacity through the provision of funding and technical support for the promotion of micro-, small and medium enterprises providing rural road maintenance and improvement. Training should be offered in the administration, planning, construction and maintenance of rural roads.
- Provide incentives for private investments or co-investments, through an adequate micro-infrastructure of cargo storage and transfer. Moreover, re-organize the big-city multimodal terminals designed to improve costs, and transport services that transfer equipment.
- Collect and process data, and conduct sectoral studies, for decision-making purposes.
- Consolidate qualified human resources in the corresponding agencies.
- Provide incentives for private sector participation through construction or rehabilitation and maintenance contracts with clearly stated and where possible automatic stipulation of clauses and obligations, in line with the varying levels and make up of transit services and the quality of the service provided.
- Develop mechanisms to give real responsibility and expression to users and other interested parties, incorporating community participation and advisory mechanisms in decisions concerning investments in local transport and its maintenance.
- Offer advisory services and technical training to municipal agents in the development of rural community funds for road maintenance.
- Policies concerning forms of basic access should emphasise low-cost technical solutions, provided these ensure all-weather access to motorized vehicles rather than demanding excessively high performance standards. Basic access can be guaranteed in most rural areas by ensuring that drainage facilities – bridges and culverts – are designed to withstand heavy rainfall. Access can be made more efficient as a function of cost, thus extending its benefits to more households without exceeding available budget resources.
- Coordinate improvements in physical access with other rural interventions such as plans to build basic rural services, and agricultural extension programmes.
- Introduce micro-credit programmes to enable small and medium producers to purchase the necessary means of transportation.
- Implement development policies, programmes and projects providing technical and financial support, to ensure sufficient and adequate coverage to strengthen farmers' associations so that they can upscale operations to a point where they are productively and commercially competitive in a range of markets.
- Promote road safety through education, information and communications systems.

### **FOR RURAL DEVELOPMENT PROGRAMMES AND/OR SPECIFIC PROGRAMMES TO IMPROVE RURAL TRANSPORT**

- The situation of the small producer in the context of economic globalisation necessitates an injection of resources through integrated projects designed to empower small producers to acquire local capacity for production, management and institution-building.
- Construct a favourable rural institutionalality – perhaps originating in the State but necessarily including the participation of rural families and their organizations – to execute policies that include the improvement of infrastructure and transport as part of a holistic approach to rural development.
- It is essential to promote the formation and development of rural enterprises or other forms of association for small producers, for production and/or marketing purposes, to improve their bargaining position *vis-à-vis* other stakeholders in the food chain, and overcome the inherent problems of small-scale production.
- Provide basic and specialized training in road management, rehabilitation and maintenance, leading to the formation of road consortia or micro-enterprises.
- Provide technical assistance to producers to identify the critical points at which their products are likely to suffer transport damage, and the measures needed to prevent such damage.
- Train producers and prepare technical manuals for proper handling of transport-related operations. The intent should be to reduce product losses and damage to a bare minimum. Training should include the use of compatible packing materials; management and supervision to ensure careful handling during loading and unloading operations; the use of loading areas with ramps (very useful for loading trucks); protection from sun and rain in loading and unloading areas; the use of carts, conveyor belts and lifts to reduce manual handling; optimum use of space to reduce shifting during transit; uniform distribution of weight; necessary ventilation; adequate stowing to ensure the product and its wrapping or packing remain intact; control of the condition of the vehicle and driver, and logistics planning.
- Establish information services at municipal and/or provincial level to include information on transport services, carrier costs, formalities and documentation required for agrofood transport, prices of products in different markets, market access conditions and marketing opportunities.



# **Transport of agrofood products in rural areas of Bolivia, Colombia, Ecuador, Peru and Venezuela (Andean Pact)**

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*Eduardo Neira*

*Peru*

*FAO Consultants*





## The transport situation in the Andean Pact countries

Transportation is one of the underlying planks of human social development. Without it, mankind would never have reached the levels of development and integration achieved today. Arguably, the development of transport systems is one of the distinguishing features separating developed from developing countries.

In the Andean Pact countries, as in most developing countries, many people are living in relative isolation from markets, cities, and the basic social services. This is due to their problematic access to transportation systems. It is no exaggeration to state that isolation increases in direct proportion to lack of access to transportation, and that isolation is a key augmentor of poverty.

The absence of a well-maintained road network generally has a negative impact on the economy and on the quality of people's lives. It drives up the costs of transport, raises production costs, shrinks the competitive potential of export products, encourages the outflow of foreign currency for the purchase and replacement of transport units, and limits access to markets. All this has repercussions on income, making people poorer. It also limits the access of rural people to public services – the negative impact of this on human development is incalculable.

The importance of rural roads in the Andean countries emerges quite strikingly from the consideration that nearly 30 percent of Peru's population (6.5 million people) live in rural hamlets with fewer than 500 inhabitants, half of whom living in extreme poverty. In Bolivia 61.9 percent of the population (5 million) is rural, of whom 62 percent are extremely poor. In Ecuador, rural people account for 64.3 percent (8.06 million) of the total population.

The purpose of this paper is to serve as a planning and decision-making input for high-level technical or strategic personnel and authorities engaged in some planning, management, support or advisory capacity as well as to address the needs and problems of improving the agrofood transport system serving rural communities in Latin America

and the Caribbean, especially in the Andean Pact countries. The paper may also be useful in gaining a strategic overview of action to enhance the efficiency of food transport from farm-gate to market and end consumers. It may also serve as a methodological reference for specialized country studies on the essential and defining factors, variables and indicators influencing the rural transport of food products in Latin America and the Caribbean, and for plans and programmes to improve this sector.

The methodology followed in preparing the paper involved a review of the relevant bibliography on transport themes in general, and food transport in particular. The Internet was searched for information as well, to outline a description of the food sector, and the state of existing road networks in Andean countries. This gave a broad overview of the general theme, and revealed that food transport problems are not uniform throughout the Andean area. Quite the reverse; there are major differences in the cases studied. They vary in accordance with the relative level of development in the regions, the type of product, the market destination, and the economic stakeholders in each particular case.

Further was observed that the food transport issue was viewed depending on the analytical perspective of each stakeholder in the value chain. For the small, rural food producer, for example, the main transport problem is access to the means of transportation and to roads. For carriers, the main problems are operating expenses and how to attain a reasonable balance between loads carried on the outward and return journeys. For the urban consumer, the problem is market supplies. For importers and/or exporters, the problematic issue is the port costs and tariffs that determine the competitive position of their merchandise.

Given this gamut of possible approaches, this paper focuses its initial analysis on the perspective of rural smallholders. They are, after all, the group most affected by transport constraints. The study then moves on to two specific food transport issues in the Andean region, so as to refer the final

recommendations to concrete cases. The first issue concerns the milk circuit in the Department of Cajamarca, and the second the rice circuit in the Department of San Martín, both in Peru.

These case studies were prepared on the basis of studies and analyses by NGO staff working in the region, and field interviews with various stakeholders in each of the two production chains.

The paper is organized in four sections. The first offers an introduction to the importance of transport in the food chain, and describes the paper's objectives and the methodology used

in its preparation. Section two describes the socioeconomic and political context of the rural farm sector, and existing overland transport systems in the Andean countries. The third section presents a detailed analysis of the food transport system based on two concrete cases: milk in the southern part of the Department of Cajamarca, and rice in the Department of San Martín. The fourth and final section of the document presents elements and recommendations for consideration in the formulation of food transport development strategies.

# Analysis of rural transport systems in the Andean Pact countries

## ECONOMIC, POLITICAL AND SOCIAL CONTEXT OF THE ANDEAN PACT COUNTRIES

The Andean Pact includes Bolivia, Colombia, Ecuador, Peru and Venezuela. It embraces a population of some 115 million inhabitants, and covers a geographical area of 4.6 million km<sup>2</sup> (Table 20).

The region embraces a wealth of diversity in its existing ecosystems and geographic regions. The Cordillera of the Andes and the Amazon Basin are two of the most important areas of the subregion, with a high concentration of plant and animal biodiversity.

This rich biodiversity, or megadiversity, unquestionably represents one of the region's major development potentials. The sustainable use of this immense biodiversity poses one of the prime challenges to the countries of the region. This challenge becomes ever more acute in light of the accelerating rate of natural resource loss in the last few decades – losses that in many cases are irreversible.

Despite this great potential, the region is one of the most backward in all of South America. In most countries of the region, a vast part of the population lives below the poverty line, as Table 21 shows; and within each of these countries, the highest concentration of poverty is among the rural poor. This is clear evidence of structural problems of access to basic services such as energy, drinking water, housing and adequate transport systems

and means of transportation. On the international scale, the five countries of the Andean region are classified in the human development index as medium.

## ECONOMIC, POLITICAL AND SOCIAL CONTEXT OF THE FOOD SECTOR

### Share of the food sector in national GDP

Agriculture plays an important role in the development of each of these countries, accounting for slightly more than nine percent of regional GDP. There are marked differences from one country to the next, however. The countries can be lumped together as Bolivia, Ecuador and Colombia, contributing 12 to 13 percent of GDP, and Peru and Venezuela contributing five to seven percent. Generally speaking, the contribution of the agricultural sector to GDP tends to fall as a country industrializes and becomes more urbanized. This decline is even steeper with reference to the total proportion of the population dependent on agriculture for their livelihood (Caro and Otero, 1999).

Despite this, agriculture and agriculture-related activities are still responsible for much of the growth within the subregion. This becomes obvious from a glance at the figures for the production, marketing and processing of goods of agricultural, livestock and forestry origin.

The agricultural sector therefore continues to play a leading role, as can also be seen in the figures

TABLE 20  
Andean Pact countries: area, population and human development

Countries	Area (thousands of km <sup>2</sup> )	Population in the year 2001 (thousands)	Annual population growth (2001) (%)	Life expectancy in the year 2000 (years)	Human Development Index (2001)
Countries	4 695.74	115 100			
Bolivia	1 100.00	8 500	2.2	62.6	0.672
Colombia	1 100.00	43 000	1.7	71.6	0.779
Ecuador	283.60	12 900	1.8	69.6	0.731
Peru	1 300.00	26 100	1.7	69.3	0.752
Venezuela	912.14	24 600	2.9	73.3	0.775

Source: Author's adaptation based on World Development Indicators database, April 2002. The World Bank Group and UNDP, Human Development Report, 2002.

TABLE 21  
Andean Pact countries: principal macroeconomic indicators

Countries	GDP year 2001 (thousands of million US\$)	Annual growth GDP in the year 2001	Per capita GDP in the year 2001(US\$)	Population living below poverty line (%)
Bolivia	8.0	1.2	988	60.0
Colombia	82.4	1.4	1 951	55.0
Ecuador	18.0	5.6	1 289	35.0
Peru	53.5	0.2	2 106	49.0
Venezuela	124.9	0.7	4 979	31.3

Source: Author's adaptation based on World Development Indicators database (Portal) INE–National Census of Population and Housing, Bolivia 2001.

of aggregate income of the population. Despite this, it is important to note that a very high proportion of the population in these countries is living in poverty. This is made clear in Table 21, which also shows that the highest concentrations of relative poverty are found in rural areas.

### Principal agrofood products

A review of the data supplied by the Andean Community of Nations for the year 1999 shows that the highest volumes of agricultural and livestock products were sugarcane, bananas and plantains, cow's milk, rice, maize and potatoes (see Table 22).

It is also important to look at the largest areas under various crops, and here the top contributors were maize, coffee, rice, bananas and plantain, and soybean.

TABLE 22  
Andean countries: principal agricultural sector products

Crops/products	Production (thousands of tonnes)	Area harvested (thousands of ha)	Yield (tonnes/ha)
Maize	3 713.6	1 889.9	2.0
Rice	6 845.5	1 460.8	4.7
Barley	273.1	289.0	0.9
Sorghum	678.5	265.5	2.6
Potatoes	6 048.6	583.4	10.4
Beans	286.3	300.3	1.0
Tomatoes	853.3	44.8	19.1
Onion	895.1	52.7	17.0
Cassava	3 315.0	390.8	8.5
Bananas and plantains	15 303.1	1.255.8	12.2
Oranges	1 048.4	96.7	10.8
Soybean	891.4	699.5	1.3
African palm	3 737.8	260.8	14.3
Coffee	963.4	1 707.2	0.6
Cocoa	172.7	490.6	0.4
Sugar cane	58 161.1	763.3	76.2
Cotton	348.6	209.4	1.7
Cow's milk	9 562.2		
Hens eggs	779.3		

Source: Andean Community of Nations, 1999

The region's vast potential for forestry development also deserves mention. There was an estimated wooded area of some 257 000 000 ha in 1995. Total estimated cultivable land area for the same year came to around 141 000 000 ha, considering arable land, permanent crops and pasture land (Caro and Otero, 1999).

Forestry potential is however undoubtedly subject to the high rate of deforestation now threatening ecological equilibrium in the region. This is the outcome of inadequate land occupation policies in areas of low population density, such as Amazonia. Other environmental problems related to agriculture and agroindustries include erosion, desertification, water contaminated by agroindustrial and agrochemical residues, waning soil fertility, and carbon and other emissions.

Another agricultural production sector, less significant economically, but important in social and cultural terms is the so-called traditional or smallholder agricultural sector. The results of technological innovation have not reached this sector, because of problems of accessibility or marginality. The sector plays a leading role in the food security of the rural and urban population in this study. The output of this sector is often the result of traditional lore that has been handed down through generations, and has an important function in preserving biodiversity in the Andean and Amazonian regions of the studied countries.

The Andean region is no stranger to the problem of food security, and its close relative, poverty. The FAO report *Food Security in the Andean Countries: towards an integrated rural development and poverty reduction strategy* states that more than 40 percent of the region's people are living beneath the poverty line, and 15 percent cannot cover the basic food requirements necessary to lead a healthy and productive life.

Limited access to productive infrastructure and appropriate technology is another constraint hobbling rural and agrarian development in

the region. The scarcity of irrigated land is an illustrative indicator here.

### COMMERCIAL BALANCE OF THE AGROFOOD SECTOR

Tables 23 and 24 list the import and export values of the principal agricultural and livestock products of countries in the Andean region. The region exports large quantities of agricultural and livestock products. Among the main ones are bananas or fresh plantains, coffee, roses and other cut flowers, cacao, asparagus, and others. The principal products imported to meet domestic demand are maize, wheat and beans.

### PRINCIPAL STATE POLICIES: REGIONAL OVERVIEW

The process of globalization and structural adjustment began and/or was consolidated in the 1990s, either by internal design or in response to pressure from the international financing agencies.

This process represented a new and awesome challenge for rural producers, especially small-

TABLE 23  
World exports Andean Community (thousands US\$)

	Year 2002	%
<b>Total trade by selected product</b>	3 947 416	
Bananas or plantains "Cavendish Valery" type, fresh	1 346 507	34.11
Coffee, not decaffeinated, not roasted	985 351	24.96
Cut roses, for decoration, fresh	384 824	9.75
Other flowers and buds, except carnations, chrysanthemums, pompoms (dahlias) and roses, cut for decoration, fresh	321 684	8.15
Cut carnations, for decoration, fresh	191 436	4.85
Cacao beans, whole or split, not roasted	95 496	2.42
Asparagus, fresh or refrigerated	85 023	2.15
Bananas or plantains (for cooking), fresh	59 525	1.51
Mangoes and mangosteens, fresh or dried	45 714	1.16
Brazil nuts, unshelled	31 145	0.79
Beans (red beans, broad beans, common beans) soybean, except for sowing, including brokens	24 043	0.61
Peppers dried, sliced or ground (paprika)	21 826	0.55
Other bananas or plantains, except "plantain" and "cavendish valery", fresh	20 919	0.53
Dark tobacco, not deveined or denerved	20 285	0.51
Fresh grapes	19 065	0.48

Source: Sicext, CAN 2003.

TABLE 24  
World imports from the Andean Community (thousands of US\$)

	Year 2002	%
Other durum maize ( <i>Zea mays</i> var. <i>vulgaris</i> or <i>Zea mays</i> var. <i>indurata</i> ), yellow, except for sowing	413 718	19.69
Other wheats, except durum, except for sowing	381 068	18.13
Other durum wheat, except for sowing	266 834	12.70
Beans (red beans, broad beans, common beans) soybean, except for sowing, including brokens	215 052	10.23
Uncarded, uncombed cotton	138 076	6.57
Fresh apples	70 594	3.36
Other beans (red beans, peas) common beans ( <i>Phaseolus vulgaris</i> ), except for sowing	46 027	2.19
Lentils and broad beans, except for sowing, dried	40 059	1.91
Barley, except for sowing	35 654	1.70
Technically specified rubber (TSNR), except latex	30 245	1.44
Fresh grapes	28 073	1.34
Other durum maize ( <i>Zea mays</i> var. <i>vulgaris</i> or <i>Zea mays</i> var. <i>indurata</i> ), white, except for sowing	25 633	1.22
Peas, except for sowing, dried	22 215	1.06
Roosters and hens weighing up to 1 850 g, live	21 779	1.04
Fresh pears	17 998	0.86

Source: Sicext, CAN, 2003

holders. It was based on a process of open markets and unequal competition in the countries of the south, such as the Andean countries. The withdrawal of the State and of its extension, credit and research agencies left a vacuum that the private sector has failed to fill.

The underlying assumption of these measures was that private investment and the free market would fill this vacuum. This did in fact work quite well for commercial agriculture, but not so well for small- and medium-scale agriculture. Indeed the economic situation of this sector worsened (IFAD, 2001).

Concerning agricultural research and extension in the Andean region, a number of agencies are doing innovative work in the post-harvest and processing sectors. All countries in the region have in common a specific instance: the so-called National Agricultural Research Institutes. Each country has its own lead agency: the Bolivian Institute of Agricultural Technology (IBTA) in Bolivia; the Colombian Corporation for Agricultural Research (CORPOICA) in Colombia, the Autonomous National Institute

for Agricultural Research (INIAP) in Ecuador; the National Institute of Agricultural Research (INIA) in Peru, and the National Institute of Agricultural Research (INIA) in Venezuela.

The National Agricultural Research Institutes have traditionally operated with State funds since their inception in 1960. Their prime focus has been the solution of agricultural productivity-related problems in the top livestock and crop production sectors of the national economies.

However, these research policies have generally distanced themselves from the problems of smallholders in the region, and their condition of vulnerability and poverty. This is further aggravated in agricultural production zones where access is a problem.

Research has also taken an important detour in terms of primary production. This is true even where the institutional mandate also dictates research in the post-harvest and processing sector. In Peru, research in this sector was transferred in 1992 from INIA to the Institute for Agroindustrial Development (INDDA), with unimpressive results.

Moreover, the main focus of research has been the crop, and not the productive system. This has further distanced research findings from smallholders in the region, with their typically diversified productive systems, and a rural mindset based on a marked aversion to risk-taking.

Important changes were introduced in the traditional role of the national research systems with the introduction of structural adjustment policies and the globalization of national economies. These changes are directly related to the process of downsizing the State apparatus. Interesting instances of cooperation between private and public research bodies have emerged in the region. In principle, research priorities are starting to increasingly reflect market demand and requirements, and enterprises and private producers' organization are beginning to contribute technological innovations.

The outstanding challenges to providing rural extension or technical assistance in the current context involve attempts to implement sustainable technical assistance mechanisms that can reach the smallholder. This applies to primary production, as to post-harvest and processing. To put it another way, the challenge is to develop a private market for technical assistance.

## PRINCIPAL STATE POLICIES IN THE COUNTRIES OF THE REGION

### Bolivia

In line with the 2002-2006 "Plan Bolivia" (República de Bolivia, 2002), the government considers its priority task to be tackling the problem of unemployment. This is the most imperious need of Bolivian society, especially among young people in rural as in urban areas. The approach embraces public investment in road infrastructure and basic services, the provision of cooking gas to homes, rural electrification, and irrigation systems. The State also plans to re-establish rail services.

For production, a policy of productive transformation of the agricultural sector to improve the livelihoods of smallholders and strengthen rural enterprises through the provision of production, credit, marketing and development opportunities is now in place.

As for the problems of ethnic disintegration, a policy of social, economic and cultural inclusion is being promoted for the Quechuas, Aymaras and other ethnic groups of Amazonia, Chiquitania and the Chaco.

The Victor Paz Estenssoro Highway and the East-West Corridor will be built, linking seven departments and five neighbouring countries. These works will enable the people settled along these routes to develop economically, and allow goods to be moved to domestic and external markets.

### Colombia

The 2002-2006 National Development Plan (República de Colombia, 2002) includes support to conflict zones and depressed areas. The approach will be to re-establish the local economic foundation in these zones through productive and income-generating projects in the agricultural, forestry, agroforestry and silvopastoral sectors. These projects are to be discussed and decided with the local communities, and will embrace the various stages of production chains, including production, processing and marketing.

The Plan includes action to develop the physical and social infrastructure of depressed areas by means of a strengthened "Colombia Profunda" programme. Works initiated earlier such as road, airport and fluvial projects will be completed. Electrification programmes in areas not yet connected to the grid will be developed through



the introduction of new networks and/or small hydroelectric plant projects.

The Plan tackles the rural issue with an approach emphasizing interaction between the rural sector, small and medium urban centres, and metropolitan areas. It also considers active community participation as a central Plan component. Environmental sustainability, land use planning, gender equity, and specific regional, cultural and ethnic situations are all parameters of Colombia's rural development and sectoral policies.

### Ecuador

One of the most severe problems faced by Ecuador was the economic and structural crisis of 1998–2000. In this context the Government is attempting to tackle what is considered the priority issue: poverty (European Commission, 2002).

The government has thus designed a national strategy to contribute to integrated, equitable and sustainable development. Three poverty-reduction mechanisms have been implemented.

- The Solidarity Voucher Programme, aimed at providing economic compensation through cash transfers to the poorest through the elimination of gas, electricity and fuel subsidies. The Programme reaches 44 percent of Ecuadorian families.
- The Scholarship Programme, aimed at increasing the family income of families living in extreme poverty, and promoting permanent access to basic education for children and adolescents of both sexes, through guaranteed assistance for at least 90 percent of the school year.
- The School Feeding Programme, aimed at enhancing the quality and efficiency of basic education. It provides supplementary feeding, especially in areas with the highest incidence of poverty.

### Peru

The 2002–2006 National Strategy Plan (Republic of Peru, 2002) of the Peruvian government gives priority to the following:

- employment generation;
- poverty reduction;
- decentralization;
- modernization of the State.

In the agricultural sector, policies primarily target:

- promoting the development of rural producers organized in production chains designed to achieve developed and sustainable agriculture;
- strengthening and developing rural markets, increasing the coverage and quality of the provision of goods and public services to the agricultural sector;
- reducing poverty and improving the quality of rural employment;
- strengthening institutional, and private and public organization within the rural sector;
- improving sustainable natural resource management and use.

Policies concerning the transport sector target the following objectives:

- integrating the national territory;
- providing an appropriate road infrastructure for an efficient transport system;
- promoting efficient and safe road transport services within a framework of free competition;
- promoting and providing efficient and safe air and water transport infrastructure and services.

### Venezuela

In line with the 2001–2007 National Development Plan (República Bolivariana de Venezuela, 2001), the priority orientation of the public sector is decentralization. The aim is to make the most of the country's potential and achieve a more balanced and sustainable distribution of productive activities, investments and population in the national territory. The strategy designed by the National Government is based on the search for five equilibria.

- *Economic Equilibrium*: to develop an economic model leading to global production of wealth and justice in the use of wealth. The goal is to build an equitable, fair and prosperous society, which means establishing a humanistic, self-managed, competitive economy.
- *Territorial Equilibrium*: to develop a model of land occupation through the strategy of deconcentrated decentralization based on territorial potential, and its environmental and cultural restrictions.
- *Social Equilibrium*: the goal is not just to correct the vast differences affecting the

society with its burden of social injustice and exclusion, but also to achieve the full development of the citizen with reference to the exercise of democracy.

- *Political and Institutional Equilibrium*: the aim is to promote the transformation of the institutional framework within which all political, social and economic stakeholders make plans and take decisions.
- *International Equilibrium*: the goal is the proper insertion of Venezuela in the international context, and promotion of the economic, territorial and energy integration of the countries of Latin America and the Caribbean.

## SOCIOECONOMIC CHARACTERISTICS OF THE RURAL AGRICULTURAL SECTOR

### Agricultural land area and rural population working in agriculture

Table 25 gives data on the total amount of cultivated land and the total irrigated land area in each country of the Andean region.

### Land tenure and land distribution

One important characteristic shared by the Andean countries of Bolivia, Ecuador and Peru is a pattern of extremely fragmented land ownership. This is attributable to the agrarian reform processes of the 1960s and 1970s in these countries, which gave rise to land deconcentration.

As an example, in Peru some 1.8 million agricultural and livestock producers occupy an area of 35.6 million ha (INIA, 1999). According to this same source, over half of these agricultural and livestock units own less than three ha, and occupy only 3.2 percent of all agricultural land. On the other hand, barely more than three percent of all agricultural establishments concentrate 77 percent of the available farmland, with properties larger than 50 ha in size.

TABLE 25  
Andean countries: cultivated land area

Countries	Cultivated area <sup>1</sup> 000'ha	Irrigated area	
		000'ha	Irrigated/cultivated land (%)
Bolivia	2 100	88	4.2
Colombia	4 430	1 061	24.0
Ecuador	3 001	250	8.3
Peru	4 200	1 760	41.9
Venezuela	3 490	205	5.9

<sup>1</sup> Arable land and farmlands under permanent crops  
Source: Caro and Otero, 1999.

Smallholdings are numerically predominant in the Andean region. However the best lands are held by the medium and large establishments (Chiriboga, 1996).

These structural characteristics of land ownership emphasise the need to seek economic alternatives for the smallholder population. This applies to agricultural alternatives such as appropriate patterns of built-in technical assistance and infrastructure support. And it also applies to non-farm alternatives with proven potential to create employment and generate income in rural areas.

### Rural agroindustry in the Andean Region

It is important to point out the great many labour-intensive, small-scale, rural agroindustries in the region working to process local raw materials. Riveros (1997) mentions approximately 785 000 entrepreneurial endeavours of this type, providing work for some 1 962 500 people.

In both the large and the so-called intermediate cities one finds a great many microenterprises processing food in various production lines. They comprise a major alternative for the generation of self-employment and income for sectors of low economic capacity.

The microenterprise sector is in great need of built-in technical assistance and access to adequate financing in rural as in urban areas, so that they can compete in today's globalized markets. These small-scale units also need to become better organized. This means horizontal organization in the form of associations or groups, and/or vertical organization, with providers or producers of raw materials, as with enterprises of larger size or scale.

### Globalization, urbanization, and changes in the agrofood sector

The Andean region has been no stranger to the changing patterns of diet and consumption arising from the swift pace of urbanization. Nor has the process of globalization of the food trade in each of these countries passed it by. As Riveros (2001) reports, the current trend is for urban consumers is to eat a good percentage of their meals outside the home, much of which consisting of fast foods, for lack of time. The same author reports major investments in the commercial and industrial segments of the food sector in Latin America, mainly through the acquisition of businesses and mergers.

At the same time, new markets are emerging in the developed countries as environmental awareness spreads among certain segments of the population, sparking a rising demand for organic or “green” products, and equity in production and trade relations, or “fair trade”.

### Illicit crops

Another major feature of the rural sector in Bolivia, Colombia and Peru is the importance of illicit crops, mainly coca. There are an estimated 50 000 has under coca in Bolivia (involving 61 000 growers), 81 000 in Colombia (160 000 growers), and 150 000 in Peru (40 000 growers) (Cabieses, 1999).

### SMALLHOLDER FOOD PRODUCTION CHARACTERISTICS

Various studies agree that the current picture of agriculture in the Andean countries is characterized by its diversity. It is thus difficult to categorically spell out its specific characteristics at this time. Nonetheless, by using an agricultural systems – or production systems – approach, it is possible to tease out certain common features of this sector.

A joint FAO/World Bank publication (*Farming Systems and Poverty*, 2001), identifies seven farming systems of utmost importance in the Andean region in which smallholders are widely represented.

- *Irrigated systems*: primarily applied to fruits, vegetables and grasses.
- *Forest-based systems*; mainly found in Amazonia. There are vast stretches of (migratory) subsistence farming areas, as well as livestock production and plantations.
- *High-altitude mixed systems*; these include the generally well developed inter-Andean valleys, highland valleys, and mountain agriculture, where the most traditional systems of Andean culture continue to subsist (Andean crops and livestock systems).
- *Extensive/mixed systems*; include the savannahs of Colombia and Venezuela.
- *Coastal plantations and mixed farming systems*; where the major export crops are grown, fruit orchards and tubers.
- *Intensive highland-mixed systems*; includes vegetables, coffee, maize, cattle and pigs, cereals and tubers.
- *Extensive rainfed-mixed systems*; cotton, livestock production and subsistence farming are the characteristic systems.

### TRANSPORT DEMAND

It is no easy matter to break down the information available in the Andean countries so as to detail means of transport and type of load. An estimate of the share of highway transport of food products in the GDP of individual countries would therefore not be very reliable. Additionally, the data from Bolivia and Venezuela include communications, and, for Bolivia, storage, making comparisons difficult. Despite this, the information presented below (Table 26), taken from a study of the Andean Community of Nations (CAN, 2000), gives some idea of the situation.

The demand for food transport in the rural areas of Andean countries varies by region, in accordance with a range of factors such as production structures, the integration of farm products into production chains and dynamic markets, and the geographical and climatological characteristics.

In some food-producing regions, there may be an intense, constant, and year round demand for food transport due to the diversity and volume of production, and its regional importance in supplying specific national and/or external markets. These are usually found on the outskirts of most major cities in the Andean countries. They tend to be well connected by paved roads and secondary road networks, with access to diversified transport, maintenance and intermediation services. The level of demand may rise or fall depending on weather conditions and the farm calendar, without necessarily signifying any variation in transport technological characteristics.

Elsewhere, product type and production structure may also determine the characteristics of transport demand. One example is the case of

TABLE 26  
Andean countries: share of transport and communications in GDP (%)

Countries	Years	GDP (millions US\$)	Transport (% of GDP)	Transport (millions UPS)
Bolivia	1997	1 967	8.2	654
	1998	8 575	7.8	666
Colombia	1997	95 925	7.1	6 850
	1998	--	--	--
Ecuador	1997	19 760	6.2	1 225
	1998	19 710	6.3	1 242
Perú	1997	65 173	7.4	4 823
	1998	66 942	7.4	4 954
Venezuela	1997	98 003	5.1	4 998
	1998	98 863	5.9	5 833

Source: Andean Community of Nations, 2000

small cattle ranchers who carry five to ten litres of milk to market every day on muleback, or on their own shoulders, over bridle paths. Another case might be the small rice or coffee grower transporting harvests of roughly two tonnes each, two or three times a year, for which transitable roads and draught animals or motorized vehicles are required. The type of demand and the transport technology will vary with the case at hand.

The less developed regions represent the opposite extreme. Here production is barely integrated into the urban marketing circuits, and there is a lack of road infrastructure, as in isolated Andean communities, or a lack of transport, as in isolated Amazonian communities. In such cases, the demand for food transport is much smaller, sporadic in terms of frequency and volume, and usually combined with other transport requirements such as the need for passenger or messenger services.

#### ROAD INFRASTRUCTURE AND MOTORIZED FLEET

The situation of road transport in the rural areas of Andean countries tends to be similar throughout the region. These are vast territories, the terrain is rough and difficult and the road networks inadequate, leaving thousands and thousands of people in isolation and poverty. The roads are in poor condition for lack of maintenance, the vehicles are ancient and of many makes, operating and maintenance costs are high, service irregular, there are bureaucratic limitations, budgets are very limited; the problem here, in short, is backwardness and poverty (Table 27).

Often enough, the problem of transport in terms of poverty reduction in extremely poor, remote regions is not so much a question of the access of rural communities to cities and markets, but rather the reverse. The question, in other words, is how can food, and the basic health,

education and energy services be brought to these communities?

Transport systems thus form part of the surrounding reality, and mirror the degree of local social and economic development in the areas they serve. Concrete opportunities for improving these services must take these realities as their point of departure, putting forth viable proposals in accordance with concrete capacities.

The road networks of the five countries of the Andean region are described next. Venezuela has a total paved road network of 93 472 km, with an index of occupation of 101 km of roadway for each 1 000 km<sup>2</sup> of area. Ecuador has 159 km of roadway for each 1000 km<sup>2</sup> of area. Bolivia and Peru lie at the opposite extreme, with about 50 km of roadway for each 1000 km<sup>2</sup> of land area.

Looking at the density index instead, Colombia and Peru are the most deficit countries in terms of roadway/inhabitant. Peru is the country with the largest land area unserved by roads, and the greatest numbers of people living in remote areas, isolated from cities, dynamic marketing circuits, and the monetary economy.

Despite extensive efforts by Latin American governments over a period of several decades to provide their countries with adequate road infrastructure, the agencies responsible report the following situation. By the early 1990s, only one third of the principal roads in the region were in acceptable condition and an additional one-third were in need of complete reconstruction. The remainder was urgently in need of rehabilitation.

For secondary roads, the average proportion of roads in poor condition at that time was 65 percent, and the figure was 85 percent for local roads (Bull, 2000). This was why many governments in the region undertook costly road reconstruction projects during the 1990s. There was a strong and marked tendency to replace the old with the new, never concluding that road degradation is

TABLE 27  
Andean countries: area, population and length of road network

Countries	Population year 2000 (1 000 inhabitants)	Area (1 000 km <sup>2</sup> )	Length road network (km)		Density index total road network/1 000 inhabitants	Occupation index total road network/1 000 km <sup>2</sup> of area
			Total km	Paved km		
Andean countries	111 484	4 714	379 047	61 742	3.40	80.41
Bolivia	8 142	1 099	53 153	2 933	6.53	48.36
Colombia	41 564	1 142	113 500	13 620	2.73	99.39
Ecuador	12 411	271	43 197	5 184	3.48	159.40
Peru	25 661	1 285	75 725	10 051	2.95	58.93
Venezuela	23 706	917	93 472	29 954	3.94	101.93

Source: Andean Development Corporation, 2000

not some natural or inexorable fact, but rather the outcome of absent or misapplied road maintenance policies (IPES, 2001). Nowadays, agencies such as the World Bank and the Inter-American Development Bank offer financial support to the countries of the region in the form of programmes combining road construction, rehabilitation and maintenance, that enlist the participation of local and national governments, the private sector and user communities.

In Peru, the new roads in rural mountainous areas built under the Rural Roads Project have brought the outer world and its markets closer to the three million rural poor living in these zones. The programme design was innovative, forcefully underlining the key factors of poverty reduction, community participation, and the collaboration of key participants: the Ministry of Transport and Communications, the Inter-American Development Bank, the World Bank, and over 25 NGOs. This co-operatively oriented institutional framework was designed to maximise each of the comparative advantages offered by participants. The programme reduced isolation and favoured the integration of target communities, boosting economic opportunities and encouraging the participation of local entrepreneurs. Over 11 000 km of roads were rehabilitated. A total of 32 300 jobs for unskilled labour were created, along with 4 700 permanent jobs in 410 local road maintenance businesses. This innovative programme was awarded a Prize for Excellence in 2001 by the World Bank.

The costs for road rehabilitation in this programme ranged from US dollars 12 000/km for roads averaging less than 15 vehicles/day to US dollars 15 000/km for roads averaging 15 to 50 vehicles/day. In wilder areas, such as those found in Amazonia, the cost could be as high as US dollar 20 000/km. Routine maintenance costs for rehabilitated roads ranged from US dollars 500/km/yr for paved roads and US dollars 230/km/yr for dirt roads.

The characteristic problem of the fleet of motorized cargo vehicles in the Andean countries is the predominance of ageing trucks, more than ten or 15 years old, and past their useful life as stipulated by their makers (Table 28). This is basically an obsolete fleet (CAF, 2000). Another outstanding feature of the fleet in the total flow of cargo is the high percentage of lightweight vehicles, ranging from 30 to 40 percent of the total. This is a reflection of the misuse of the freight transport fleet. In some cases, as much as 60 percent of the

TABLE 28

**Andean countries: motorized fleet by type of vehicle**

Countries	Total commercial vehicles	Truck	Trailer	Trailer and semi-trailer
Bolivia (a)	52 839	n.d.*	n.d.	n.d.
Colombia (a)	139 702	109 752	10 341	19 609
Ecuador (a)	1 438	n.d.	n.d.	n.d.
Peru (2001) (b)	145 549	110 276	17 081	18 192
Venezuela (a)	443 632	231 170	42 582	169 880

Source: (a) Andean Development Corporation, 2000

(b) National Institute of Statistics and Informatics, 2002.

\* n.d. = no data available

vehicles used to transport freight on journeys of 280 to 450 km were light trucks.

Another problem that emerged is the high proportion of empty trucks in the vehicular flow. The proportion ranges from 26 to 38 percent of all journeys, implying that 50 to 80 percent of all trucks are empty on the return journey. Clearly, this drives up the cost of transport. Individual carriers comprise the bulk of the smaller-capacity vehicles (up to 20 tonnes), and this in turn accounts for 83 percent of the motorized fleet in the region.

### Aspects of transport logistics and administration

Road management has traditionally been the province of the national governments through their Ministries of Public Works or Transport. With very few exceptions, these ministries have not paid enough attention to the issue of roads. The responsibility for this sector was partly or wholly transferred (depending on the importance of the routes) to decentralized or deconcentrated government agencies during the 1990s as part of the State reform process taking place in that era. In most countries, the main routes remained under the management of units with national coverage, such as the National Road Systems, Services or Institutes, whereas management of secondary and local roads tended to be turned over to lower government levels such as the municipality or prefecture.

Decentralization was positive for the main routes in terms of sustainability, and the extent to which transport was concessioned to the private sector or paid for by unsubsidized tolls. But for secondary and local roads, the devolution of management to lower levels of government was, with some exceptions, less successful. There are several reasons for this, including the lack of



legal precision as to the responsibilities of local governments for road management, and the unfamiliarity with road management systems of the new authorities responsible for organizing their running. Budgetary constraints, the priority given to new construction over the maintenance of existing roadwork, and the absence of specialized technical staff were further problems.

### Food losses and food safety during transport

There are two major objectives of the application of post-harvest techniques to food of farm origin. The first is to maintain product quality: appearance, texture, flavour, and nutritional value and food sanitation. The second is to reduce losses occurring between harvest and final consumption. Key to achieving these objectives, even more than the use of highly developed technology, is efficient management of the product at every stage of the post-harvest process. While the use of advanced technology may offer certain advantages for large-scale operations, these options are frequently not economically feasible for small-scale producers.

In the case of Peru, the Ministry of Agriculture (MINAG, 2003) estimates post-harvest – losses of unprocessed farm products from farm-gate to consumer at ten percent, in the case of certain specific foods. The same source reports estimated yearly losses of over 900 000 tonnes, the equivalent of US dollars 50 million/yr. Other estimates of damage due to improper handling, storage and transport of food range from 15 to 30 percent. The case studies presented in this report offer estimates of food losses for the supply chains of milk in Cajamarca and rice in San Martín.

The direct causes of losses can be related to a range of factors. These include premature harvesting, poor ripening, poor threshing, inadequate drying, improper cleaning, attacks by bird, rodent or insect pests, or micro-organisms, biochemical changes, theft and pillage, improper moisture content during the storage phase, and inadequate storage and processing techniques. Indirect causes include lack of capital, ignorance of appropriate management techniques, lack of machinery, equipment, pesticides and packaging, and the weaknesses of transport systems and production and marketing organization systems. In any case, the problem of post-harvest losses is unquestionably quite complex, and variable from one case to the next.

## CASE STUDIES: FOOD TRANSPORT IN THE DEPARTMENTS OF CAJAMARCA AND SAN MARTÍN

The departments of Cajamarca and San Martín, in northern and northeastern Peru, are representative of the types of food transport systems found in the rural areas of Andean countries.

Cajamarca is one of the most populous and poorest parts of Peru. Its mainly rural population specializes in the production of milk and dairy products to supply the main metropolitan areas.

San Martín, with a close network of urban settlements and good farm soils, has developed a number of agricultural specializations that have changed over time to keep pace with the demands of domestic and international markets. Once a top producer of rubber, followed by maize and coca, the focus now is on rice and coffee.

The following bibliographical references, consulted for the purposes of this analysis, include studies carried out by the Intermediate Technology Development Group (ITDG), Peru, and the Programme to Develop Rural Agroindustry (PRODAR). Within the framework of the PRODAR project, references include *Local agrofood systems: rural agroindustrial strategies and territorial dynamics*, sponsored by the Inter-American Institute for Cooperation in Agriculture. Other sponsors include the International Centre for Tropical Agriculture, and the Agricultural Research Centre for International Development (Boucher, 2000, 2002; Cabieses, 1999; Chiriboga, 1996; Guegan, 2001; Lewis, 1998; Magrath, 1996; Pezo, 1998; and Theenten, 2002).

### MILK TRANSPORT IN CAJAMARCA General characteristics of the region

The department of Cajamarca lies in the Andean Cordillera in northern Peru, near the border with Ecuador. It covers a total land area of 33 317 km<sup>2</sup> – 2.6 percent of the national territory. The region ranges from 550 to 4 200 m. in altitude with an estimated population of 1 498 567 inhabitants – 5.6 percent of the national total. This is one of the most heavily populated parts of the country (INEI, 2002).

Cajamarca's population is relatively young. Fully 43 percent of its people are under the age of 20, and only 7.6 percent over 60. The birth rate is roughly 30.7/1 000, and the mortality rate 7.1/1 000. The department has the densest population



in the country, with less than 25 percent of the population living in urban areas. It is also one of the poorest departments, with over 77 percent of the population living under the poverty line (50 percent is classified as extreme poverty) (INEI, 2002).

Agriculture is the fundamental economic activity in Cajamarca, although mining, manufacturing and construction are also prominent. These four economic branches normally contribute nearly 70 percent of the department's GDP. Most of the population of Cajamarca is not directly involved in mining, but the presence of the Yanacocha mining company is a prime factor in demand and in the generation of regional GDP. The economically active population is concentrated, in decreasing order of importance, in farming, the service sector, industry and commerce.

### Cajamarca's road infrastructure

Cajamarca is one of the most heavily populated and rural departments in the country, and yet its road network accounts for only seven percent of the national road network, and only four percent of the paved roads (Table 29). Cajamarca's main road connects the regional capital, Cajamarca, with the Pan-American Highway. This is the backbone of the national road system, running through the cities of Chiclayo, Trujillo and Lima. There is another paved highway crossing the northern part of the department, and in practice linking regions of eastern Amazonia, such as San Martín, with the Pan-American Highway. The regional road network branches off from this paved road, and consists of mostly unpaved roads, except for a few stretches making up 32 percent of the regional network. This in turn branches off into an enormous network of footpaths (61 percent of the regional network), where the bulk of rural output is carried on the backs of people and animals.

The road network is quite extensive, covering most of the territory, but it does suffer from

serious problems that severely curtail the mobility of its rural population. The main problem is the poor state of most roads in the network, made worse every year with the arrival of the rainy season. This, the common denominator in most rural areas of the Andes, is the outcome of years of abandon and a chronic failure to serve on the part of those bodies responsible for the sector. It can be traced to budgetary limitations, the technical and administrative incapacity of local governments, and the absence of mechanisms to ensure sustainable rural road maintenance.

### Characteristics of the dairy sector in Cajamarca

The department of Cajamarca has specialized in the production of dairy cattle since the middle of the 19<sup>th</sup> century. Today it is Peru's second milk producer, contributing 16 percent of the national output (Boucher *et al.*, 2000). Cajamarca is also known as a region offering quality dairy products, which are successfully, sold in all the principal markets of the country. The region has about 200 000 agricultural and livestock producers, who own nearly 600 000 head of cattle, producing an average of 1.5 to 2 million litres of milk each week (Theeten, 2002). Most producers own from one to five cows, on the average, each of which produces from 30 to 60 litres of milk each week.

The pattern of land tenure is quite skewed. Fully 67 percent of the farming and livestock units in the region are under 5 ha, and occupy only 14 percent of the arable land. At the other extreme, properties greater than 100 ha, and representing less than one percent of all agricultural establishments, occupy approximately 35 percent of the territory (INEI, 1994). In the poorest areas, the scarcity of agricultural resources is reflected not only in the poor condition of grasslands and the cows that graze on them, but in other agricultural assets as well. According to Lewis *et al.* (1998), 79 percent of smallholders report that they lack the resources

TABLE 29  
Cajamarca: length (km) of the road network by type of surfacing 1996

Geographical area	Total length	Type of surfacing			
		Paved	Improved	Unimproved	Path
National total	73 756	8 565	13 280	16 875	35 035
Cajamarca total	5 268	371	877	815	3 206
Primary roads	1 134	350	594	85	106
Departmental roads	739	0	136	498	105
Local roads	3 396	21	147	232	2 996

Source: National Institute of Statistics and Informatics 2002

to enable them to generate enough income to develop an economy of full employment on their farms. Despite this, a bare 18 percent are seeking employment on distant farms or in the commercial sector. This gives some idea of the degree of poverty and isolation in which most farmers in the region live.

An estimated three-quarters of the milk produced in the Cajamarca basin is purchased directly by the big industrial dairy plants in the region. A further 13 percent is sold to the small dairy by-product processing plants, and the rest goes for direct consumption or to feed the calves (Boucher *et al.*, 2000).

Milk is a highly perishable product, and marketing conditions are precarious due to the poor state of the roads and footpaths and the isolation of dairy farmers. For this reason a cheese-making industry developed in the region serves as a back-up mechanism for small-scale dairy farmers to preserve their output. In some cases they also use it to obtain a higher price compared to what the dairy plants pay for raw milk. And so when they are unable to sell their raw milk, they turn it into *quesillo* cheese, which is then sold to intermediaries at the weekly fairs held in the villages of Cajamarca. This forms the basic ingredient for the famous regional *mantecoso* cheeses eaten in every city in the country. *Quesillo*, also called *cuajada* or *queso fresco* is the most important ingredient in the production of *mantecoso* cheese. Ten litres of milk are needed to produce one kilo of *quesillo* cheese. The only ingredients used are milk and rennet. Product quality is usually quite poor, given the poor hygiene practices employed in its manufacture. The Institute of Industrial Technology Research and Technical Standards (INDECOP), defines *mantecoso* cheese as a mild, buttery, fresh cheese product, made from whole and reconstituted pasteurized or unpasteurized milk, soft and fine-textured, white or slightly yellowish.

In the district of Encañada in the Cajamarca area some 5 000 *quesillo* cheese producers live in settlements scattered among the communities of Chanta Alta, Quinoa Baja and Quinoa Alta. They own three to ten head of cattle, on average, and they all engage in the making of *quesillo* cheese, from milking to marketing, and with the active participation of the women of the family.

The producer in this area transports the *quesillo* cheese to the Chanta market (or streetfair) in crates or bags, on foot or horseback. The buyers take the product from Chanta in the same bags or crates,

using public transport in the form of minibuses or pick-up trucks (Boucher, 2002).

Boucher (2002) identifies two types of *quesillo* cheese: the traditional product and an improved version. The first, made by most *quesillo* cheese-makers is simply a sort of cottage cheese prepared in a recipient in the same field where the cows are milked. This is a low-tech operation, and there is a serious problem with hygiene. The serum is separated from the curd at home and is then used to feed the livestock.

Improved *quesillo* cheese involves washing the udder with water, and the use of a cloth filter during milking to ensure cleanliness. The milk is taken home and subjected to a simple analysis designed to detect the presence of mastitis. Industrial rennet is used in this case, and the milk is heated to a temperature of 37° C for 30 minutes. The serum is then removed from the cheese, and the cheese is stored. The approximate yield is one kg of cheese per eight litres of milk. This process is still used by a small number of producers.

There is no reliable data on the production volumes of the regional cheeses. This is because the greatest problem of this small-scale sector is that 70 percent of producers prepare and sell their cheese on an informal basis at very low prices and do not conform to hygiene and quality standards. Cheese producers do report, however, that one of the main constraints to the development of this industry is the scarcity of milk produced in the area, as productivity is very low and most of the milk output is earmarked for the dairy plants.

### Marketing channels for dairy products

Most of the milk produced is purchased directly in the field by two big industrial plants operating in the region. One collects from 1.14 to 1.19 million litres per week, and the other 210 000 to 420 000 litres (Theeten, 2002). Both companies have established collection systems for this operation. They use unrefrigerated trucks that do a daily run of the rural roads in the region, collecting milk from smallholders for delivery to industrial plants located in the regional capital. The only condition both companies require of their producers is to guarantee a steady, minimum supply of 10 litres of milk/day. This disqualifies a great many smallholders, who are unable to fill this quota.

Smallholders also have to transport their milk containers by horseback over footpaths to the highway collection points where the milk trucks stop. During the rainy season, the roads become

virtually impassable. And so the most distant producers no longer trek out to the collection points, unwilling to run the risk of travelling for many long hours, only to find on arrival no milk trucks due to road circulation problems, or that their milk has turned too sour to be acceptable.

One of the two industrial enterprises in the zone is installing cooling plants at strategic points along the road network to address this problem. This will allow milk to be stored and avoid losses due to spoilage. The milk producers bring their product to the cold plants where they can be checked for degree of acidity and stored until the arrival of the cold truck. Small cold plants that can hold 400 litres have been installed in the field. These can be managed by the smallholder, and are operating quite efficiently. There are also fairly remote zones with improved roads, but not served by the cold trucks. In these areas small-scale dairy farmers concentrate on the production of *quesillo* cheese as an income-generating strategy. They take their cheese to the Chanta market fair on Saturday on horseback, or else sell to middlemen.

### Transport costs for producers

In calculating the cost of non-motorized transport to producers, a journey of up to six km per trip is assumed, which can take as long as six hours (coming and going), carrying the load on the producer's own animals. Maintenance costs are estimated at S/. 0.05<sup>1</sup> to feed one animal for one day. The cost for motorized transport is entirely the responsibility of the buyers, who set up service contracts with the owners of the milk trucks. However, the producer does have to travel to the city once every two weeks to collect the money for sales, at an average cost of S/.10 for each round trip, which often reduces the margin of profit and inhibits supplies.

For *quesillo* cheese, first there is the cost of the trip on foot or horseback from the home in the countryside to the weekly fair in the nearest town. Then there is the charge by the trucking fleet to carry the product to the city wholesalers, which costs about S/. 5.00 per 70–80 kg. bag, for an average journey of 70 km.

### Transport costs for the carrier

Table 30 lists some average figures drawn from surveys filled out by four *quesillo* cheese carriers operating in the weekly market fairs in the area.

### The milk economy in Cajamarca

There is very little data on milk production costs, and consequently on those for *quesillo* cheese. Farmers are not in the habit of calculating their costs, as they have no power to determine the sale price to the intermediary, and are therefore unsure of their gains and losses. Nor are there any academic studies on the subject. What follows are a number of estimates, based on the primary information at hand.

The cost for a small-scale dairy farmer to produce one litre of milk is in inverse proportion to the number of cows owned. On average, such a farmer owns three cows. Considering the full range of costs, a producer will incur losses, since the price he gets for one litre of milk is only S/.0.60 to S/.0.70 per litre.

Small producers who cannot sell their milk to the industrial plants, either because they are unable to meet the minimum production quota, or are unable to move the milk out to the highway pick-up points, have two alternatives. They can sell the raw milk to a third party (many of whom are suppliers to the big milk processing plants) for a little less than that paid by the plants (a difference of S/.0.05 to S/.0.10/litre), or they can turn the raw milk into *quesillo* cheese. This is then sold, either to buyers who collect the cheese on a door-to-door basis for sale at the weekly market fairs. Or they can transport the cheese to the fairs themselves for sale to wholesalers. The producer's margins of profit are tiny, whatever the alternative, and vary in accordance with seasonality, product quality and the conditions for moving the product. The producer's final choice of alternative will depend on a careful calculation of what seems more profitable at any given moment.

A study by Lewis, Agreda and Vargas (1998) showed that the price of milk, and hence the price of *quesillo* cheese is established directly by the biggest of the two dairy plants. Its purchasing power is such that the plant can regulate the price of milk, setting its own criteria and mechanisms of control. In other words, there are no arbitration mechanisms in this region to resolve price conflicts. Nor is there any legal body to whom producers can turn (the State apparently does not intervene in this process). We need to remember that the producer is delivering the milk on consignment, and that the final price will only be determined once the plant has tested for acidity and adulteration in its own

<sup>1</sup> US\$ 1.00 = S/. 3.45 (November 2003)

TABLE 30  
Cost of *quesillo* cheese transport

Vehicle	Price	Age (years)	
Purchase price used (5 t truck)	US\$ 17 000	17	
	Gasoline	Diesel	Consumption
Per gallon fuel costs		S/. 8.20	S/. 57.40
Average yield = 20 km/gal			
Average round trip (km)			140
Cost of lubricants/ 3 000 km (oil and filter)			130
Vehicle maintenance			Yearly
Tires			2 100
Parts			1 000
Labour (maintenance)			400
Breakdown average costs	Depreciation		Amount S/.
<i>Quesillo</i> fleet (average 1 924 kg )			127.00
Passengers			40.00
Transport small animals			35.00
Groceries Cajamarca-Chanta			60.00
Total Income			262.00
Maintenance average/day			1.33
Parts average/day			3.33
Engine maintenance average/day			6.73
Average vehicle maintenance/day			6.06
Fuel cost/140 km			58.00
Driver			15.00
Assistant			10,00
Food			10,00
Total outlay			129.52
<b>Total profit/trip</b>			<b>132.48</b>

(\*) Assuming 10 yrs of non-intensive use  
1 US\$ 1.00 = S/. 3.45 (November, 2003)

laboratories. The inference is that the industrial plant can apply its current pricing policy, taking advantage of the fact that producers have no other means of determining milk quality. This situation is only aggravated by the fact that producers are working as independents, and not as members of some association.

*Quesillo* cheese prices vary with product quality, which is in direct ratio to the water content of the cheese. Lower water content means a higher price for *quesillo*. Prices can be as high as S/.7.00/kg (roughly US\$ 2.00). On the other hand, higher water content can drive the price as low as S/.1.50/kg, or about US\$ 0.40. The average price ranges around S/.2.50/kg. Pointedly, the price paid by the buyers who purchase the cheese at the farmgate is quite similar to the retail market price. The profit is derived from modifying the scales used to weigh the product. This technique allows a buyer purchasing 250 kg to earn as much as S/.100 (US\$ 29.00). Wholesalers buy the *quesillo* in quantities ranging from 250–400 kg and can, in turn, fetch retail prices of S/.0.50 to S/.1.00/kg in the city.

### Demand for transport

There is just one truck working to supply the weekly market fairs in the Chanta and Yanacancha areas covered by the study. In Chanta the carrier delivers about 4 000 kg of *quesillo* each weekend to the town of Cajamarca. The average weekly delivery in Yanacancha is about 1 300 kg.

Milk producers in the area report that road infrastructure is considered a crucial factor for development of this industry. Road infrastructure also determines the final destination of the milk produced. According to Lewis *et al.* (1998), there is a direct link between the availability of roads and the final destination of the product. In the Yanacancha area, for example, producers report that before the road was built, all the milk they produced was made into *quesillo* cheese. Furthermore, every other product grown or raised on the farm was intended for home consumption, due to the difficulty of transporting their output along footpaths. And so, when the road was built, the final destination of the milk produced was not the only change. The amount of land under crops increased as well,

especially for potatoes. The road enabled farmers to lower their transaction costs, an obvious benefit for the personal well being of those involved.

In the absence of state road maintenance programmes, many suppliers of the industrial plants are organizing to provide regular road maintenance for the roads used as milk pick-up points. This assures access for the pick-up and delivery trucks serving the weekly fairs in the local towns. The roadwork often does more harm than good, however, because the work squadrons do not have the money to hire and mobilize heavy earth-moving equipment. They are also unschooled in appropriate road-surfacing techniques, and use farm equipment and tools for roadwork and maintenance. This, unfortunately, is directly related to the structural problem of regular financing of rural roads. It would be advisable here to promote the support of public bodies, private enterprise and the cooperation agencies to facilitate the access of milk producers to markets through the construction and improvement of access roads. It is also recommended that more intensive studies focus on the need to develop sustainable road maintenance practices and methods, based on the intensive use of local manpower, and simple and economical road-surfacing techniques.

Producers also need to deal with the problem of how quickly milk sours, in addition to the need for more roads in better condition. Often enough, there is an existing road, but the pickup trucks pass by at irregular intervals. There is a need to promote the technological development of cold systems that will prolong the amount of time milk suppliers can preserve their products. Here it is recommended that collective milk storage centres be promoted, and located strategically near small producer settlements, so as to reduce the margin of loss to the producer.

For *quesillo* cheese, which has a longer shelf life than milk, the transport problem is not as serious as the problem of product quality. Indeed, while all milk producers know how to make *quesillo* cheese, most use unhygienic practices, which reduce the value of the product. In this case technical training programmes to improved *quesillo* cheese-making practices, especially among the poorest women in the region are recommended. This is quite apart from the alternative of upgrading the roads, which would probably have the effect of reducing the amount of cheese produced and increasing the amount of raw milk sold.

### Aspects of transport logistics and administration

No administrative authority has been established to regulate food transport in the region.

Some 20 to 30 trucks go by in a week in Bambamarca, for instance, carrying about 70 tonnes of cheese to the markets mentioned above. Only five of these are refrigerated. They carry cheese directly to the city of Lima. At least half these trucks also transport other products at the same time, although the law stipulates that these cheeses must be transported separately. In Cajamarca, on the other hand, where about 14 tonnes of home-made cheese are produced each week, wholesalers buy up this regional product and carry it down to the coastal markets, generally using one of the passenger buses serving the area. About 60 percent of the home-made cheese produced in Cajamarca and 72 percent of that produced in Bambamarca reach Lima by this means. Each of the four or five bus companies operating in Cajamarca carries about 400 kg of cheese to Lima every day.

The industrially produced cheese from the big dairy firms (an output of 30 tonnes/week), is transported to its final destination, the coastal markets, in refrigerated trucks at temperatures of up to 4°C. This prevents the milk from souring, and it is delivered in peak condition. It should be noted here that with the exception of fresh cheese, which is packed in plastic bags, all other cheeses are carried in cardboard boxes. Only *mantecoso* cheese is protected by plastic film.

### Food transport development needs

The critical points (Box 1) of dairy product transport in the region basically have to do with the poor quality of the local road network, consisting of tertiary roads with stretches of footpaths. These roads, and they are in the majority, tend to be abandoned to the good fortune of local maintenance by grass roots groups organized for this purpose. This is directly linked to the price structure of products in the field, and their direct impact on producers.

Another critical problem concerns the limited capacity of the regional public bodies for road management. There are usually several national, regional and local bodies with some sort of responsibility for the development and management of road infrastructure. This is characteristic of countries in the Andean region. They often lack the wherewithal to comply with



## BOX 1

**SWOT analysis of milk transport in Cajamarca****STRENGTHS**

- Cajamarca has a fairly extensive road network linking the principal milk-producing zones with the cities, and with the network of primary roads.
- The trunk routes of the regional road network are reasonably transitable, thanks to investments by the central government in recent years.
- The Rural Roads Project in Peru has invested substantially in the rehabilitation of large sections of the network of secondary roads. It has established a system of road maintenance based on local micro-enterprises.
- Certain groups of milk producers have organized on their own to shoulder the task of maintaining local roads.
- The big milk buyers operate a milk collection system using milk collection trucks with regular routes and pick-up points serving the region.
- Milk producers have a fallback strategy of home-made cheese production, to avoid milk losses from spoilage.
- There are a number of relatively well-organized systems for transporting dairy products from rural areas to market.

**OPPORTUNITIES**

- The process of devolving public administration responsibilities to regional and local administrations offers an opportunity for upgrading the management of regional road networks.
- Regional and local governments will have the power to manage economic and technical resources for the central government and external cooperation agencies. These resources could be earmarked for development and maintenance of the regional road network, following the management models established by the Rural Roads Project and the associations of dairy producers.
- The big dairy firms might eventually help to finance local rural road upgrading and maintenance programmes.

- The industrial dairy plants have set up cold storage modules that can be installed in hard-to-access areas, to keep stored milk from souring.

**WEAKNESSES**

- The regional road network is mostly made up of poorly maintained local roads and footpaths, the condition of which deteriorates even further during the rainy season.
- Regional governmental bodies lack the technical, organizational and administrative capacity to upgrade regional road management on their own.
- The milk producers who have organized to carry out road maintenance possess neither the proper tools and machinery, nor the expertise in appropriate road-surfacing techniques, nor the necessary economic resources.
- The poor condition of most rural roads in the region limits the number of routes that can be covered by the milk collection trucks. Many milk producers in remote areas thus have no access to this service.
- The most isolated producers have to walk for many hours carrying the milk on horseback (or on their own shoulders) to reach milk pick-up points or local markets.
- Producer costs for milk rise in line with transport problems, even as their incomes plummet.
- The high degree of acidity in milk for sale in rural areas drives down prices as well.

**THREATS**

- The road networks will continue to deteriorate if local road management capacity is not boosted.
- Strengthening local governments in the near future is no guarantee that the quality of the regional road network will be improved.
- The gradual deterioration of the regional roads tends to constrain milk and dairy collection systems, and to drive up their costs.
- The growth of stabled livestock production and milk production in local areas, where transport costs are lower, is making the big dairy companies much more competitive than the dairy producers of the Cajamarca.



their mandate, and this obviously generates system-wide inefficiency.

None of the local stakeholders in the milk and cheese circuits, however, consider the current availability of transport a serious constraint to the access of their products to market.

Other factors affecting the development of the regional dairy industry have little to do with transport, however. These concern the low productivity of milk cows due to the scarcity of pasture, and sanitary problems caused by the artisanal and unhygienic milk handling and cheese making practices in use. Other factors include the lack of trust between stakeholders involved in the marketing of dairy products, and – a fundamental factor – the lack of strong producers' association that could improve the bargaining power of members *vis-à-vis* the dairy plants.

#### **Income generation from the transport sector in rural areas**

No reliable indicators or previous studies exist from which to deduce the volume of employment generated by the transport sector in the region. Clearly, however, some rural municipalities do contract local manpower for truck maintenance and repair work.

#### **Food losses and food safety during transport**

In the absence of competent authorities to regulate the transport system in general and food transport in particular, it is virtually impossible to calculate with any degree of exactitude how much food is lost at the various stages of transport. Nor do the records of the transport services shed much light on the problem. Milk producers in the region indicate milk losses of about 1.5 percent for each litre transported, but there is no way of verifying these data.

The problem of souring is a constant threat for small-scale milk producers, and an even greater one in remote areas where access is a serious problem. It is a problem that generates substantially lower prices, thus cutting into the income of producers. Dairy plants lower the price they pay for milk in which high levels of acidity are detected.

Nor is there reliable data available on the volumes of milk that are already acidic at the time of collection. It would be useful to generate information on this subject, and thus be able to suggest viable alternatives in accordance with the volume of losses.

## **RICE TRANSPORT IN THE DEPARTMENT OF SAN MARTÍN**

### **General characteristics of the region**

The Department of San Martín is located in the Amazonian foothills, on the eastern slope of the Andean Cordillera, in northeastern Peru. This is a mountainous region, with soaring hills covered with tropical forest and vast valleys formed by the tributaries of Huallaga River, a major arm of the Amazon river.

The region has an estimated population of 757 740 inhabitants, which is 2.9 percent of the national total (INEI, 2002). Thirty-seven percent of this population is under the age of 14, and 60 percent between the ages of 15 and 65. The bulk of the population – 60 percent – lives in urban areas. Those who do live in rural areas are concentrated in small settlements not far from the principal highway that unites the territory of this region.

San Martín is also one of Peru's poorest departments, with 67 percent of the population living below the poverty line and 36 percent considered extremely poor – compared to national averages of 55 percent and 24 percent (INEI, 1996).

Economically speaking, the region contributes about two percent of the national GDP, mostly in the agricultural and livestock sector, which accounts for 32 percent of the region's GDP (INEI, 1996).

The principal crops are rice (33 percent), oil palm (21 percent), plantains and cassava. Except for plantains and cassava, the principal crops are targeted at extra-regional markets. Illegally grown coca has become an alternative money earner; the tropical forests have undergone uncontrollable depredation; and an incipient tourist industry has taken its first steps.

### **The road infrastructure in San Martín**

Considering the size of the territory, the road infrastructure of the department of San Martín is not very extensive, comprising a mere 2.5 percent of the national network (Table 31). The backbone of the system is National Route 5N, formerly known as the Jungle Border Road and today renamed the Fernando Belaúnde Terry Highway. It runs through the territory from north to south, connecting the principal cities and valleys of the region with the big coastal markets, and the eastern Amazonian region through its link with the river network. Despite its importance for the regional economy and the shipment of heavy

TABLE 31  
San Martín: length (km) of the road network by type of surfacing. 1996

Geographical area	Total length	Type of surfacing			
		Paved	Improved	Unimproved	Footpath
National total	73 766	8 564	13 280	16 875	35 035
San Martín total	1 870	47	830	713	280
Primary roads	699	47	567	20	65
Departmental roads	214	0	163	0	51
Local roads	957	0	100	693	164

Source: National Institute of Statistics and Informatics, 2002.

freight between the eastern and western parts of the country, most of this primary road of nearly 700 km is unpaved. This, in the view of most local economic agents, is one of the main constraints to development in the region.

The network of regional roads takes off from this national road. It is made up of surfaced but unpaved roads (82 percent of the total), and footpaths (18 percent of the total). Almost the entire network is in a very bad state of repair, and virtually impassable during the rainy season. Indeed a number of large and economically very promising valleys remain cut-off and undeveloped due to the terrible state of connections with the main road. Most of the agricultural establishments that are part of the regional economic process are located near the Belaúnde Terry Highway because the secondary road network is so undeveloped. Location is thus central to an understanding of rural issues in the region. People living far from this road are virtually excluded from the market economy and, in some cases, from the monetary economy.

Another serious problem is the poor condition of the southern half of the Belaúnde Terry Highway, which is precisely where the major rice-growing areas lie. This stretch of the highway, approximately 500 km long, is in such poor condition that the provinces affected are virtually cut off from the neighbouring regions. People are forced to travel an additional distance of over 1 000 km northwards to offer their products on the Lima market, the main consumer of the rice grown in the region. Paving this long stretch of the highway is, in fact, among the major demands of the region, but the cost is off the charts in terms of local financing capability.

The Poverty Reduction and Alleviation Project (PRA, 2001) estimated the economic loss to the region due to the failure to upgrade this highway at 254 million US dollars each year. This is in consideration of a seven-year planning horizon, and a discount rate of 12.5 percent (in US dollars).

The methodology of the estimate used is based on the estimated increase in surpluses for producers in the affected regions as a result of the reduced transaction costs inherent in paving the highway. A planning horizon of seven years was arbitrarily chosen because it is considered a prudent period of time for carrying out road rehabilitation work. The discount rate of 12.5 percent is the figure used by the IDB and the World Bank, lower than the 14 percent figure used by the Investment Office of the Ministry of the Economy.

Paving this stretch of the highway would bring producers in this region within reach of the Sierra and coastal markets, considerably reducing the distance to Lima, as well as the surcosts for freight, which can be as high as 100 percent in some cases.

In short, the major critical points of the regional road network have to do with the limited development of the secondary road network. This has severely curtailed the productive potential of some of the region's large agricultural valleys. The poor quality of the southern stretch of the main road, running from Yurimaguas to Tarapoto to Aucayacu, really drives up the costs of the regional trucking fleets.

### Characteristics of the rice sector in San Martín

Rice production in Peru is estimated at two million tonnes/year (2001), of which San Martín contributes about 16 percent: San Martín is Peru's second largest rice producer. The crop accounts for just over 60 percent of aggregate regional agricultural output (1998), contributing nearly one-fifth of the department's income.

There are roughly 63 000 agricultural and livestock producers in the region, of whom over half are rice growers (Ministry of Agriculture, Republic of Peru, 2002). The average per hectare and per harvest yield is estimated at six to seven tonnes – there are two harvests/yr. Some 75 percent of all agricultural and livestock establishments are

TABLE 32  
San Martín: farmer/producers and Area

Size of farm units (ha)	Farmers/producers		Area	
	Amount	%	ha	%
Less than 1	1 817	3	804	0
More than 1 to 5	19 978	32	48 225	4
More than 5 to 20	25 413	40	248 705	22
More than 20 to 100	15 019	24	538 782	49
More than 100	835	1	270 838	25
Total	63 062	100	1 107 354	100

Source: National Institute of Statistics and Informatics.  
San Martín statistical records, 1996.

under 20 ha in size, and occupy 26 percent of the available farmland. At the same time, less than one percent of farms occupy roughly the same percentage of land (Table 32).

There are three clearly differentiated rice-growing zones in the region, depending on productivity, rice quality and market accessibility.

The northern rice-growing zone, known as Alto Mayo, produces about half the rice in the region, and has good connections with the coastal cities of Chiclayo and Lima via the paved section of the Belaúnde Terry Highway, and a fairly comprehensive network of secondary roads. However, yields in this zone are quite low at 5.7 tonnes/ha, and 16 different rice varieties of medium quality are grown. The output is sold on markets where purchasing power is not very high, and is often mixed with other qualities of rice.

The central rice-growing area, known as Bajo Mayo, contributes 15 percent of regional output, and is connected to Alto Mayo via a heavily trafficked stretch of highway 150 km long, and currently under repair. The rice grown there is a good quality product, especially the Capirona variety, yielding on average seven tonnes/ha, and destined for medium and high-quality markets.

The southern zone, which is, called Huallaga Central, accounts for 35 percent of the rice grown in the region, but this also includes the most degraded section of the Belaúnde Terry Highway. The rice is of very good quality, and productivity high. The great disadvantage, however, is the high trucking costs due to the fact that carriers have a very long journey northwards through Bajo Huallaga and Alto Mayo to arrive at coastal markets.

### Product destination

An estimated 85 percent of the total output of the Department of San Martín is earmarked for domestic markets, and the remainder for home

consumption and for seed. Almost all the paddy produced in San Martín is hulled in mills located outside the region, in the coastal cities of Chiclayo and Lima. This is an indication of the department's weak capacity to retain the option of value added for what is its principal commodity. The reasons no doubt lie in its disadvantageous location with respect to the major markets, and are directly attributable to the poor quality of its roads.

The characteristics of the rice circuit differ in accordance with farm size and the grower's location with reference to roads. Among the small producers (60 percent of all rice farmers), 25 percent sell their paddy directly at the farm-gate to buyers for transport to collection centres or directly to local mills. The remaining 75 percent carry the harvested rice to their homes on horseback or by some motorized means of transport, where it is dried for later sale to mills or rice buyers, with enhanced value added. Or it may be destined for home consumption.

Among the medium-sized producers (30 percent of all rice-growers), about 65 percent have their harvest hulled in local mills and sold on the regional market. The remainder is sold as paddy to buyers for delivery to the coastal mills. The big growers transport their entire output as paddy to the coast.

### Rice marketing channels

Rice intermediaries basically comprise buyers and sellers working with mills located inside and outside the region, and truckers carrying loads of 20–40 tonnes between the coast and the eastern part of the country.

In Alto Mayo in the northern part of San Martín, the primary and secondary roads are in fairly good condition, enabling easy access for the big coastal mills to the farms where the rice is grown, where they purchase the paddy directly from the farmer, with no intermediaries involved. Here, the easy road access has been put to good use by the mills in neighbouring Chiclayo. At the same time, however, this has inhibited the development of a local post-harvest industry that would have added value to the product for the profit of local people. In this sense the highway has not been favourable to regional development, but it did favour commercial integration with more developed neighbouring regions.

In the Bajo Mayo area, on the other hand, most producers have one to two ha under rice, with yield of about seven tonnes/ha of good quality rice per harvest. Depending on supply and demand, many

mills buy the paddy directly in the field, especially from the poorer farmers, to whom they often advance funds to tide them over to the next season. Other farmers may take their harvests into the city in search of mills offering the lowest drying and hulling costs, or sell to buyers for export, or on local markets.

In the Huallaga Central area, the process is similar, except that there are no big mills in the sector, and moving the harvest to the central zone is extremely costly given the poor road conditions.

One of the main problems with the San Martín mills is the use made of rice by-products (comprising about 30 percent of the whole rice grain). Broken grains are not used for balanced food and no local industry uses rice husks for building materials or as fuel. The husks are therefore taken to dumps outside the city and burned, a high and unrecoverable cost.

### Transport costs for growers and rice mills

Most of the rice farms are located near roads, and because the volume of production of an average parcel (10–15 tonnes) is too heavy to transport in small quantities, the usual choice is motorized carriers. Most of these vehicles are farm trucks, and trucks that can carry from four to 40 tonnes. During the rainy season transit becomes a problem on these rural roads, and, as the harvest is smaller, many farmers use animals or carts pulled by tractors to take the harvest from the fields.

Farmers who want to get their rice to the city mills contract the services of farm trucks or pick-up trucks, which charge from S/.1.50 to S/.2.00 t/km. The transport cost varies seasonally and with the movement of the market, but the usual price arrangement is roughly S/.20.00/tonnes for the entire trip (usually 6–10 km, on average), or else a flat rate for the entire load. This service is normally in good supply, and farmers do not appear to contest these charges (Box 2).

The big mills in the central zone take the bags of hulled rice down to the coast in high-tonnage trucks that usually charge around S/.2.00 to S/.3.00/t/km, for average distances of 850 to 1 000 km.

### Transport costs for the carrier

Table 33 illustrates the business costs of the rice truckers, as reported directly by the category.

The problem here is not the supply of transport. The big mills send about 100 trucks loaded with rice down to the coast every month. The problem is the business costs of the carriers. They have no problems with ensuring a full load from the rice mills down to the coastal markets. But they often fail to fill the truck on the return journey. This unquestionably generates an economic loss that is passed on to the mills, which in turn pass it on to the small farmer. Likewise, at the height of the harvest season, trucks give greater priority to rice and less to other possible candidates for their services. Losses in fruit harvests are frequent, for

TABLE 33  
Cost of rice transport

Vehicle	New	Used	Age
Vehicle purchase cost 20 t capacity	US\$ 120 000	US\$ 30 000-50 000	15-20 years
Gasoline	Diesel		Amount
Per gallon fuel cost		S/. 9.20	S/. 4 317.69
Average yield = 20 km /gallon			
Average km per trip (round trip) Tarapoto - Chiclayo			1 500
Average km per trip (round trip) Tarapoto-Lima			3 100
Cost of lubricants per 3 000 Km. (oil and filter)			180
Average yield = 6.5 km/gallon			
Vehicle maintenance			Yearly
Tires			2 500
Parts			3 000
Labour (maintenance)			350
Detail average costs			Amount S/.
Rice fleet and other agricultural products, average per trip to coast			5 000.00
Total income			5 000.00
Average maintenance cost per trip			250.00
Fuel cost			4 317.69
Helper			80.00
Total outlay			4 647.69
<b>Total profit per trip</b>			<b>352.31</b>

## BOX 2

**SWOT analysis of rice transport****STRENGTHS**

- The Department of San Martín is a major producer of good quality rice.
- The region has a national highway that unites the territory, linking its principal cities to the big coastal markets.
- Most rice growers live in areas located near the road, and so heavy vehicles are able to reach these farms fairly easily.
- The freight transport service available in the region is good, diversified, and relatively modern.

**OPPORTUNITIES**

- The process of decentralization whereby the duties of the public administration are devolved to subnational authorities provides an opportunity to upgrade the level of management for regional roads.
- The rice market is still highly “elastic”, and a promising one for boosting both production and productivity within the region.
- Better roads, particularly the paved part of the Belaúnde Terry Highway, can reduce transport costs considerably, thereby increasing profit margins for small farmers.
- The political will of the new Regional Government has translated into a proposal to swap the elimination of exoneration from VAT for resources to pave the highway.

**WEAKNESSES**

- The high cost of transporting rice to the big markets reduces the comparative advantages of the region compared to other national and foreign rice growers.
- A major section of the main highway is in very bad condition for traffic, which has driven fleet costs sky-high, and cut the region off from potential neighbouring markets.

- The secondary and tertiary road networks are very limited, and the roadways in very poor condition. Substantial natural resources in the region that happen to lie far from roads thus remain untapped.
- State investment in the development and maintenance of the regional road network has been insignificant, and basically focussed on upgrading specific sections of the main highway.
- There are no local farmers’ associations to take local responsibility for road maintenance tasks.
- Truckers carrying big loads of rice down to the markets on the coast find it very difficult to fill their trucks with freight for the return journey. The losses are passed on to the mills that buy the rice, and they in turn pass them on to the small rice grower.
- Other farmers producing other types of commodities have a hard time finding transportation for their products during the big rice harvest.

**THREATS**

- The road network will continue to deteriorate unless local road management capacity is strengthened.
- The upcoming increase in the power of local governments is no guarantee that the road network will be upgraded.
- The gradual deterioration of the roads tends to limit the rice transport fleets, and to make them more expensive as well.

example, when growers are unable to find transport for their output.

Another problem linked to rice transport is the weight of the truckloads. Technically speaking, loads exceeding 12 tonnes axle are not allowed, as a precautionary measure for maintaining paved

roadways in good condition. But in practice, loads of up to 20 tonnes/axle are customary. The same cannot be said of the tax, payable on account, paid by the mills for shipping each tonne of rice and which amounts to ten percent of the estimated value of the sale. Controls by the National Superintendence



TABLE 34  
Cost of rice production, Department of San Martín

Heading	Unit of measure	Amount	Unit price (S/.)	Sub-total	Total (S/.)
<b>A. Direct Costs</b>					
<b>Land preparation</b>					
Ploughing	hours	4	70.00	280.00	770.00
Harrowing	hours	4	70.00	280.00	
Puddling	hours	3	70.00	210.00	
Sowing					
Seeds	kg	80	1.80	144.00	464.00
Extraction and loading	days	6	12.00	72.00	
<b>Seedlings</b>					
Transplanting	days	20	12.00	240.00	
Fertilization					160.00
Urea	kg	200	0.74	148.00	
Tillage					247.00
Fertilization	days	4	12.00	48.00	
<b>Application of phytosanitary control</b>					
Irrigation	days	6	12.00	72.00	
Border weeding	days	8	12.00	96.00	
Phytosanitary products					449.00
Herbicide	litre	3	70.00	210.00	
Insecticide	litre	1/4	180.00	45.00	
Fungicide	litre	1	80.00	80.00	
Foliar fertilizer	litre	3	38.00	114.00	
Harvest					325.00
Harvest and bagging	days	25	13.00	325.00	
<b>Subtotal</b>					2 456.00
<b>A. Indirect costs</b>					
Unforeseen 5 %/day.					122.30
Technical assistance 10%/day					122.80
Interests					245.60
<b>Sub-total</b>					491.20
<b>Summary</b>					
1. Direct costs					2 456.00
2. Indirect costs					491.20
<b>Total costs</b>					2 947.20
<b>Yield kg/ha</b>					6 500.00
<b>Cost/kg</b>					0.45

Variety: Capirona

Average yield: 6 500 kg /ha

**Production costs**

US\$ 1 = S/.3.45 (November 2003)

**Sale prices**

Farm-gate price to producer: S/. 650/t

Local price to public: S/. 700/tonne

Ex-region price to public: S/. 850/t

Intermediaries: (Farmer to Mill to Wholesaler to Consumer)

Source: Farmer Manuel Mondragón; 150 ha sown in Consuelo area

of Tax Administration (SUNAT) are so strict on the highways that truckers require prior proof of payment from the mills before they will move the freight. The “efficiency” is lost, however, by the failure to control sales on the wholesale markets of the principal cities, where traders neither request nor issue a bill of sale. As a result, the “sales tax” becomes a “production tax”, which cascades back to the original purchase price.

### The rice economy

Table 34 presents figures on the production costs for one hectare of irrigated rice, and margins of profit for the average rice farmer in the region.

Generally speaking, the big wholesale dealers in the city of Lima determine the price chain for rice. This means that price fluctuations on the final market are much less than on the production sites in San Martín. These fluctuations bottom out between



May and September, a period coinciding with the harvests in the coastal valleys, where per hectare yields and production volumes are considerably higher than in our study area, and processing and transport costs lower as the network of mills and roads is more developed.

### **Demand for transport**

Bearing in mind that rice yields in the area average 6.5–7.5 tonnes/ha, the demand for transport is reckoned at two or three vehicles/week for an 18–25 tonne truck, hired to deliver to the mills in the region. There is no major gap between the supply and demand for transport, given the importance of rice production in San Martín in terms of supplying the regional market, and thanks to the road infrastructure in the region.

During the off-season, however, the demand for transport contracts considerably. Consequently, carriers face serious economic problems, and may be 15 to 20 days without work in a month.

### **Food losses and food safety during transport**

As in Cajamarca, there are no public authorities in San Martín specifically responsible for regulating and monitoring the food transport services. This

has direct repercussions on the recording of data in general, and particularly the data on post-harvest losses during transport.

Information supplied by farmers, millers and carriers suggest that post-harvest losses due to transport can be estimated at 0.6 to 0.7 percent. The damage can be traced to improper handling of the sacks rice is shipped in, wear and tear of these sacks, and higher moisture content of rice during wet weather.

All those interviewed tended to agree that a sizeable percentage of these losses occur during the early stages of the process, when the rice is moved from the farms to the first pick-up point, due to the poor condition of the access roads. These roads are so bad that the big heavy-duty trucks cannot get into some farms, and so the rice has to be brought out on carts pulled by tractors or draught animals. However, the greatest losses occur during the process of drying rice on the ground (the traditional technique used by farmers to lower the moisture content), and not during transport.



# Strategies for improving rural food transport

## DESIRABLE CHARACTERISTICS OF FOOD TRANSPORT SYSTEMS

An ideal vision of the desirable characteristics of food transport systems in the rural parts of the Andean countries should include a sufficiently extensive road network to unite the various production zones of the region with intermediation centres and consumer markets. This network would be efficiently organized and administered, and there would be sufficient economic and technical resources to ensure its sustainability over time.

It is also possible to imagine transport services and means of transport technically adapted to the production systems and conditions of each production zone, and economically accessible to the poorest farmers in the region. This would not produce the surcosts that make farmers' products less competitive and standards and regulations appropriate for the specific social, economic and technological realities on the ground in each zone would be in place. There would be administrative and management bodies to ensure the development and sustainability of the road infrastructure, and compliance with road safety and other norms.

## ANALYSIS OF JOINT INTERVENTIONS TO ADDRESS FOOD TRANSPORT PROBLEMS

Throughout the Andean area, there have been joint interventions by the agencies responsible for the overland transport sector, and other state and private agencies, to promote solutions and programmes to favour development in the Andean regions.

Investments by the big mining companies to build and upgrade transport infrastructure in the region are a case in point. Of course, the specific target of this action is to facilitate access to the mines and the extraction of minerals, but it also affects the surrounding agricultural context in various ways.

The state agencies that were established to generate temporary employment in urban and rural areas have played a major role in the construction and maintenance of rural roads. The

same can be said of the state-sponsored settlement programmes in the Amazonian territories. An important investment component in almost every one of these cases was the building of penetration roads. These roads promoted migration into the area, but they also unleashed a whole sequence of unplanned events. These include mechanized tree felling, the use of heavy machinery, inappropriate logging methods, and the invasion of territories belonging to indigenous communities.

Some NGOs active in food support projects have also indirectly contributed to certain aspects of transport infrastructure. The food they deliver to recipients is based on the "Food for Work" concept. The work component generally involves efforts such as roadwork, designed to benefit the community at large.

There are also joint programmes by port and airport authorities to develop multimodal transport systems in areas where the Andean roads, the Amazonian river system, and urban airports converge. State and private capital, such as the dairy firms and mining companies in Cajamarca, foster joint efforts to build and/or improve roads so as to facilitate the circulation of specific goods from one region to another.

Coordination and intervention with local governments is also important. The trend is toward growing local governmental involvement in the development and maintenance of the road networks under their jurisdiction. They are also responsible for supervising the food that comes in and out of urban markets, and monitoring the movements of trucks. There is additional coordination with the police, customs and tax authorities for different transportation controls for inter-regional trade.

The major impact on food transport, however, comes from the road upgrading and development programmes of the Ministries of Transport. An example is the Rural Roads Project of the Ministry of Transport in Peru. The objectives of this World Bank-sponsored programme, with an estimated value of 300 million US dollars, are to upgrade the transitivity of rural road networks

in the poorest departments of the Peruvian Andes. This will improve connections between producer communities, urban towns and markets, and make public and private services more accessible. It will help reduce transaction costs, develop markets, generate more jobs, stimulate local and regional economies, and raise the living standards of the rural population.

According to the economic, social and environmental assessment report prepared immediately after the conclusion of the first five years of the Programme (Cuanto, 2000)<sup>1</sup>, the impacts generated are closely related to the period of maturity of the works. Initially, the most important and visible impacts concerned aspects directly related to transport conditions, such as notably shorter travel times and increased vehicle transit, and, to a lesser extent, lower costs for the freight and passenger fleets.

Impacts linked to access to public services are less discernible, however, even if medical examinations and health care have been considerably enhanced. But neither the supply nor the demand for educational services has increased. Concerning access to branches of the justice system, no change has been observed. Despite the growing demand for security, it is difficult to understand whether this demand is due to increased access to the administrative branches of justice, or to the increase in social turmoil.

There has been little impact on the spectrum of productive activities as a whole. It is possible that once the works reach full maturity, substantial variations in these aspects may be detectable. There is an observed impact on producer prices, which were higher on average than those in the control zones (outside the project area). This was not perceived by the farmers, however, as farm prices fell throughout the country in the year 1999. There is no evidence of increases in the amount of planted acreage, yields, crop and income diversification, or the percentage of output intended for market.

As for employment, there has been no significant improvement, except in the case of the road maintenance microenterprises. Nor has migration been halted; though there has been a small counter flow of families who had moved earlier for economic reasons.

Concerning gender issues, there has been a significant increase in the access of women to health centres, compared to men. Women felt that the roads had done more for them in social terms, than in terms of productive matters.

In the case of Ecuador, the national government has implemented an IDB-supported project called Rural Transportation Infrastructure (PIRT). It aims to lay the foundation for a sustainably managed rural road system. The pilot application will concern the rehabilitation of 415 km of surfaced roads and 100 km of paved roads.

This model is based on a redistribution of the functions and responsibilities of road management at the different governmental levels, retargeting financial resources, enlisting the active participation of target communities, and introducing technical procedures based on the creation of rural micro enterprises for routine road maintenance.

In Bolivia, the most decentralized of the three countries, there are no government projects *per se* targeted at rural road improvement. However, some local governments are receiving training through an ILO project to promote labour-intensive roadwork.

#### **OPPORTUNITIES FOR HOLISTIC SOLUTIONS FOR IMPROVING FOOD TRANSPORT SYSTEMS**

There is a whole range of opportunities for upgrading food transport systems in the Andean region. Rural road network rehabilitation and improvement programmes targeted at physical infrastructure are one priority that needs to be closely linked to local and regional economic development plans promoted by the municipalities. The municipalities need to take on duties and responsibilities concerning transport.

Other unbeatable opportunities for lowering transport costs and promoting social and economic development are those offered by food processing and preservation processes, preferably on-site, that both reduce the weight of food products and add to their value. This is true of cheese-making in Cajamarca, a milk-processing technique to get the product from the farmer to the market, and locally milled rice in San Martín, or the processing of other traditional local products such as fruit. These processes need to be solidly anchored on a series

<sup>1</sup> The assessment was made immediately after the conclusion of the first five-year phase (1995-2000) of the Rural Roads Project, and as a pre-condition for financing the ongoing (2003) second phase.

of marketing, technical, and economic feasibility studies.

The importance of developing and disseminating technologies that are appropriate to the specific social and economic context is of prime importance here. They should enable producers to add value to their primary products at little expense to themselves, thus improving their margins of profit. Processing can in some cases as much as triple the producer's profit. Further benefits are substantial reductions of food losses through food processing, the value added inherent in finished or semi-finished products, and the lower transport cost for these smaller volumes of production.

In a broad sense, technology development means more than the mere development of labour-saving mechanical processes, it also means building the working and organizational capacities of producers working in the same branch or in the same region. There is an indisputable need for technical assistance in this field. This is arguably a serious constraint, and will require the support of private enterprise (through equitable coordination), state technical education services and NGOs. It is vitally important to train local human resources to implement these business initiatives.

The question of access to basic services such as energy and drinking water is crucially important. The point is to meet the basic needs of the rural population, and to guarantee the efficiency and quality of value-added productive processes. There are viable alternatives such as micro-hydraulic water supply systems, and environmental cleanup tailored to rural communities.

It is also important to facilitate access to up-to-date marketing data, to enhance the capacity of smallholder or other rural producers' associations to achieve timely access to regional and extra-regional markets, and to decide to diversify as and when the demand so requires. There are already experiences with rural info-centres, under some of the informational technology projects.

There is a wealth of collective development experiences – some successful and some not, which have been undertaken under various modalities of social organization. Taking the example of the Cajamarca milk producers in our case history, they may quite possibly improve their terms of trade with dairy transnationals if they can successfully organize to offer a standard product on a joint basis. This would also be complemented by the provision of laboratory and cold storage services at the roadside collection points.

## **COLD CHAINS: AN ALTERNATIVE FOR THE RURAL SECTOR**

Undoubtedly, the so-called cold chains are among the most important technological advances in post-harvest management, with the greatest economic impact on the various production chains. Cold chains make it possible to keep highly perishable products fresh by regulating the low temperatures at which products are maintained from when they are harvested to when they are sold to the end consumer. For fruits and vegetables, as for dairy and meat products, cold chains offer a guarantee for the final quality of fresh and raw products.

Small farmers in the Andean sub-region have very little access to cold chains, however, due to the high cost of this equipment and the lack of access to low-cost energy in rural areas. In most cases the cold chains are found where medium or large enterprises are participants, and manage to integrate the various stages of the post-harvest cycle because they are handling large volumes of production.

There are a number of interesting experiences, such as the Cajamarca case study, where one of the big milk buyers is setting up cold centres for milk in rural areas. These centres, each with a daily capacity of 400 to 2 000 litres, are used as collection points for the milk produced by small local dairy farmers.

Access to low-cost energy sources is a precondition for milk cooling plants. This is therefore a viable alternative for communities who are already hooked up to the grid, or who have access to some economical alternative source of energy, such as that provided by micro hydroelectric plants.

This equipment can be manufactured locally at lower cost, and disseminated to interconnected collection centres, or to centres with the potential to tap mini hydraulic energy systems. The milk company can then collect fresh milk with controlled acidity, and guarantee higher prices to the farmer.

This last item of course demands a joint effort on the part of organized small producers, private businesses, local government and rural development cooperation agencies.

For these systems to be accessible to small producers, they must organize. Economies of scale and a certain level of managerial capacity *vis-à-vis* the public and private entities involved are both essential. A clearly defined business model for producers' associations is also important. The personnel in charge of management need to

be carefully selected and properly trained in the managerial and technical aspects of their jobs.

### **PROBLEM PRIORITIZATION**

Despite the existing differences between the various road systems in the Andean countries, they do all generally share the same problems and the same constraints. The road networks are insufficient to meet the communication needs of all regions. Most roads are unpaved, and circulation is a frequent problem for lack of maintenance. The regulatory frameworks are often inadequate, and both national and subnational governments face serious budgetary, administrative and technical constraints to proper management of the road networks. Added to this are further limitations such as the poor quality of the transport services, and the technological dependence that inevitably drives up the general cost of transport.

### **Road infrastructure**

The long stretches of roads in the network unsuitable for motorized transport, the scarcity of roads, and the fact that innumerable valleys and regions lie outside the present network, and thus cut off from development, all constitute major road infrastructure problems. A further problem concerns the quality of existing roads, most as yet unpaved and lacking regular maintenance, thus limiting vehicle transit and driving up the costs of commerce.

During the rainy season, most of the unpaved roads become impassable, either because stretches of the road become giant mud puddles, or due to the frequent mudslides that block roads, temporarily isolating communities, or leaving them with serious communication problems. Local governments in the poorest rural areas lack the resources and equipment to deal with emergencies. Nor are there any institutionalized regular road maintenance services, so that road degradation is a continuous process. The situation can get so bad that the roads become impassable to vehicular traffic, requiring costly partial or full road rehabilitation operations, which will shortly again turn to loss, in the absence of regular maintenance.

In some cases road users have organized to carry out maintenance and rehabilitation tasks on their own, usually during the rainy season. But they lack the necessary earth-moving machinery, special skills and appropriate tools, and so the results are doubtful at best.

There are other cases, however, where the government has encouraged the creation of

micro-enterprises to do routine maintenance under contract on previously rehabilitated roads. Unfortunately, this is not an economically viable proposition, as the maintenance costs exceed the economic benefits generated. The upshot is that road maintenance is basically a subsidized enterprise, and hence dependent on eventual budgetary injections from the central government to regional and local governments.

The two cases illustrated in this paper are representative of what occurs throughout the Andean region. In San Martín, the road network is minimal given the size of the territory. Extensive valleys with great promise for agricultural development are not reached by roads. Quite logically, their populations are demanding new road-building projects to free them from this state of isolation. In Cajamarca, on the other hand, the road network extends throughout the region, but most of the roads are in a chronic state of poor maintenance, and it is very hard for people in the more remote areas to get their goods to market.

### **Transport management**

One main aspect of the transport issue concerns the distribution of responsibilities and resources among the various levels of government. The national roads, mostly paved and also the most promising in terms of economic return are the responsibility of the national governments through the various branches of the Ministry of Transport. The departmental roads are the responsibility of the regional governments, and the local roads come under the local governments.

Resources earmarked for road infrastructure, deriving as they do from taxes or from external indebtedness, are perennially scarce. The few resources that are available tend to be concentrated among the national agencies to serve the needs of the most important and most economically viable roads. Subnational and local governments on the other hand, who are the ones responsible for rural transport systems, suffer from a lack of the necessary financial, technical and organizational resources to address their responsibilities in this sector. This situation is likely to change in the future, along with the evolving process of decentralization now underway in some countries of the region.

A second aspect of the transport management issue concerns the regulatory framework governing transport activities. This involves road concessions, road safety, vehicular traffic and loads, and the



services supplied by transport firms. The regulatory standards are normally applicable nation-wide, with no regard for regional specifics. Often enough it is impossible for local administrations to comply with established procedures, because they simply lack the necessary minimum financial, technical and human resources to operate in compliance with them.

### Technology and access to transport

Available technology is another aspect of the transport issue. It concerns social access to the means of transportation, the businesses offering transportation services, trade intermediation, and vehicular maintenance.

Not only is the cost of acquiring a vehicle quite beyond the economic reach of small producers, the great diversity of makes and models also drives up the maintenance costs for existing vehicles, as well as the cost of parts and repairs.

As an additional complicating factor, many of the vehicles now in circulation are past their useful life, technically obsolete, and in need of replacement. Despite this their owners continue to patch them up, reducing their margin of profit and making the roads even less safe. Many cargo vehicles lack the necessary equipment, loads are not correctly handled, and the whole process generates substantial losses.

Social access to the means of transportation is another problem. While regular transport services do exist in many cases, their costs put them beyond the reach of the poorest small producers. An additional problem here is that carriers find it difficult to fill their trucks on the return journey, and so they need to transport sufficiently large volumes on the outward journey from rural food-exporting areas to make up this loss.

All of the above make freight transport costs a very high-cost item for rural producers – often too high, placing them at a disadvantage with respect to other competitors.

### STRATEGIC PLANNING TO ADDRESS FOOD TRANSPORT NEEDS

The determinants of food transport systems in Andean countries vary in nature, and thus come under the jurisdiction of different sectors of public administration and levels of government. Strategic planning aimed at addressing or upgrading the conditions of food transport in general may be aiming at too broad a target. There are so many external factors, involving so many stakeholders

(who may have very different – and perhaps conflicting – views and objectives). This is further complicated when the Andean region is viewed as a single unit, despite the great diversity of characteristics and problems among regions and from one country to the next.

Speaking in general, however, strategic planning objectives designed to upgrade food transport systems in Andean country regions mainly concern the same factors. These include infrastructure, the means of transportation, services, equipment, public administration, the kinds of products transported, post-harvest processes applied prior to transport, and relations with marketing agents.

Concerning infrastructure, rural road networks need to be fairly extensive and well maintained. This obviously means solving the problem of funding road maintenance on a regular basis. This in turn assumes the existence of public or private regional road maintenance services, paid for through taxes or road tolls. It is recommended that studies be done on how to develop appropriate, sustainable road maintenance methods and practices based on intensive recourse to local manpower, and simple, economical, road surfacing techniques.

It is also recommended that public agencies, private businesses and cooperation agencies working on rural road construction and improvement projects lend their support. It is certainly important to upgrade existing roads by means of sustainable rehabilitation and maintenance. But it is also important to promote the construction of new secondary and tertiary roads so as to bring now isolated Andean communities into the mainstream, and reinforce commercial flows from the countryside to urban areas.

As for the means of transportation, the sole alternative, given the current context of technological dependence in the Andean countries, is to promote the development of intermediate means of transportation that the less favoured sectors of the population may be able to afford.

Concerning services, what is needed is a supply of duly equipped transport services with appropriate equipment for the various kinds of cargo, offering regular transport service, priced within reach of the local population. This is dependant on a whole series of random external factors, such as market fluctuations, changes in the terms of trade, price hikes for technological maintenance, climatic variables, and so on.

As for infrastructure, community pick-up and storage centres should be built and strategically

sited in areas where small producers cluster, so as to avert losses from spoilage. This is where the big private firms, normally the principal buyers of the output of small producers, can play a leading role in developing rural assets and facilities. Other alternatives such as loans for small cooling plants in remote areas may also be promising.

Concerning public management, the various sectoral, national and regional bodies need to improve coordination to the point where they can efficiently facilitate and promote the development of transport systems and food marketing.

These subnational bodies also need to promote closer links between the supply and demand for technical assistance services in order to promote economic development. In the specific case of food, this assistance should be designed to cover the principal gaps at every link in the food chain.

There is another area in which private enterprise can also make a contribution to upgrading food transport from the countryside to the city. They can help producers to manage their products, and to develop the on-site post-harvest processes that add value to primary products. Processing reduces the volumes to be shipped, lowers the cost of transport, and ensures more favourable terms of trade for the rural poor.

Farmers' associations also need to remain strong and active. Only thus can they protect the interests of small food producers *vis-à-vis* intermediaries and the principal buyers, and ensure the provision of market data and other such services to small producers, including cold storage and credit systems, and promote the existence of rural/urban trade regulatory bodies.

### **POLITICAL AND SOCIAL CONSTRAINTS TO THE EFFECTIVENESS OF THE PROPOSED SOLUTIONS**

Factors limiting the viability of the proposed solutions are generally structural in nature, and their impact on the national transport system is across the board.

We refer particularly to the scant public resources earmarked for building, improving and maintaining national road networks, and the fact that these few resources and the decision on how to spend them are concentrated in the hands of the central government

Often enough, these decisions take a political twist. Hence the recurrent difficulties for regional and local government to address transport problems at their level of jurisdiction.

The weakness of rural economies is another major constraint to resolving transport issues. The margins of profit and local capacity to keep any profits earned within the region do not justify major investment in road infrastructure, except for strategic projects of clear national interest. The same criterion is applied in the area of training and technical assistance from the private sector, which focus on areas that show the greatest potential for development, are most accessible, and where producers can more easily pay for these services.

Other important factors concern the poverty levels and quality of life of most small farmers. They lack the necessary technical and economic resources to make their land more productive, add value to their products and better their terms of trade.

Lastly, the technological dependency of the means of transportation, while not definably a social or political factor, does entail high maintenance and operating costs for the vehicles in the fleet, and exerts a considerable restraint on the potential development of food production and transport.

### **DESIRABLE BENEFITS OF VIABLE SOLUTIONS TO FOOD TRANSPORT PROBLEMS**

The evaluation of the Rural Roads Project in Peru, made by the Cuanto Institute (2000), sheds some interesting light on the potential benefits of upgrading rural road networks.

The benefits of this project to rehabilitate and upgrade rural roads concern the period of maturity of the work concluded. The immediate benefits registered first on transport conditions in the target areas, and especially the shorter transit time, cost of moving freight and passengers, and the increased transit of motorized vehicles. This had a very relevant impact on the producer prices for farmers, due to lower transport costs, despite the fact that the higher earnings were lessened somewhat by adverse weather conditions that reduced production.

There were also relevant increases, though to a lesser extent, in the access of rural people to public services and urban markets. However, the report does not establish whether or not these indicators will grow in the medium term as a result of these road improvements. Nor does it establish definitively whether or not they will increase over time, which might be an indication that being connected or not being connected is not the sole determinant of isolation. It is also significant to

note that the evaluation showed that improving roads has so far had not had much impact on boosting either employment or income, nor has it slowed the outward flow of migrants, or helped to alleviate poverty.

As for the potential benefits of enhancing market-oriented production and postproduction activities, it is hoped, first of all, that this will result in a relative reduction in the transport costs farmers pay, as the volumes of processed *vs.* unprocessed foods are smaller. Secondly, it is hoped that increasing the value added of the products and reducing losses from spoilage will also increase the producer's profit. These reductions in transport costs due to the smaller volumes that have to be transported will not be very significant in the absence of substantial technological changes in the transportation units. It is recommended that

funding programmes be promoted to renew the freight transport fleets, and to encourage efforts to upgrade the regional capacities for vehicle maintenance and the manufacture of spare parts.

Access to appropriate technology will also generate greater efficiency in production, at lower cost and enhanced quality. Here it is important to consider the promotion of small farmer organization and associations so as to produce economies of scale to improve market coordination.

Lastly, it is hoped that the process of decentralizing transport systems, now being devolved to subnational levels of government, will facilitate policy decisions and pave the way to more direct participation on the part of producers and the private sector in developing and solving the problems of regional transport systems.



## Conclusions and recommendations

The issue of food transport in the rural areas of Andean countries is extremely complex. It involves a great many local and superstructural factors, which may well lie beyond the capacity of national authorities to control. The issue is part and parcel of a much larger problem that involves the general problem of transport, the scarcity of resources of both the State and its citizens, and the isolation in which large sectors of the population live. These recommendations cannot, therefore, be exhaustive for all aspects of the problem, and refer only to specific, important aspects.

### MANAGEMENT AND PLANNING

- National management and planning schemes need to be devised for transport systems, and duly devolved to local government levels, but at the same time attuned to overall national transport policy.
- The above assumes a very intense effort on the part of national authorities to build the economic, administrative and technical capacities of subnational governments.
- Likewise, such decentralization also assumes the active participation of the community as crucial to the sustainable development and maintenance of transport systems. It is therefore necessary to continue to seek such mechanisms to ensure sustainability at each project stage.
- People's participation in road maintenance must be channelled through the local governments and communities by means of information, consultations and cooperation.

### TRANSPORT SYSTEMS

- Local (municipal) and regional governments and businesses must promote forms of organization to facilitate the hiring of local manpower within the community.
- Non-motorized transport should be promoted and included within transport sector programmes, especially in areas where accessibility problems are most acute.
- Minimum standards for the operation of

regional transit need to be adapted to ensure comfort, safety and efficiency.

- The carrying capacity of paved roads and bridges needs to be upgraded.
- The geometric design of roads needs to be upgraded.
- Maintenance programmes with self-financing management need to be developed.
- Market infrastructure for agricultural products needs to be developed in different areas of each country. The CENMA project in Guatemala and the Tiendona project in El Salvador are good examples of this.
- Most functions of the design, inspection, construction, operation and maintenance of the road infrastructure should be transferred to the private sector.
- The planning and regulatory functions of the Ministries of Public Works and Transport should be strengthened.

### FOOD PRODUCTION AND POST PRODUCTION SYSTEMS

- The creation of associative road maintenance micro enterprises should be supported, ensuring the use of local manpower, as a contribution to job generation, sustainable roads and a better national economy. Micro enterprises and cooperatives should preferably be made up of local people living in the direct area.
- Food processing to reduce product weight and increase value added should be promoted.
- Sustainable technical assistance schemes should be promoted for primary production and processing of rural products, based on the identification of market demand.
- Technical and entrepreneurial learning incentives for rural people need to be promoted so as to build human capital.

### KNOWLEDGE GENERATION

- The experience of the various road and road maintenance funds in the regions should be reviewed and systemized for the purpose

of disseminating the achievements and drawbacks of current experience.

- Institution building depends on earmarking government funds and priorities for lesser

interventions such as rural roads that have a direct impact on the lives of people in local communities.



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The agrifood transport sector in Latin America and the Caribbean is a key component of the food supply chain, making a significant contribution to gross domestic product in these countries. Well-developed, efficient food transport systems are crucial to the survival of thousands of people, and pivotal to the success or failure of key economic sectors such as agriculture and other major national and international commercial activities. This publication of the Agricultural and Food Engineering Technologies Service of FAO's Agricultural Support Systems Division presents a detailed study of problems encountered in three Latin American and Caribbean country groups: Central America and Panama, the Expanded MERCOSUR, and the Andean Pact. It covers seventeen countries. The study focuses primarily on stumbling-blocks faced by small farmers, and suggests possible policy and programme interventions to improve the situation in the neediest areas, with repercussions for the population as a whole.

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