Pro-Poor Livestock Policy Initiative

Livestock Sector Policies and Programmes in Developing Countries

A Menu for Practitioners

A Living from Livestock

Pro-Poor Livestock Policy Initiative
A Living from Livestock

Livestock Sector Policies and Programmes in Developing Countries

A Menu for Practitioners

Ugo Pica-Ciamarra
Joachim Otte
Chiara Martini

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2010

Recommended citation

FAO. 2010. *Livestock sector policies and programmes in developing countries – a menu for practitioners*, by U. Pica-Ciamarra, J. Otte and C. Martini. Rome, pp. 150

ISBN 978-92-5-106543-3

Contents

Tables and boxes

TABLES

BOXES

Preface

Interventions aimed at strengthening the livestock sector in the developing world are relevant for reducing poverty and hunger as hundreds of millions of rural households rely heavily on livestock for sustaining their livelihoods. Farm animals generate opportunities for on- and off-farm employment and provide an important supplement to the cereal-based diets of the less well-to-do. At the same time, demographic growth and gains in real per caput income are drivers of increased demand for animal-source foods, particularly in rapidly growing, often densely populated developing countries.

The livestock sector's potential for reducing poverty and enhancing food security has been under-exploited as the the sector has long been treated as an appendage only to agriculture, with both policy-makers and development practitioners giving priority to staple crops over high-value agricultural products such as fruits, vegetables and animal-source foods. In addition, livestock sector interventions have been mostly of a technical nature, focusing on the elements of animal husbandry, feeding/nutrition and disease control. While important, these interventions tended to disregard the broader policy and institutional framework within which farmers operate. In other words, the range of incentives and disincentives that underpin household production and consumption decisions have thus been overlooked. In addition, when on rare occasions adequate attention has been paid to policy and institutional dimensions, livestock sector policies/programmes have been designed by technical staff in livestock departments, NGOs or international organizations with little consultation with other ministries, and limited appreciation of and connection with the 'non-livestock' policies and markets critical for livestock sector development.

The Livestock Sector Policy Menu presented in this volume (hereafter, the Menu) has been prepared by the Pro-Poor Livestock Policy Initiative (PPLPI), funded by the Department for International Development (United Kingdom) and launched by FAO in 2001 with the objective to enhance the capacity of FAO and its Member States to formulate and implement policy and institutional changes in the livestock sector to the benefit of the poor. The Menu comprises a user-friendly, non-technical compilation of livestock sector policies/programmes, including case studies, to assist policy-makers and development practitioners in formulating and implementing plans for institutional reforms and livestock sector-related policies that will benefit livestock farmers in particular and, in general, all stakeholders along the value chain. The Menu views the livestock sector in the broader context of agriculture, and provides some 60 examples of policies and programmes from a variety of domains, including land tenure, insurance, animal health service provision, credit, marketing, trade, environment and research, all of which have a vital role in promoting the rapid, inclusive growth of the sector.

The Menu is innovative in some respects. First, many of the policies and programmes identified draw on market-based instruments that rely on public-private partnerships. Public institutions dealing with the livestock sector may promote such partnerships, both within

the sector and in non-livestock-specific domains, thereby tapping into the entrepreneurial capacity of rural households to promote the development of livestock and livestock-related markets. This is particularly important when livestock ministries face strict monetary policies and budgetary restrictions. Second, by showing that any policy objective can be served by a variety of complementary or alternative public actions rather than by blueprint solutions, the Menu provides the reader with a range of options, including how to select the most appropriate action to remove country-specific constraints on livestock sector development. Third, for ease of reading, the policy and programme descriptions contain no technical jargon but include bullet points highlighting their pros and cons, and the role of the public and private sectors in their design and implementation. Finally, each chapter stands on its own as a comprehensive policy review of the subject matter, thereby allowing the reader to decide which chapters to read and in what sequence.

Although, on its own, the Menu is not sufficient fully to support the design of policies and programmes promoting the rapid, inclusive development of the livestock sector, it should be useful in helping policy-makers and development practitioners to recognize the broad context that livestock keepers operate in, and to appreciate the multiplicity of options available for addressing livestock development constraints. Policies and programmes can be formulated and implemented to promote the efficient, equitable growth of the livestock sector only when different options are reviewed and compared; depending on the prevailing structure of the sector and on institutional and market conditions, these options have different costs and benefits for farmers, government and, ultimately, society as a whole.

Samuel Jutzi
Director
Animal Production and Health Division
FAO

Acknowledgements

The present Livestock Sector Policy Menu was prepared by a core team composed of Chiara Martini, Joachim Otte and Ugo Pica-Ciamarra (team leader). Messrs Otte and Pica-Ciamarra are staff members of the Animal Production and Health Division of the Food and Agriculture Organization of the United Nations (FAO), whereas Ms Martini is at the University of Roma III.

In preparing the Menu both official and grey literature were drawn upon, as well as field work, working papers and research reports prepared under the FAO Pro-Poor Livestock Policy Initiative (PPLPI), funded by the Department for International Development of the United Kingdom and launched by FAO in 2001. The objective of the PPLPI is to enhance the capacity of FAO and its Member States to formulate and implement policies and institutional changes in the livestock sector, to the benefit of the poor.

Special thanks go to Achilles Costales, Piero Conforti, Adrian Cullis, Mamta Dhawan, Pierre Gerber, Paolo Groppo, Irene Hoffmann, Abdi Jama, Lucy Maarse, Nancy Morgan and David Palmer, who provided valuable, constructive comments on the various chapters of the Menu. We are also grateful to Brenda Thomas and Jane Shaw, who have been very helpful and patient editors, and to Monica Umena for formatting this manuscript.

Abbreviations and acronyms

ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ATM	automated teller machine
BNDA	National Agricultural Development Bank (Mali)
BSE	bovine spongiform encephalopathy
CAHW	community animal health worker
CBPP	contagious bovine pleuropneumonia
CVECA	self-administered village savings and credit bank (Mali)
CVGT	village land use management committee (Burkina Faso)
DAC	Department of Agriculture and Cooperation (India)
DCS	dairy cooperative society (India)
DDA	Dairy Development Authority (Uganda)
DLS	district local services (Indonesia)
DVS	Department of Veterinary Services (Malaysia)
DRP	Disaster Response Product (Mongolia)
EMC	environmental management committee
ESI	environmental services index
EU	European Union
EWS	early warning system
FAO	Food and Agriculture Organization of the United Nations
FMD	foot-and-mouth disease
GDP	gross domestic product
GPS	global positioning system
GTZ	German Agency for Technical Cooperation
HPAI	highly pathogenic avian influenza
IER	Institute of Rural Economy (Mali)
IFAD	International Fund for Agricultural Development
ILCA	International Livestock Centre for Africa
ILRI	International Livestock Research Institute
INCORA	National Land Reform Institute (Colombia)
IPR	intellectual property right
LGA	Local Government Act (Uganda)
MAP	Marketing Assistance Project (Armenia)
MDGs	Millennium Development Goals
M&E	monitoring and evaluation
MIDP	Marsabit Integrated Development Programme (Kenya)
MINAS	Mineral Accounting System (the Netherlands)
MIS	market information system

MO	membership-based organization
NABARD	National Bank for Agriculture and Rural Development (India)
NGO	non-governmental organization
OIBM	Opportunity International Bank of Malawi
OIE	World Organisation for Animal Health
PES	payment for environmental services
POS	point of sale
PPLPI	FAO Pro-Poor Livestock Policy Initiative
PSB	Burkina Sahel Programme
RAC	regional agricultural chamber (Mali)
R&D	research and development
ROSCAS	rotating savings and credit association
SEDC	Sarawak Economic Development Corporation
SHG	self-help group
SPS	sanitary and phytosanitary srandard
TLMP	Tanzania Livestock Marketing Project
TLU	tropical livestock unit
TRIPS	Trade-Related Aspect of Intellectual Property Rights
UNDATA	Uganda National Dairy Traders' Association
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WTO	World Trade Organization
ZAMACE	Zambia Agriculture Commodities Exchange

1. Pro-poor livestock sector policies and programmes

1.1. RATIONALE FOR THE LIVESTOCK POLICY MENU

Poverty reduction is an ongoing imperative of present-day development policies. Eradicating extreme poverty and hunger, and reducing by half the number of people living on less than one dollar a day are two of the objectives encompassed in the United Nations Millennium Development Goals (MDGs). Growth in agriculture can make a direct contribution to the overall objective of eradicating hunger and poverty because, essentially, three out of every four people in the developing world live in rural areas. This translates into 2.1 billion people living on less than two dollars a day and 880 million on less than one dollar – and most of them depend on agriculture for their livelihoods (World Bank, 2008a).

Within agriculture, the livestock sector constitutes an important engine of growth and poverty reduction. In the first place, a large proportion of the poor keep livestock: preliminary estimates indicate that, to some extent, almost one billion of the world's extremely poor depend on livestock for their livelihoods as a source of food, income, manure, draught power, hauling services, social status, a buffer against risk and a form of savings (FAO, 2008; LID, 1999; Upton, 2004). In addition, growing populations, gains in real per capita income and progressive urbanization fuel the demand for high(er)-value agricultural products, including fruit, vegetables, fish, meat and dairy products, thereby expanding the business opportunities for many livestock farmers (Delgado *et al*., 1999; FAO, 2006). Finally, livestock sector development generates a demand for labour, supports backward and forward linkages (e.g. in the feed and processing industry), and sustains trade balances. It also contributes to better food security through increased supplies (and possibly lower prices) of animal-source food, thereby stimulating economic growth and development[1] (IFCN, 2004; Pica *et al*., 2008).

The livestock sector's potential for reducing poverty and contributing to economic growth has remained largely untapped to date, to such an extent that it is difficult to identify a single developing country where growth in the sector has been unambiguously pro-poor. On the contrary, from a pro-poor perspective, the sector's performance has been unsatisfactory in most developing regions over recent decades. Current national and supra-national policies often pay scarce attention to the livestock sector and overlook its potential contribution to reducing poverty (Byron Nelson, 2005; LID, 1999; Pica-Ciamarra, 2005). For example, over the last 20 years, producers in the developing world have been

[1] Livestock sector development may also result in negative outcomes: animal wastes can pollute soils and water sources; expansion of livestock production is frequently associated with deforestation; some animal diseases may affect human populations; and increased demand for feed grains may lead to unsustainable use of land resources (de Haan *et al*., 2001; FAO, 2006).

unable to satisfy growing local demand for milk and dairy products, as evidenced by sharp increases in import volumes in the majority of such countries (Knips, 2005). A review of 61 (Interim) Poverty Reduction Strategy Papers (PRSPs) concludes that livestock-poverty linkages are by no means appreciated by national policy-makers, as only four PRSPs contained a detailed strategy for livestock sector development in their early versions (Blench *et al*., 2003). Overall, the revision and re-elaboration of prevailing policies/programmes governing livestock sector development appear to be critical for capitalizing on existing opportunities for achieving the MDG objectives in agriculture-based economies.

Box 1. POLICIES AND PROGRAMMES

There are a number of different definitions and understandings of policies and programmes.[2] Policies are here considered as a set of government actions oriented towards a long-term economic and/or social purpose in a broad subject field; they are pan-territorial and permanent, i.e. they cover an entire country and stay in place until a new policy regime is designed and put into effect. Liberalization of animal health services, rules and regulations that allow banks to accept livestock as collateral for loans, and environmental taxes on discharges from livestock may be termed policies. Instead, programmes are defined as actions managed by public or private agents, which are limited in time and resources and involve direct interaction with particular stakeholder groups such as livestock farmers and financial institutions. Examples of programmes include the establishment of drought early-warning systems; establishment of a commodity exchange, and the one-off distribution of vouchers to farmers to purchase livestock services and veterinary supplies at market prices. Programmes, which include 'projects', are often seen as tools for implementing a broader policy and, as such, should be consistent with the prevailing policy framework. In most instances, policies and programmes should go hand-in-hand, because policy reforms only become effective when supportive programmes nurture changes in the way that governments and private-sector institutions/organizations operate.

[2] Policy is "a course or principle of action adopted or proposed by a government, party, business, or individual, etc." (OED, 2006). "Policies [...] constitute the means for implementing a vision" (Norton, 2004). Policies are "the methods used by governments to change the environment" wherein economic agents operate (Ellis, 1992). Policy is "a deliberate act of government that in some way alters or influences the society or economy outside the government. This includes, but is not limited to, taxation, regulation, expenditures, and legal requirements and prohibitions" (Deardorff, 2006). Policy is "very much like a decision or a set of decisions, and we 'make', 'implement', or 'carry out' a policy just as we do with decisions. [...]. In some other ways a policy is not like a decision. The term policy usually implies some long-term purpose in a broad subject field. Sometimes, however, we conceive policy not so much as actively purpose oriented but rather as a fairly cohesive set of responses to a problem that has arisen" (Sandford, 1985). A programme is "a planned series of actions" (OED, 2006). "Programmes are defined as only those [actions] that ... are delivering a service ... and have a well developed plan" (World Bank, 2006). "Programmes are limited in time and resources. They require the active participation of the government (even if the implementation is contracted out to the private sector), and when the funding terminates, the programme ends" (Norton, 2004).

A number of technical manuals deal with specific livestock development issues. These include, for instance, guidelines for epidemiological surveillance in animal health or for the management of transmissible spongiform encephalopathies (Dufour and Hendrikx, 2009; FAO, 2007); the few comprehensive analyses of livestock sector policies/programmes tend to be sector-specific and technical in nature (e.g. Ehui *et al.*, 2003; ILRI, 1995; Jarvis, 1986). Therefore, there are no manuals or guidelines to help policy-makers appreciate the multi-faceted dimensions of the livestock sector or to elaborate approaches to formulating policies/programmes taking account of the economic/institutional context in which livestock farmers arrive at their production and consumption decisions.

The Menu presents a number of practical guidelines and examples to assist policy-makers and development practitioners to (i) view the livestock sector from a broad socio-economic and institutional perspective, and (ii) formulate effective sector policies and programmes that take account of the economic and institutional context in which livestock producers operate.

1.2. FOCUS AND STRUCTURE OF THE LIVESTOCK SECTOR POLICY MENU

Focus has been placed here on direct links between livestock sector development and poverty reduction. These links mainly involve increased production and productivity of livestock producers: a precondition for second-round poverty reduction effects such as employment generation along the supply chain and greater availability of affordably priced animal-source foods. In particular, the Menu:

- reviews and details a key selection of policies and programmes that (aim to) enhance the efficiency and equity of livestock production systems;
- looks both at livestock sector policies/programmes and at public actions in related and cross-cutting sectors – such as credit and environmental policies/programmes – that are critical to ensuring efficient and equitable livestock sector growth.[3]

Efficiency and equity are standard rationales for government interventions in markets (Stern, 1991; Stiglitz, 1989). They also justify policies and programmes in livestock and livestock-related markets:

- Some livestock-related goods and services, such as disease control and prevention, are public goods with the attributes of non-rivalry (can be used jointly by many) and non-excludability (those not paying for the goods also benefit). These goods and services, therefore, are not supplied by the private sector. For instance, no individual farmer will control tsetse flies on open rangelands because the benefits thereby generated will extend to the whole grazier community free of charge. For the supply of public goods, therefore, someone must take charge of organizing collective action. This can be done at various levels, from voluntary cooperation in local communities to compulsory actions legislated by central government in the event such goods, such as for the control of zoonotic diseases, benefit a large proportion of the population.

[3] Economic growth is efficient when scarce resources are allocated to maximize the production of goods and services; it is equitable when it maximizes the benefits to society, which depends both on the quantity and distribution of the goods and services produced among the population.

- The lack of, and asymmetries in, information on many livestock and livestock-related markets may go against the interests of livestock producers. For instance, financial institutions have limited information on farmers' capacity to make remunerative investments and repay loans. But, because acquiring that type of information is prohibitively costly and difficult, if not impossible, loans are usually only offered to farmers able to provide collateral. Many livestock keepers, therefore, are unable to capitalize on profitable investment opportunities because they are 'credit-rationed'; this results in a net loss to society as a whole. To correct this type of market failure, there is a need for increasing the quantity/quality of information to stakeholders, for instance, by establishing credit bureaus and marketing information systems.
- Some livestock production activities generate externalities. These occur when the actions of some actors in the livestock production chain benefit or harm other actors, but without the benefits being paid or the damage compensated for. For instance, a farmer who immunizes his/her animals against a contagious disease also reduces the risk of infection among other farmers' animals, thereby generating a positive externality. However, since the farmer is not remunerated for that positive externality, he/she might 'under-vaccinate'. The result would be an under-supply of goods that generate positive externalities, whereas the opposite occurs for goods generating negative externalities. In these cases, government is expected to step in and support the production of goods that generate positive externalities (e.g. through subsidies) and prevent the excessive 'supply' of goods generating negative externalities (e.g. through taxes).
- Government activities aimed at supplying public goods, reducing information gaps and managing externalities make for more efficient use of productive resources. However, even in well-functioning markets, the distribution of income is not necessarily socially desirable. This typically happens when economies of scale and transaction costs are large: the former occurs when the average cost of production decreases with output quantity; the latter are indirect costs that reduce the profitability of market exchanges such as travel, time and paper costs. The implication of both is that some private goods will not be available on the market, at prices consumers are willing to pay, unless there is some degree of support from the public sector. For instance, despite livestock keepers being willing to pay a given price for concentrate feed, such feed may not be available on the market because the high fixed production/transaction costs in sparsely populated rural areas reduce private investors' profits. Thus, even in 'efficient' markets, economies of scale and transaction costs can lead to socially undesirable outcomes that justify government intervention, for instance, through provision of key infrastructure or fiscal advantages to stakeholders operating in remote rural areas.

Policies/programmes that address efficiency and equity issues only in the livestock domain are, however, insufficient to promote sustainable livestock sector growth. The development of the sector also depends, and often in a critical manner, on non-livestock sector policies/programmes at the macro and agricultural sector levels, such as monetary, trade and rural credit policies. For instance, public action focusing exclusively on improving

animal breeds and the quality/coverage of animal health services, may have little chance of success unless farmers also have access to feed, labour, water and other inputs, as well as to output markets. What are the incentives for livestock keepers to keep high-quality livestock breeds if they have limited access to the feed necessary to raise them? Who will they sell their surplus meat or milk to if they lack access to remunerative markets?

A comprehensive livestock sector policy agenda should view livestock farming from a broader perspective, and take account of the multiplicity of elements necessary to sustain the sector's development. Such an agenda could be subsumed into three major components aimed at assisting farmers in: (i) managing the basics of livestock production; (ii) enhancing livestock productivity and competitiveness; and (iii) sustaining livestock productivity and competitiveness (Dorward *et al*., 2004a; 2004b; Pica-Ciamarra, 2005).

- Policies/programmes to assist farmers in 'managing the basics of livestock production' are public actions that both provide livestock keepers with adequate and secure access to basic production inputs, such as land, feed and water for animals, and help them to cope with risks and shocks such as natural disasters and price swings. While secure access to basic production inputs and to risk-coping mechanisms are preconditions for engaging in production, they are not sufficient for livestock keepers to produce market production surpluses and rise out of poverty.
- Policies/programmes aimed at enhancing livestock productivity include all actions intended to facilitate farmers' access to animal health services, credit and output markets – both national and international – all of which are critical for farmers to generate and market production surpluses and for improving livestock's contribution to household incomes.
- In order to avoid being forced out of the livestock sector, farmers must be able to respond and adapt to changing market conditions and consumer demand. Policies/programmes that aim to sustain livestock productivity and competitiveness include research, environmental protection and all other public actions necessary to support the sustainability and competitiveness of livestock farmers in the medium to long term.
- For each of these three components, the Menu details a variety of complementary and/or alternative livestock-related interventions, including land, risk-coping, animal health, credit, marketing, trade, research, and environment policies/programmes. The Menu describes the rationale of each policy/programme; reviews the role of the public and private sectors in their formulation and implementation; identifies major implementation issues; and presents a country case study. Table 1 lists the policies and programmes presented in the Menu.

Table 1: STRUCTURE OF THE LIVESTOCK SECTOR POLICY MENU

Development domains		
Managing the basics	**Enhancing livestock productivity**	**Sustaining livestock productivity**
Land policies & programmes	Animal health policies & programmes	Research policies & programmes
State-led land reallocation	Decentralization	Decentralization
Market-driven land reform	Cost-recovery of animal health services	Matching research grants
Regulation of land rental markets	Joint human-animal health systems	Levy-funded research
Land titling	Subcontracting	Competitive research funds
Recognition of customary land tenure	'Smart subsidies' to private service providers	Strengthening intellectual property rights
Land co-management	Community animal health workers	Participatory livestock research
	Membership-based organizations	
	'Smart subsidies' to livestock farmers	
Risk-coping policies & programmes	Credit policies & programmes	Environmental policies & programmes
Livestock insurance	Portfolio diversification and flexibility	Controlled grazing
Early warning systems	Livestock as collateral for loans	Co-management of common pastures
Contingency plans	Warehouse receipt system	Livestock zoning
Emergency feeding	Mobile banking	Discharge quotas
Grazing reserves	Branchless banking	Payments for environmental services
De-stocking	Member-based financial institutions	Marketing of environmental goods
Re-stocking	Credit bureaus and scoring	Environmental taxes
	Marketing policies & programmes	
	Livestock trader associations	
	Livestock brokers or commission agents	
	Periodic markets	
	Market-oriented farmer associations	
	Contract farming	
	Market Information systems	
	Commodity exchanges	
	Trade policies & programmes	
	Export support measures	
	Import restriction measures	
	Export restriction measures	
	Sanitary and phytosanitary standards	
	Disease-free export zones	
	Commodity-based trade	
	Trade-enhancing infrastructural investments	
	Quarantine zones	

2. Managing the basics of livestock production

If livestock keepers are to engage in production activities, they must have adequate access to land, water and feed (and, of course, livestock). At the same time, if they are excessively vulnerable to risks (e.g. drought) that affect their assets and returns, they may follow a conservative production strategy (e.g. be slow to adopt technology) and respond poorly to market opportunities and public policies. Governments must therefore:

(a) ensure that livestock farmers have access to land, water and feed for their animals (land policies);
(b) ensure that livestock farmers have access to mechanisms to cope with natural disasters and price shocks (risk-coping policies).

2.1. LAND POLICIES AND PROGRAMMES

Secure access to production land and water is critical to livestock farmers. Animals are fed with crop residues and stubble in mixed crop-livestock production systems, and with grass and shrubs on rangelands. Land availability does not have a significant effect on production/productivity in intensive industrial production systems and peri-urban areas, because the livestock are mainly given compound feed.

Farmers and pastoralists may have access to land and water under diverse and complex tenure systems (FAO, 2002a; 2002b; World Bank, 2003):

- Private property rights: the land (water point) is assigned to an individual, household or corporate body with exclusive rights to make (or not make) productive use of, mortgage, sell, subdivide and lease the land for any lawful purpose.
- State property rights: the land (water point) is assigned to a public-sector authority. The state may manage the land directly, or grant or rent it to a community or household.
- Communal property rights: the land (water point) is assigned to a community, the members of which have the right to use, and/or exclude others from using it. Common land is often held in customary regimes and managed under traditional practices.
- Open access: land (water) rights are not assigned exclusively and no one may be excluded from using the resource. Examples here include marine tenure, where access to the high seas is generally open to all, and some rangelands and forests.

Most land tenure systems are present in all countries, including common grazing rights and water reserves, private agricultural holdings and state ownership of forests. *A priori*, no system is superior to another in terms of its contribution to agricultural/livestock production and social welfare, excluding the open-access land tenure systems often associated with resource overexploitation. Indeed, it is not the system of land tenure that matters so much as the adequacy and security of tenure that allow for efficient and sustainable use of resources.

Adequate access refers to the quantity of land that allows livestock farmers to feed their animals regularly and adequately. There is no optimal ratio between land availability, agricultural production and livestock stock, as this depends on household endowments, agro-ecological conditions, production technology, non-farm labour opportunities, institutional infrastructure and, in general, the level of development of a region/country. Secure access means that the economic agent's land rights are socially recognized and legally enforced if challenged. This implies the existence of a functional and updated land cadastre system (formal or informal) and of an effective judicial system (formal or customary) to resolve land disputes. It has been shown that security of tenure encourages long-term land-fixed investments in physical/human capital and reduces the mismanagement of assets. Therefore, it has a positive impact on household welfare. For instance, if a household agreed to a one-year rental contract, it would have no incentive to plant long-term gestation trees and might prefer investing in movable assets such as livestock. But investing in livestock might not be the most rewarding investment.

When agricultural land is not a scarce resource, there is no demand for land policies, i.e. rules and regulations governing rights to access and use of agricultural land. Indeed, anyone could gain access to sufficient land for production purposes. Historically, however, economic and institutional dynamics have increasingly contributed to inefficient and inequitable land tenure systems, thereby constraining livestock production and productivity. Nowadays, therefore, land policies are enacted to ensure equity and efficiency, with the objectives of both improving rural households' access to land and stimulating greater efficiency in allocating productive resources.

Land policies are beyond the control of any livestock department/ministry and, because such policies involve changes in power structures in rural areas, they must be supported at the highest level of government. However, livestock departments/ministries may: advocate the enforcement of existing land tenure laws and regulations (still not applied in many countries); contribute to drawing up land titling programmes; recognize customary land tenure in arid and semi-arid areas; and lead land co-management schemes aimed at reducing the conflicts that arise when a multiplicity of users, including livestock farmers, have access and user rights over the same agricultural/grazing area. Table 2 identifies major land policies and programme options available to decision-makers, which are reviewed in the following sections.

Table 2. LAND POLICY AND PROGRAMME OPTIONS

2.1.1	State-led land reallocation
2.1.2	Market-driven land reform
2.1.3	Regulation of land rental markets
2.1.4	Land titling
2.1.5	Recognition of customary land tenure
2.1.6	Land co-management*

* May be implemented by livestock departments/ministries

Credit: ©FAO/10816/A. Wolstad

2.1.1. State-led land reallocation

When there is unequal distribution of land rights and the demand for land remains unmet, one option for policy-makers is to launch a government-driven land reallocation programme or agrarian reform. Basically, this means that a central authority forcibly dispossesses large landowners of their land and redistributes it to selected beneficiaries who, either individually or collectively, cultivate it (Ghose, 1983; World Bank, 2003). State-led land redistribution programmes are non-market mechanisms (expropriation) for reallocating resources; they usually target settled farmers and involve:

- identifying the agricultural area to be expropriated and redistributed – this will be possible only when an updated, functional land cadastre is available;
- establishing criteria for assessing land values, and drawing up a compensation schedule for landowners; compensation is usually in the form of interest-bearing bonds, with cash seldom exceeding 20 percent of the fixed price of land;
- establishing how much (if any) landowners will be allowed to retain and how much will be granted to each beneficiary household;
- in accordance with established criteria, selecting the beneficiaries who will either receive the land free of charge or will be required to repay it to government (often benefiting from loans on favourable terms);
- establishing an institutional mechanism for reallocating land, setting out responsibilities for identifying land suitable for expropriation, establishing land values, selecting beneficiaries, issuing and distributing land titles, and managing financial outflows/inflows.

State-led land reforms have not always been successful to date. This is because of the following:

- They ultimately change the pattern of wealth distribution in rural areas and thus lead to fierce opposition from landowners, who often boast of being closely connected to government or are themselves the legislators. The few successful programmes have been implemented by governments with no political connections among the rural

bourgeoisie, and sufficiently quickly to ensure that large landowners would not be able to set up opposing coalitions and/or find legal or quasi-legal ways of bypassing the programmes.

- The land valuation process and selection of beneficiaries can lead to endless debate and often involve court rulings, which makes for very lengthy programme implementation.
- Large-scale state-led land reforms are costly (expropriation) and difficult, if not impossible, for most developing country governments to finance. However, as such reforms are one-off interventions, they do not call for continuous government spending.
- Beneficiaries are often unable to set up productive farms because, although they might have received some productive land, they lack both management expertise and access to other productive inputs. Successful agrarian reforms have been carried out in countries where an efficient system of extension services was already in place and smallholders had access to seeds, fertilizer and other productive inputs.

Box 2. STATE-LED LAND REDISTRIBUTION IN JAPAN

Prior to the Second World War, Japanese farmlands were cultivated by 5.5 million peasant households, one third of which were tenant cultivators (kosaku) working small, rented plots. In the aftermath of the war, when the country faced starvation, the Government implemented a drastic land reform programme to redistribute farmland and eliminate the tenant/large landlord system. The land reform, carried out in 1946-1950, was structured around six components: (i) farmland owned by absentee landlords was subject to compulsory purchase; (ii) tenanted land in excess of 1 ha belonging to village landlords was subject to compulsory purchase; (iii) owner-cultivated land in excess of 3 ha (12 ha in Hokkaido) was subject to compulsory purchase; (iv) purchase prices were calculated by multiplying the rental value by a fixed factor; (v) payments to landlords were made in national bonds bearing an interest of 3.6 percent and redeemable within 30 years; and (vi) in all cases, the land was purchased directly by the Government based on a plan drawn up by village land committees with the approval of the prefecture land committee.

The Japanese land reform is seen as one of the most successful worldwide: (i) it was implemented under the guidance of the Allied Powers, which were running the country at the time and had no connection with landlords; (ii) it was implemented rapidly (in 1946-1950); and (iii) it involved no changes in agricultural production technologies because the land was transferred to the tenant cultivators, without changing the farm structure. Overall, agricultural production boomed, and the distribution of income within rural society was largely equalized.

Source: Kawagoe, 1999.

2.1.2. Market-driven land reform

Whenever land property rights are unequally distributed and demand for land for production purposes remains unmet, one option for policy-makers is to carry out a market-based, market-driven or negotiated land reform programme that stimulates voluntary land-market

transfers based on negotiation between small buyers and large sellers. The role of government is restricted to establishing the necessary framework to trigger exchanges of land property rights (rather than buying and distributing/selling the land directly). Voluntary land transfers, whereby only efficient farmers are willing buyers and only inefficient producers are willing sellers, are expected to increase agricultural productivity. Market-based land reform programmes target settled farmers, bypass pastoralists and do not contemplate the establishment of collective farms (Borras, 2003; Borras *et al.*, 2008; Deininger, 2001). Such programmes call for the following:

- Identifying areas where land property rights are unequally distributed, and where there is a potential market for land (demand and supply). These areas might cover an entire country, but market-based land reform programmes are usually confined to limited regions.
- Providing incentives for large farmers to sell (part of) their land, such as ratifying fiscal laws that make hoarding land for non-production purposes unprofitable, or enforcing a progressive land tax system that favours small rather than large farms.
- Stimulating demand for land by, *inter alia*, providing financial assistance to selected beneficiaries. In general, beneficiaries are expected to draft a farm development plan with the assistance of local government officers, NGOs and grassroots organizations. They then receive a combination of grants and loans from the public and private sectors to negotiate purchases of land from willing sellers, assisted by community and local government officers.
- Providing start-up funds and technical assistance from the public and private sectors for beneficiaries to set up self-sustainable agricultural farms.

From the late-1990s, market-driven land reform programmes have been implemented in northeastern Brazil and in Colombia and South Africa. In this regard, the main implementation concerns are as follows:

- There is a pressing need for institutional infrastructure to implement market-driven land reform programmes, including strong national and local governments, presence of NGOs and grass-roots organizations in rural areas, and a private sector willing to invest in small farms.
- Public policies that make hoarding of land for non-production purposes unprofitable are often impossible to enforce owing to institutional weaknesses and pervasive patron-client relationships in rural areas.
- The demand for land is typically much greater than any government can afford to support. In addition, the supply is often limited because large landowners are willing to sell only unproductive and/or marginal land.
- It is difficult to quantify the cost of such programmes because the actual price of land is not often known owing to the absence of a land market before their inception. Furthermore, grants to buyers must cover both the full market price of the land and the start-up and working capital costs of the initial years' farming; these differ from farm to farm and from farmer to farmer.
- Market-driven land reforms are not necessarily pro-poor. This is because, in order to be qualified as beneficiaries, rural dwellers are required to draw up farm development

plans if they are later to receive funds (also) from private investors. The very poor are often incapable of preparing such plans, although they receive help to do so from NGOs, farmer associations and local government officers.

Box 3. MARKET-DRIVEN LAND REFORM IN COLOMBIA

Colombia is characterized by a highly dualistic distribution of land ownership, the roots of which can be traced back to colonial land grants (*encomiendas*). Since 1961, several land reform programmes have been led by the National Land Reform Institute (INCORA). For three decades, all attempts at land reform, mainly consisting of partial land expropriation and colonization of the agricultural frontier, were largely unsuccessful. In 1996 the Government, backed by a World Bank loan of US$1.82 million, funded a technical unit to draft and lead a pilot programme for market-based agrarian reform, which was designed and implemented as follows. (i) Municipios drew up a land reform plan identifying the potential availability of, and demand for, land. The potential availability was estimated by reviewing land cadastre data. As to the potential demand, households were required to complete questionnaires to provide basic information on their educational level, agricultural experience (if any), income sources and access to government services. The questionnaires were then used to select potential beneficiaries; the names of accepted/rejected beneficiaries (indicating the reasons for rejection) were posted publicly. (ii) Training courses in farm management for beneficiary households, funded by INCORA. (iii) Selected beneficiaries received 70 percent of the land price, inclusive of start-up costs, as a subsidy and 30 percent as loans from private financial institutions at commercial interest rates. In particular, the municipios were required to identify financial institutions willing to provide credit to land reform beneficiaries, and to draw up lists of qualified technical assistance providers for beneficiaries to choose from and enable them to use the portion of their land purchase grants earmarked for that purpose.

There are conflicting views about the success or otherwise of Colombia's market-driven land reform programme. Deininger *et al*. (2004) argue that the sales market has been more effective in transferring land to the poor than previous government-led land reforms; Mondagrón (2005) contends that land market transactions have been limited, with medium-scale farmers selling low-quality land to poor people. In general, the evidence of market-assisted land reforms worldwide is very mixed, and the overall consensus is that results have fallen short of expectations.

Sources: Borras, 2003; Deininger, 2001.

2.1.3. Regulation of land rental markets

Farmers often lack secure access to land because no written, registered and legally recognized document specifies their rights over agricultural land. Under such circumstances, producers are not willing to invest in land-fixed assets such as boreholes and fences because they are afraid they will not be able to reap the benefits of their investments (if, for instance, they are evicted). Therefore, even though returns would be higher from land-fixed

Credit: FAO/ 12004/T. Fenyes

investments, they prefer to invest in movable assets. One policy instrument to increase land tenure security – and hence agricultural production and productivity – is regulation of the land rental market, namely, the establishment of a legal and judicial system to regulate and enforce tenancy relationships formally (Pica-Ciamarra, 2004; Sadoulet *et al.*, 1998; World Bank, 2003). The regulation of land tenancy contracts calls for the following:

- The existence/establishment of an efficient land cadastre that records not only land ownership titles but also land rental contracts.
- The provision of financial and economic incentives for both landlords and tenants to register rental contracts formally. Such incentives may include reduction of paper costs to register contracts, reduced taxes on rented land, etc.
- Unambiguous rules and regulations on the rights and duties of both tenants and landowners, to be included in all rental contracts to ensure that the contracts entered into are fair and just. For instance, contracts should stipulate that tenants will not be evicted during the crop-growing season, thus ensuring that landlords do not unfairly acquire the entire harvest.
- An equitable and affordable judicial system in order for tenants, who are the weaker contracting party, to sue for breaches of contract and question patron-client relationships.

The regulation of rental markets has proved difficult, for a number of reasons:

- Setting up an efficient land cadastre to record land property rights is a daunting task for many developing country governments; recording rental contracts may also be prohibitively demanding.
- The costs of registering contracts are often high, both directly (e.g. paper, fees, bribes) and indirectly (transport, time).
- As tenants are mostly unaware of their rights, they rarely sue landlords: patron-client relationships loom large in rural areas; judicial procedures are intimidating and costly; and the administration of justice is seldom impartial.
- Governments tend to overregulate tenancy arrangements, for example, by fixing rental ceilings and contract duration, etc. The parties involved may be less inclined, therefore, to register contracts and instead look for ways to bypass the law. In some cases, tenancy regulations have prompted landlords to engage in mass evictions of tenants, thereby reducing security of tenure.

Box 4. REGULATION OF RENTAL MARKETS IN WEST BENGAL, INDIA

Under the 1949 Constitution, all Indian states were empowered to enact and implement land reforms aimed at improving both access to land and security of tenure for farmers. Since then, between them, the states have passed more than 80 land legislation acts. However, as many state legislatures were controlled by the landlord class, reforms have often been partial and most states have failed to change the land tenure system in any significant manner. The State of West Bengal is one exception here. In 1977, the State Government launched the so-called Operation Barga, a programme designed to implement and enforce agricultural tenancy laws that had previously never been enacted, in order to provide security of tenure to sharecroppers. Under these laws, once they have registered with the Department of Land Revenue and as long as they supply at least 25 percent of output as rent to the landlord, tenants are entitled to permanent, inheritable tenure on the land they sharecrop. To make the law effective, the State Government launched a massive, well-publicized village-to-village campaign to convince tenants to register their contracts: local government officials travelled to rural areas, met with sharecroppers, explained the laws, and gave them an opportunity to register their contracts on the spot. At the same time, the State Government simplified procedures for registering tenancy contracts, empowered village political organizations to ensure that landlords did not intimidate their tenants, and ensured that sharecroppers registering contracts did not suffer retaliation from landlords and that contract disputes would be handled fairly by the judicial system.

Operation Barga is considered to be a success. By 1993, more than 65 percent of an estimated 2.3 million sharecroppers in West Bengal had registered their tenancy contracts, with a significant improvement in the terms of contracts and increased security of tenure. Agricultural productivity has increased more rapidly in West Bengal than in any other Indian state.

Sources: Banerjee *et al.*, 2002; Besley and Burgess, 2000.

2.1.4. Land titling

Farmers seldom have secure access to the land they work owing to the absence of written, registered and legally recognized documents that guarantee access and user rights. Land titling programmes set in train the process of demarcating, adjudicating and registering property rights within a community, thereby providing both security of tenure to (livestock) farmers and investment incentives. As a general rule, land titling programmes target individual/community farmlands and are more to the benefit of settled farmers and agropastoralists than to pastoral populations (Feder and Nishio, 1999; Jacoby and Minten, 2007; Platteau, 2000a). Land titling programmes call for the following:

- Identifying and demarcating land areas for which land property titles are to be issued. This does not necessarily involve the entire agricultural area of a country but may be confined to specific regions/districts.
- Establishing criteria whereby farmers can prove their rights over the land, and procedures for registering it and receiving title thereto. The more simple and inexpensive the procedures are for farmers – who usually have limited financial and human resources – the greater the chances of success.
- Once applications have been received, government should verify and measure land parcels, and ensure that all action is taken to demarcate landholdings legally and physically, such as placing concrete boundaries on plots and issuing property titles.
- Given the complexities of defining and establishing private land property rights, any application for title should be publicized to allow individuals to oppose possible adjudications.

Designing and implementing land titling programmes may be challenging, for a number of reasons:

- In several countries, land is rarely under a single management system; it is therefore difficult to bring the complex bundle of rights attached to a specific land parcel to the adjudication register.
- Titling procedures are often cumbersome and costly, making it difficult for smallholders to obtain title to land. Complex titling procedures may even reduce the security of tenure for some categories of people, such as women, pastoralists and members of minority tribes, who traditionally enjoy subsidiary or derived (usufruct) rights over agricultural land.
- At times, farmers have bought land (title) and been provided with non-grant loans for the purpose. However, often farmers have been unable to repay their loans and title has been withheld.
- Empirical evidence shows that there is a poor correlation between land titling and investments or land yields, or between land titling and access to financial services. This suggests that land titling programmes should be accompanied by other types of public action that will enable them to contribute to increasing agricultural growth and reducing poverty levels.

Box 5. LAND TITLING PROGRAMME IN CAMEROON

In order to promote a more rapid and inclusive growth of the agricultural sector, in 1974, the Government of Cameroon adopted the Lands Ordinance, one of the main components of which was a land titling programme aimed at establishing Western-style private property rights in rural areas. The land titling process was, however, prohibitively costly for farmers because eligible applicants were required to have already invested in their land (*'mise en valeur suffisante'*) and to pay a variety of legal and unofficial fees before receiving the land title. The majority of titles were therefore awarded to better-off people living in urban and peri-urban areas rather than to rural households, although some poor farms managed to benefit from the Land Ordinance. Because local administrators also accepted land titling applications from farmers who had not made large investments in their land, many of them simply initiated the titling process, paid state agents to place concrete boundary markers on their land and did not thereafter complete the application process, which was prohibitively costly. The concrete markers did not confer formal property rights but were accepted as evidence of an applicant's effective occupancy and ownership of the land, thereby providing some degree of tenure security.

Although Cameroon's land titling programme can hardly be seen as successful, it contributed to increasing land tenure security for traditional smallholders. However, whereas security of tenure with no formal title provides investment incentives for smallholders, it does not allow them to use their land as collateral for loans.

Source: Firmin-Sellers and Sellers, 1999.

2.1.5. Recognition of customary land tenure

Customary tenure arrangements are characterized by a multiplicity of rights over land by a multiplicity of individuals. These rights are based on overarching ritual and customary relations with the land, and typically include: (i) community 'rights' of control over land (often delegated to traditional leaders); (ii) kinship or territory-based criteria for land allocation; (iii) community-based rules that regulate land access by non-community members; and (iv) a general principle of reversion of unused land to community control. Customary tenure arrangements have long been considered inefficient – particularly because of coordination problems among users and the ensuing risk of resource overexploitation – and have rarely received official recognition from the state. Recent studies, however, have shown that communal tenure arrangements: 1) are not necessarily associated with resource mismanagement; 2) do not reduce investment incentives; 3) provide security of tenure to group members at a relatively low cost; and 4) are not ambiguous and are sufficiently flexible to adjust to evolving socio-economic relationships (Fitzpatrick, 2005; Platteau, 2000a; Tanner *et al*., 2009). Recognition of customary land tenure rights by government involves the following:

- Simple recognition of customary tenure, whereby certain areas are described in the land registry as 'customary land'; government only identifies and enforces external boundaries, without issuing land property titles. Traditional practices continue to regulate access to land for both community members and other actors.

Credit: © FAO/6077/H. Null

- Recognition of customary tenure rights provided the land is managed by non-political entities composed of community members in consultation with local governments and/or other stakeholders, without issuing land property titles. This approach aims both at recognizing customary land tenure and at integrating community concerns into local development/investment plans.
- Recognition of customary land tenure rights through issuing a property title in the name of a legal entity representing all community members. For this to be feasible, the entity should have a clear objective; there must be unambiguous rules for membership, clear administrative procedures and an effective dispute-settlement mechanism.
- Recognition of customary land tenure rights through issuing individual property titles that provide community members with share rights over the land. Characteristics of the rights attached to each share should be specified (e.g. Can shares be sold? Can be they used as collateral?).

For several reasons, any attempt to recognize customary land tenure rights may well fail. These include:

- difficulties in identifying and defining communal land tenure systems owing to 'fuzzy' boundaries of grazing/common agricultural areas and the presence of a multiplicity of users with different types of access and user rights over the land;
- difficulties in establishing a legal framework that consistently includes the various rights over land, often because dominant Western-style laws and procedures do not clearly represent the intricacies of customary tenure;
- time-consuming, over-complex or poorly conceived procedures, as well as a lack of incentives for the community to gain legal title to land;
- community imperfections may lead to reduced efficiency and equity; for instance, when recognition of customary tenure requires the establishment of a formal entity within the community, some members may retain surplus land for themselves and leave others short of it;
- communities may not necessary benefit much from recognition of community land tenure because, being poor and unskilled, they are unable to improve management practices and/or set up profitable contracts with external public-/private-sector organizations.

Box 6. RECOGNITION OF CUSTOMARY LAND TENURE IN BOTSWANA

At independence (1966), customary land tenure in Botswana comprised 79 percent of all agricultural areas. The land was allocated and reallocated in accordance with traditional chieftaincy practices which, being based more on social than economic rationales, were unable to provide incentives for community investments in agricultural land. In 1968, with the aim of increasing crop and livestock production/productivity, the Government passed the Tribal Land Act. The Act identified and demarcated tribal lands and entrusted responsibility for the allocation and overall management of tribal lands to local land boards – non-political bodies composed of members elected and nominated in the following manner: (i) the tribal chief/subchief is an *ex officio* member; (ii) one member is appointed by the tribal chief; (iii) two members are elected by the district council from among the councillors; and (iv) four to six members are appointed by the Ministry of Local Government and Lands. The land boards' primary duties are to demarcate land parcels, lease parts of the land directly to the community and/or to subgroups or individuals, collect leasehold rents, regulate non-community members' access to common land, resolve potential disputes and, more in general, implement government policies for land use and planning. Land boards are not authorized to sell the land and tenants are allowed to keep it as long as they use it for the original purpose.

Botswana's is one of the most progressive land tenure systems in sub-Saharan Africa, which has certainly contributed to its steady economic growth, but the lack of human resources, coupled with population growth, make it increasingly difficult for land boards to perform their functions. In 1998, therefore, the Government drew up the National Settlement Policy to promote the development of rural areas by creating infrastructural and market links between different rural settlements, thereby ensuring more productive use of agricultural land.

Sources: Adams *et al.*, 1999; Botswana, Government of, 1998.

2.1.6. Land co-management

Conflicts over land often occur when a multiplicity of users claim to have formal/informal access and user rights over the same agricultural/grazing areas – e.g. settled farmers and herders claiming exclusive access to agricultural land in semi-arid areas; and hunters, farmers and pastoralists, who all exercise rights over national parks and game reserves. Under these circumstances, land co-management is emerging as a popular strategy for efficient and sustainable land use without conflicts. The assumption is that some degree of complementarity may exist between the different objectives of various land users, who may therefore establish and enforce win-win rules and regulations for joint land use and management (CEESP, 2002; SA-PPLPP, 2009; WRI, 2005). The public sector is expected to support the process of establishing land comanagement schemes. This involves the following:

- Identifying and demarcating the land area to be co-managed, and acknowledging the different groups of users claiming rights over the resource.
- Establishing a participatory process, perhaps led by a local representative committee, to define the rights and duties of different stakeholder groups. Decentralized govern-

Credit: ©FAO/10475/A. Wolstad

ment agents and local governments may need to be trained to facilitate and supervise participatory processes.

- Since all stakeholders should have an equal voice in the process leading to definition of co-management rules, when necessary, government should provide adequate training and support to key stakeholders and, in particular, marginalized groups.
- Setting up an institutional and regulatory infrastructure to facilitate both enforcement of endogenous co-management rules and interactions with non-resource users. For instance, the state may ensure that local co-management rules conform to prevailing environmental laws and that user committees act legally on behalf of the entire community.

Land co-management policies and schemes have, however, proved difficult, for a number of reasons:

- Participatory processes involving a variety of stakeholder groups are time-consuming and unpredictable: it is extremely difficult to mediate tensions between individual and collective interests and to achieve consensus on land co-management rules and regulations.
- Even when land co-management rules have the agreement of all stakeholder groups, formal/informal coordination mechanisms often prove to be weak on the ground, particularly when non-financial incentives for users are not sufficiently appreciated (e.g. democracy, pride, sense of ownership).
- Successful land co-management schemes paradoxically generate new tensions and conflicts associated with increased land values, i.e. their long-term sustainability may be at risk.
- Many developing country governments lack the capacity to facilitate participatory processes related to land co-management, i.e. they themselves require a degree of training. This makes land co-management a long-term policy option unless, as is often the case, external agents (e.g. NGOs) are involved in the process.

Box 7. LAND CO-MANAGEMENT IN NORTHERN BURKINA FASO

Kishi Beiga is a vast pastoral zone situated in the extreme north of Burkina Faso. Its population comprises several sedentary and semi-sedentary ethnic groups, as well as seasonal transhumant herders from neighbouring regions. In the 1980s, environmental degradation was generating increased competition for land between settled farmers and pastoral peoples, which often ended in violent conflicts. The German Agency for Technical Cooperation (GTZ) launched the Burkina Sahel Programme (PSB) in Kishi Beiga in 1991, with the objective of reducing desertification and promoting sustainable use of agricultural land. In its first phase, PSB facilitated the establishment of participatory village land-use management committees (CVGTs) responsible for identifying options first to reduce and then to reverse the desertification process. These options included the digging of dykes, tree planting and, in general, the so-called *mise en défens*. However, these committees tended to give precedence to settled farmers rather than to pastoralists, with many of the proposed options benefiting only the former and/or indirectly damaging the latter. Ultimately, the CVGTs were unable to reverse the land degradation process to any significant extent or to resolve conflicts between the farmers and pastoralists. PBS therefore supported the establishment of 25 consultative committees comprised of representatives of pastoralists and farmers, and facilitated and guided initial meetings and discussions. By concentrating on resolving conflicts and promoting the sustainable use of resources as their primary objectives, the consultative committees gained the trust of both farmers and pastoralists, and began to formulate development plans for Kishi Beiga. Rules and regulations regarding the farmers'/pastoralists' use/maintenance of trees and water points were agreed jointly; microprojects that were both environment-friendly and profitable for both stakeholder groups were also implemented.

Overall, PSB (which ran for about eight years) proved effective in slowing down and reversing environmental degradation, and contributed to reducing poverty in the pastoral zone of Kishi Beiga. However, positive interaction among local people was only possible thanks to the support of an international actor (GTZ). The question remains, therefore, as to whether such processes could have been driven by national and local governments, which are not often perceived as neutral by the stakeholders concerned.

Source: Banzhaf *et al.*, 2000.

2.2. RISK-COPING POLICIES AND PROGRAMMES

Economic and natural shocks regularly affect developed and developing countries alike. Economic shocks include fiscal and balance of payment crises, more or less sudden swings in international terms of trade, import surges and so forth. Natural shocks involve droughts, floods, storms, outbreaks of animal disease, and the like. Economic and natural crises hurt both the poor and the better-off, but are far more devastating for those who are already poor (Skoufias, 2003; World Bank, 2001).

Sound fiscal and monetary policies, sustainable government budgets, prudent regulation of financial activities and effective corporate bankruptcy legislation are necessary to

prevent and contain economic crises. But these types of instruments are not available to livestock policy-makers. The poor are also stricken by relatively small market dynamics such as seasonal meat/milk price fluctuations. Governments are not expected to be directly involved in coping with such fluctuations, which often just indicate the presence of a frictionless, well-functioning market and/or are the results of characteristics/failures of demand and supply patterns (Conforti, 2004). On the other hand, decision-makers in the livestock sector are in a position to help livestock farmers to cope with severe and often unexpected natural shocks.

Natural disasters have a particularly devastating impact on livestock operators: in Morocco, 26 percent of all cattle and 30 percent of the sheep died or were prematurely sold during the 1981-82 drought (Oram, 1998). In 1998, outbreaks of Rift Valley fever were triggered by torrential rain in most of East Africa, including northeastern Kenya, southern Somalia and the United Republic of Tanzania; thousands of livestock were affected and a survey in Garissa District, Kenya, reported losses of about 70 percent of all sheep and goats, and 20-30 percent of the cattle and camels (CDC, 1998). Beyond their direct destructive impact on livestock numbers, natural disasters also indirectly affect the livelihoods of livestock farmers. First of all, livestock farmers take production decisions in order to mitigate the possible negative impacts of natural disasters, including livestock accumulation, regular and opportunistic herd movements depending on rainfall patterns, breed and species diversification, and herd dispersion between community members.[4] These strategies are associated with a loss in production/productivity as they constrain the investment decisions of livestock keepers who may, for instance, refrain from investing in highly productive non-drought-resistant breeds. Second, once livestock farmers sense that a shock is approaching, they typically dispose of their herds and leave themselves with few animals. As a result, they may not be able to take advantage of potential market opportunities in the aftermath of a shock (Hazell, 1999). Finally, both during and in the aftermath of natural disasters, input/output market prices become variable and unpredictable, making it difficult for livestock farmers to take 'rational' consumption and production decisions. Therefore, if livestock keepers were less vulnerable to natural shocks, there would be both social and efficiency gains.

Because they are poor and lack sufficient resources, poor livestock keepers are unable to cope alone with the detrimental impacts of natural shocks. At the same time, markets (private institutions) are unwilling to provide livestock farmers with either *ex ante* or *ex post* risk-coping mechanisms. *Ex ante*, it is rarely profitable for private agents to provide livestock keepers with insurance: (i) natural disasters can be devastating, as they affect widespread areas and most insurers are unable to diversify their portfolios sufficiently to avoid going bankrupt when a shock strikes; (ii) since livestock management is key to mitigating losses from natural disasters, bad managers have more incentive to subscribe an insurance policy, and private insurers rarely have enough information and resources to

[4] These traditional risk-coping mechanisms are becoming less and less effective. On the one hand, growing human populations accompanied by more animals reduce the relative abundance of natural resources; on the other hand, the expansion of agriculture from semi-arid into arid areas and a general tendency to establish private property rights over land constrain the mobility of pastoral people.

screen *a priori* thousands of small livestock farmers (e.g. 'bad' and 'good' managers) to be sure of issuing insurance policies only to the 'good' ones; and (iii) once livestock keepers acquire an insurance policy, they may well adopt less reliable production technologies or simply move to areas of higher risk. *Ex post*, i.e. after the shock, livestock keepers might have lost most of their herds and, with no savings and/or assets, be unable to participate in most market transactions. In particular, they will be 'rationed' on the credit market and lack the resources to rebuild their herds without subsidies.

In view of the foregoing, there are several rationales for the public sector to help livestock farmers cope with natural disasters. Table 3 gives a number of policy and programme options available to governments/development agencies to mitigate the negative impact of natural disasters on livestock assets.

Table 3. RISK-COPING POLICY AND PROGRAMME OPTIONS

Preparation – *ex ante*	
2.2.1	Livestock insurance*
2.2.2	Early warning systems*
2.2.3	Contingency plans*
Mitigation – during	
2.2.4	Emergency feeding*
2.2.5	Grazing reserves*
2.2.6	De-stocking*
Relief – *ex post*	
2.2.7	Re-stocking*

* May be implemented by livestock departments/ministries.

2.2.1. Livestock insurance

Providing livestock farmers with insurance could be one way of effectively protecting them from natural shocks: if a shock strikes, the livestock operators are entitled to be compensated for (part of) the value of the lost animals. However, insurance products in agriculture and livestock have long been considered unfeasible: natural shocks are devastating; insurers are often unable to diversify their portfolios sufficiently; the cost of quantifying losses can be immense; and insurance companies cannot monitor the behaviour of livestock farmers who, once they have an insurance policy, may shift towards riskier (and potentially more profitable) husbandry practices. Therefore, to date, private livestock insurance has rarely been offered to compensate for animal losses or reduced productivity owing to natural disasters, and never at all to herders in traditional pastoral systems. However, recent studies suggest that private entrepreneurs might enter the livestock insurance business provided a number of basic conditions are satisfied and, therefore, that the provision of insurance to livestock farmers should not necessarily be seen as a net cost to the public sector (Hazell and Skees, 2006; Larson *et al*., 2004; Skees and Enkh-Amgalan, 2002).

- The private sector could sell livestock insurance policies at market prices, whereas the public sector could provide them on a cost-recovery basis.
- Livestock insurance policies should be affordable, accessible to all, including the poor, and compensate for total income losses to protect both consumption and debt repayment capacity.
- That a shock has occurred should be clear to all contracting parties (yes/no). For instance, insurance contracts may be taken out against specific rainfall outcomes, measured by a given weather station.
- The shock must be causally correlated with an average level of livestock numbers and meat/milk production. This is because it would be difficult/impossible for public/private insurers regularly to carry out thousands of on-farm inspections to monitor livestock stock/production parameters, particularly when animals are on the move. This would limit farmer mismanagement and reduce incentives to cheat.
- Livestock insurance should be sold/bought before season-specific information about the insured risk becomes available (i.e. deadline for purchase). This would avoid livestock farmers buying an insurance policy only when shocks are anticipated.
- The investment costs involved in developing a private market for livestock insurance should be largely financed by the public sector. These costs involve: research to identify natural events closely correlated with livestock production and income; communication campaigns among livestock farmers to help them appreciate the value of insurance policies; impartial measurement of natural shocks, etc.

A number of constraints may impede the provision of insurance to livestock farmers:

- Transaction costs are high in sparsely populated areas. Therefore, it is seldom advisable for the private sector to enter into a business involving significant monitoring and supervision costs.
- The rural market for insurance may be too small to attract the private sector (few buyers). Also, the public costs of setting up such a system may be much higher than the potential benefits (it might be less costly to provide relief in the aftermath of a shock).
- Insurers may well go bankrupt following a natural disaster, or government budgets may be constrained to unsustainable levels. To hedge against such risks, insurers must be either large enough to diversify regionally/internationally or able to re-insure on the international insurance market.
- An insurance market will only develop when policies are competitive *vis-à-vis* other formal/informal risk-coping mechanisms. Therefore, both private insurers and governments should recognize the rationale and benefits/costs of traditional risk-management strategies.

Box 8. LIVESTOCK INSURANCE IN MONGOLIA

In 1964, the Government of Mongolia launched a compulsory insurance scheme for state-owned livestock, for which contracts were re-insured with Lloyds of London. Up to the 1990s, when the scheme came to an end, the State Insurance Organization had collected some US$3.6-3.8 million per year in livestock insurance premiums and made annual indemnity payments of US$0.8-2 million. The insurance scheme largely worked well: on the one hand, the state owned most if not all the country's livestock as well as the insurance company; on the other hand, the insurance company negotiated contracts with about 350 state-owned collective farms (to which all herders were obliged to belong) rather than with individual herders. Following the transition to a market economy and privatization of livestock in the 1990s, the scheme came to an end. Despite several attempts by the Government to reintroduce livestock insurance, less than 1 percent of livestock are currently insured (about 35 000 of a total of 30 million head). Therefore, in collaboration with the World Bank and other institutions, the Government is attempting to formulate innovative, more acceptable livestock insurance mechanisms. Three different options have been considered for insuring against livestock mortality: (i) insurance to compensate individual herders, based on documented losses; (ii) weather insurance that would compensate farmers only when an event causing catastrophic losses is recorded; and (iii) an index-based insurance to compensate farmers when livestock mortality rates exceed pre-established thresholds. Individual coverage was not considered feasible owing to the high transaction costs involved and the fact that livestock keepers might be tempted to misreport; weather-based insurance was not considered feasible because of a multiplicity of catastrophic events, namely, the different types of *dzuds*[5] that regularly affect Mongolia. Index-based livestock mortality insurance was found to be the most practical solution: livestock farmers receive an insurance pay-out based on regional mortality, irrespective of their individual losses. As the mortality index is not linked to the dzud events themselves but to the outcome of most concern (livestock loss) and to an average measure that is independent of an individual livestock keeper's behaviour, producers have a good incentive to manage their livestock properly.

In 2005, a four-year US$7 million project was launched in three provinces of Mongolia to ascertain the viability of an insurance market based on such an index (Bayankhongor, Khentii, and Uvs). In 2006, 2007 and 2008, private insurance companies sold policies to about 2 500, 3 700 and 4 000 farmers, respectively, at full market price. Insurance companies pay indemnities to farmers when the livestock mortality rate exceeds a specific threshold. However, for losses above an established 'exhaustion point', the government-financed Disaster Response Product (DRP) provides a safety net for livestock farmers. Extremely cold temperatures in western Mongolia in January-February 2008 and late snowstorms in the eastern part of the country the following May led to high livestock mortality rates and thus to a large number of indemnity claims that were paid both by the insurance companies and by DRP. The scheme proved to be effective, and the Government is committed to extending it to the entire country.

Sources: Munkh-Orgil, 2003; World Bank, 2005a; 2009.

[5] *Dzud* is a term referring to a variety of winter conditions that destroys or prevents access to pastures, which results in animals starving during the winter months of October-May. Conditions that lead to *dzud* include heavy snowfall (white *dzud*), the formation of an ice stratum over pastures (ice *dzud*), or a lack of sufficient winter fodder for animals following summer droughts (black *dzud*).

2.2.2. Early warning systems

An early warning system (EWS) is a technique whereby data are collected on a continuous basis to monitor household access to means of subsistence and food, the objective being to provide timely notice when a production/food crisis threatens people's livelihoods and to help the community and government take the most appropriate remedial action. An effective EWS comprises two basic elements: (i) identification and monitoring of risks and their potential impacts; and (ii) capacity to act on early warnings (Boken *et al.*, 2005; Buchanan-Smith, 2000; Sommer, 1998). Establishing an EWS that targets livestock farmers calls for the following:

- Identifying livestock (stock, species, gender, etc.) held by the community, seasonal trends in herd stock and, in general, recognizing livestock's contribution to household livelihoods.
- Identifying risks facing the community and their causal direct/indirect impacts on livestock assets. For instance, a flood might destroy the herd directly; an approaching drought might increase fodder prices and, indirectly, make it difficult for livestock keepers to feed their animals.
- Collating and analysing two critical sets of indicators that underpin livestock-based livelihoods: (i) environmental indicators, such as meteorological, hydrological and agricultural parameters; and (ii) socio-economic indicators, such as livestock productivity, meat and milk output prices, input prices, animal health status and household income/expenditure. Monitoring only one type of indicators is insufficient to detect approaching shocks: herd liquidation, for instance, may be caused by high market prices rather than by a scarcity of fodder.
- Setting thresholds for indicators, above/below which those at risk should be warned, and mobilizing public/private resources to mitigate the impact of expected shocks.

A number of issues should be considered when designing EWSs for livestock:

- Such systems are relatively well developed for droughts but much less so for floods, outbreaks of animal disease and civil strife, which also affect both the livestock operators and the sector as a whole.
- It is difficult to identify risk indicators that are easy (and at low cost) to monitor, and to set country- or location-specific thresholds reflecting the prevailing socio-economic situation (e.g. How much rain makes a flood? At what level of rainfall is public intervention required?).
- There is often a lack of willingness/capacity to collect sound environmental and, especially, livelihood indicators. (i) Policy-makers are often reluctant to invest in preventive measures, the tangible benefits of which are both uncertain (depending on the occurrence of natural shocks) and difficult to measure (what would be the impact of a drought if there was no EWS in place?). (ii) Livelihood indicators should be gathered at the local level, but few countries can afford to set up a decentralized system of continuous data collection. (iii) Communities may be tempted to misreport data in order to obtain more benefits than they are entitled to.
- EWSs have mainly been designed to satisfy the needs of international donors that provide massive support when serious disasters occur. Therefore, swift and effective

responses tend to depend largely on the donor community, with reduced incentives for national governments to invest in EWSs. However, EWSs established to serve the information needs of national/local authorities and communities could well contribute to responding to natural shocks.

Box 9. DROUGHT EARLY WARNING SYSTEM IN TURKANA DISTRICT, KENYA

Livestock is the backbone of Kenya's Turkana District. The Turkana EWS was developed on the basis of lessons learned following the devastating droughts of the early 1980s that caused huge losses of livestock. The system has three main objectives, i.e. to: (i) provide early warning information about the onset of drought; (ii) provide information on the availability of food as the drought gets nearer; and (iii) build up a reliable database of baseline information for use in local development planning and intervention. The Turkana EWS collects and monitors trends, and captures deviations/abnormal values for a total of 18 climatic, economic and welfare indicators – that is, rainfall levels; quality of pastures; animal birth rates; market prices; household consumption of meat, milk and cereals, etc. – that are used to quantify the supplementary food aid required to prevent/contain undernourishment. The particular features of the Turkana EWS are that: (i) it is community- and district-focused to allow for efficient collection and monitoring of trends in indicators; (ii) it gives simple messages to policy-makers at the central level, who remain responsible for emergency intervention. The messages consist of a sequence of 'warning states', from 'normal' (no unusual fluctuations in indicators), to 'alert' (unusual fluctuations), to 'alarm' (local economy affected by unusual fluctuations), to 'emergency' (all indicators fluctuate outside their normal ranges – famine threat); and (iii) the EWS messages are directly linked to a number of public response interventions.

Following the example of Turkana, another ten districts in Kenya have developed their own EWSs. However, whereas the EWS in Turkana may be effective in collecting environmental and livelihood indicators: (i) there is still an excessive lapse in time between data collection/analysis and reporting to central government; (ii) despite data collection, analysis and dissemination involving different actors at the local level, emergency interventions are still very centralized (the district provides information to central government but cannot anticipate its response); and (iii) response interventions are still donor-dependent and funds tend to arrive late, only once droughts have started seriously to affect household livelihoods.

Sources: Buchanan-Smith, 2000; USAID *et al.*, 2001.

2.2.3. Contingency plans

A contingency plan is the *ex ante* preparation of a series of actions aimed at: (i) mitigating the impact of natural shocks on production systems and livelihoods; (ii) providing relief to people rendered destitute by shocks; and (iii) promoting rehabilitation of production systems following shocks. Contingency plans are usually multisectoral; can be developed at the local, national and supra-national levels; and include a variety of interventions such as

agricultural loans, energy support facilities, marketing assistance, infrastructure rehabilitation and food-for-work programmes. To be effective, they should build on effective EWSs (Barton *et al.*, 2001; FAO, 1999; Samra, 2004). Contingency plans are based on the following elements:

- Up-to-date information indicating whether a shock affecting livestock is likely to occur, such as that provided by a functional EWS, and adequate knowledge of household risk-coping mechanisms.
- Plans for specific mitigation, relief and rehabilitation measures that support/complement household risk-coping strategies. These measures include, for example, storage of feed reserves, establishment and maintenance of fodder shrubs; emergency movements of livestock to green pastures and water points; prevention and control of animal disease; establishment of ad hoc slaughtering and marketing facilities; provision of credit/heifers for herd reconstitution; and safety-net supplies of food and medical aid.
- An institutional structure capable of collecting, processing and disseminating information, managing plan implementation across line ministries, negotiating with donors at an early stage (before the shock strikes), and, in the event an expected shock does not after all materialize, making alternative (and efficient) use of the resources obtained.

Contingency plans, including those targeting livestock systems, may be of limited effectiveness. This is because of the following:

- Lack of an adequate EWS and poor knowledge of livestock's role in household economies makes it impossible to formulate accurate/effective livestock contingency plans.
- Contingency plans tend to prioritize the distribution of food (and water) to persons and rarely to support the maintenance of physical assets/production systems. Yet an exclusive focus on relief activities has proved inappropriate: laying the groundwork for rehabilitation and development while implementing emergency work is both necessary and reasonable.
- The effectiveness of livestock contingency plans depends on the interventions of a variety of government ministries/departments, often calling for complex institutional cooperation and coordination.
- Several developing countries lack storage facilities for large quantities of animal feed, drugs and vaccines. This may lead to delayed, or even useless, interventions in the aftermath of a shock.
- Contingency plans have a specific livestock component in only a few countries because livestock play a marginal role in most economies. However, livestock are extremely important during the rehabilitation phase following a shock as animals provide outputs on a continuous basis (e.g. milk) whereas harvests are available only two or three times a year. Emergency food should be provided during interim periods.

Box 10. DROUGHT CONTINGENCY PLANNING IN RAJASTHAN, INDIA

The Central and State Governments of India have drawn up a common strategy to mitigate the impact of drought, which affects about 28 percent of the country. This strategy is based on the Famine Codes drawn up by the British in the 1880s, and stipulates that: (i) the State Government declares a drought situation and drafts a so-called Memorandum of Scarcity; (ii) the Central Government sets up a committee to assess the situation on the ground; (iii) the committee, in consultation with the State Government, formulates recommendations for assistance, including a drought contingency plan that typically includes the supply of cereals and water; provision of health and nutrition services; wage employment programmes; fodder supply; provision of animal health and veterinary supplies; and post-drought rehabilitation interventions; (iv) the recommendations in the contingency plan are scrutinized by an interministerial group that selects priority areas of intervention and determines the level of Central Government financial assistance, which may range between 10 and 80 percent of state drought relief expenditure; and (v) the State Government is responsible for implementing the approved interventions.

With an area of 342 239 km², Rajasthan is India's largest state. It has a human population of 56.5 million, of which 80 percent lives in rural areas, and a livestock population of 54.4 million. The state is particularly vulnerable to drought, having since 1901 experienced approximately 50 drought years of varied intensity. Given the prominence of livestock in the economy, the state's drought contingency plans also include mitigation and relief measures for farm animals, so much so that, in the last five drought years, expenditure on livestock fodder has came second only to wage employment (i.e. food-for-work programmes). The 2002 drought, which led to an estimated fodder deficit of 6 million tonnes, could have affected 42.5 million cattle in the state. But thanks to implementation of a well-designed contingency plan, cattle mortality rates were in the usual 12 to 14 percent bracket and the drought had no perceived impact on livestock stock. The contingency plan, which focused on *ex ante* mitigation activities rather than *ex post* relief interventions, included: (i) the distribution of 2 million tonnes of fodder, stored in more than 5 500 state fodder depots throughout the state, at a subsidized market price; (ii) loans totalling about US$222.2 million to livestock farmers to purchase fodder; (iii) a 5-rupee subsidy per head/day for 0.7 million cattle; and (vi) provision of free veterinary services to all livestock farmers.

Sources: Rathore, 2005; Samra, 2004.

2.2.4. Emergency feeding

Natural shocks often reduce feed availability and induce livestock keepers to dispose of a large proportion of their herds. If most or all animals are disposed of, however, rural households may fall into a state of permanent poverty because few of them have enough resources to rebuild their herds once the shock has passed. Policy-makers can formulate and implement two (not necessarily alternative) programmes to feed animals in case of shocks: one involves bringing feed to livestock (emergency feeding); the other involves taking livestock to the feed (grazing reserves) (Bayer and Aters-Bater, 1995; Hazell, 1999; Oram, 1998). Emergency feeding programmes comprise the following components:

- An information system providing up-to-date information on animal stocks, livestock movements and fodder availability throughout the seasons. This type of system is needed in order clearly to identify periods of scarce feed availability and for quantifying the feed to be provided on an emergency basis.
- Selecting livestock farmers entitled to receive emergency feed, which is the major cost component of the programme (e.g. Does the programme target all livestock or just heifers? Are small and large livestock operators entitled to the same quantity of feed per cattle head?).
- Building up and maintaining feed depots during normal periods, either directly or through subcontracting the private sector, and/or establishing contracts with feed importers from other countries, including public and private actors, to ensure adequate supplies of feed once the shock strikes.
- Establishing whether emergency feed is to be distributed free of charge or whether to charge livestock farmers for it (e.g. standard market price; subsidized price).
- Setting up a feed distribution system, including distribution points in strategic areas, which can be managed either by government itself or by subcontracted private agents (e.g. local wholesalers and retailers); and appropriate screening mechanisms to ensure that the feed is distributed only to eligible beneficiaries.

The following are some of the issues associated with emergency feeding programmes:

- Emergency feeding programmes are mainly carried out by NGOs on a small scale. There are few examples of successful countrywide programmes, although they are needed to mitigate the effects of large-scale natural shocks.
- Information available on livestock numbers and feed requirements during periods of shocks should not be considered reliable. Moreover, storing feed is costly and technically demanding, particularly in tropical countries.
- The common tendency is to import feed rather than storing stocks of it. However, importing large quantities of feed can be extremely expensive; it may not be suitable for local animals; and local herders may not know how to handle concentrate feed.
- Feed distribution systems are costly to establish, particularly in remote areas, and strict targeting criteria are difficult to enforce. Emergency feed may therefore end up being distributed to fairly developed areas and relatively well-off farmers. It is also possible that some livestock farmers will move their animals for the sole purpose of benefiting from supplementary feed supplies.
- Supplementary feeding programmes may artificially maintain livestock stocks above their optimal levels, which may lead to unsustainable livestock/grassland ratios and contribute to environmental degradation.
- If supplementary feed is expected to become available as soon as a crisis strikes, livestock farmers may be less inclined to use traditional, albeit more costly and time-consuming, risk-coping mechanisms such as the use of pastures in remote areas.

Box 11. FEEDING PROGRAMMES DURING DROUGHTS IN NORTH AFRICA

Droughts regularly affect Mashreq and Maghreb countries. The Governments of Jordan, Morocco, the Syrian Arab Republic and Tunisia have intervened in a variety of ways to limit their social and economic damage, including purchases of concentrate feed for distribution to owners of ruminant livestock. The common government policy is to provide barley, sorghum, maize and bran to farmers at below market prices (which are anyway often subsidized). The overall subsidy in times of drought can be as much as 32 percent in Tunisia and 50 percent in Morocco; feed import regulations are also relaxed during drought years. These programmes have proved successful in protecting livestock and meat/milk production during times of drought. For example, during the 1995 drought in Morocco, cereal production levels were 80 percent lower than in previous years but the livestock sector was barely affected; in Tunisia, sheep numbers even increased during the droughts of the early 1990s. Even though these feeding programmes successfully maintained livestock stocks, a number of negative side-effects have been reported. First, targeting was poorly designed and governments found themselves having to subsidize both the poor and wealthy producers. Second, feeding programmes contributed to increased overgrazing and, as a consequence, to land degradation in North Africa and the Near East. Third, these strategies proved very costly in view of the large amount of subsidized feed distributed. Finally, governments were inclined to implement such programmes on a continuous basis, regardless of whether or not there was a drought.

It is not clear whether emergency feeding programmes in North Africa have been successful on the whole. Moreover, Jordan recently abolished its feed subsidy programme and the Syrian Arab Republic has banned the cultivation of barley in many of the steppe areas.

Source: Hazell, 1999.

2.2.5. Grazing reserves

When natural shocks reduce the availability of feed, governments may help livestock farmers to move their animals to accessible grazing areas. For pastoralists, for instance, this is a longstanding traditional response to drought. But increasing human and livestock populations and expansion of the 'agricultural frontier' are making this strategy less and less effective, and lead to more conflicts between the pastoralists and settled farmers. Public actions are therefore necessary to regulate livestock mobility and allow animals access to select grazing areas, such as government-maintained pastures, national parks, game reserves, and government-owned or private ranches (Bayer and Aters-Bater, 1995; Heath, 2001; Taylor-Powell, 1987). Major steps needed to establish grazing reserves include the following:

- Identification of drought-time grazing zones, which can be either public (national parks/game reserves) or private (ranches). In the latter case, government should facilitate/supervise their establishment and pursue the enforcement of contracts that allow farmers access to private ranches during periods of drought.
- Investments in drought-time grazing areas, including seeding, fencing, watering, etc., so as to ensure feed availability in drought years.
- Definition of rules for access to grazing areas in times of drought: i.e. Which house-

Credit: WrenMedia/N. Palmer

holds are entitled to enter grazing reserves? How many animals – of which species and for how much time – are allowed access to grazing areas? Is access to drought-time grazing areas free, or should livestock farmers be charged a nominal/market fee?
- Where necessary, establishment of trekking routes for moving livestock to grazing areas, including contracts with private ranchers/farmers, feed depots/water points and animal health posts, as well as ad hoc transit procedures (e.g. exemption from transit fees).

Establishing and managing grazing reserves and moving livestock to forage during times of drought is a challenging undertaking, for a number of reasons:
- Growing human and livestock populations increase the social and economic costs involved in setting aside grazing areas: maintaining resources unused in anticipation of an uncertain event would be economically sound only if the gains in times of crisis were larger than production foregone in normal years.
- In times of feed scarcity, there is often greater demand for, than supply of, grazing areas (feed), which are typically insufficient to accommodate all livestock. In the meantime, targeting is complex and livestock farmers are rarely willing/ready to restrict the access to grazing areas of selected animals only, such as heifers and milk cows.
- It is difficult to design and manage massive livestock movements in an efficient manner, one reason being that infrastructural and administrative arrangements discourage movements outside traditional trekking routes.
- Livestock are sometimes taken to environments (e.g. natural parks) where they might be exposed to new diseases that result in higher mortality rates. Conflicts may also break out between drought-time grazing area managers and livestock farmers owing to difficulties in monitoring access to such areas.

Box 12. FODDER BANKS IN NIGERIA

Poor animal nutrition, both during drought and in the dry season, has been a traditional constraint on livestock production and productivity among the Fulani pastoralists of Nigeria. In the first half of the 1980s, the Sub-humid Zone Programme of the International Livestock Centre for Africa (ILCA) established a number of fodder banks, i.e. fenced areas cropped with a forage legume, to increase livestock access to forage during the dry season and help cope with drought. The costs of establishing the fodder banks were covered by ILCA, but the banks were built and managed by livestock farmers. Activities for establishing and maintaining fodder banks included: (i) fencing the areas; (ii) preparing seedbeds; (iii) transplanting; (iv) restricting grazing during early-season grass growth; and (v) deferring grazing until the dry season. A number of 4-ha fodder banks, with an average legume yield of 5 000 kg/ha, were established in Nigeria; in each bank, it was possible to graze 15-20 cows (in-calf and lactating females) for two to three hours a day during the six months of the dry season, with the objective of limiting weight loss and reducing mortality rates.

In the average Fulani herd, three to five animals usually died or had to be sold every dry season, largely because of nutritional distress, but the use of fodder banks for survival feeding of weak animals has halved such losses. However, under the programme, Fulani pastoralists allowed all their animals access to the fodder banks so that, by the end of the dry season, they found themselves with a large but emaciated herd whose market value was lower compared with that of a smaller herd in good shape.

Source: Taylor-Powell, 1987.

2.2.6. De-stocking

De-stocking programmes help smallholders to liquidate their herds during droughts, when fodder is scarce and the demand for livestock collapses, and provide direct (e.g. market price support/purchase) or indirect (e.g. transport subsidies/tax exemption) incentives for sale. With the proceeds of sales, livestock farmers are expected to rebuild their herds after drought. Such programmes are undertaken either at the height of a drought cycle, when animals are in very poor condition (salvaging objective), or at the onset of drought in an attempt to sustain farmers' livelihoods before the value of livestock collapses (mitigation objective). Both options have long been a common strategy among ranching and commercial farmers in industrialized economies, notably in the southern part of the United States of America and in Australia (Morton and Barton, 2002; Morton *et al*., 2002a; Toulmin, 1995). De-stocking programmes involve:

- identifying and selecting a community or communities entitled to take part in livestock de-stocking programmes, as well as targeting criteria for beneficiary households and the numbers/species of animals that each beneficiary household is entitled to sell through the programme;
- providing incentives for beneficiary households to de-stock: for instance, public authorities may purchase animals at above market prices; provide livestock farmers (or traders) with transport subsidies to reach market places where prices are still high;

Credit: WrenMedia/N. Palmer

grant tax exemptions to livestock traders to buy animals at above market prices from farmers; and establish feed/water points for animals that are trekked to distant markets;

- developing plans for emergency slaughtering and finding ways to sell livestock on national or foreign markets or to store excess meat to avoid disrupting market functioning. The implementing agency may also directly maintain/provide subsidies to large, key operators to maintain the livestock alive.

Implementation of de-stocking programmes is challenging, for a number of reasons:

- At the onset of a drought, when livestock and meat/milk prices are still unaffected, livestock farmers may be unwilling to sell their animals and tend to postpone sales. Sales thus occur when the animals are in poor condition and market prices extremely low.
- De-stocking projects may be prohibitively costly at the onset of a drought, when livestock prices have not yet fallen. On the other hand, if animals are sold late in a drought, supplementary feed will be necessary before slaughtering, and some animals may even die earlier.
- If there is no market for live animals/livestock products and no processing/storage facilities, any de-stocking programme will most likely be unsustainable as none of the costs will be recovered. In addition, farmers participating in de-stocking programmes may sell their animals at below market prices, thereby crowding out non-subsidized producers.
- Traders are often the major beneficiaries of de-stocking programmes. Indeed, implementing agencies find it easier to deal with a few traders rather than with hundreds of livestock farmers. Traders have greater bargaining power during drought as livestock farmers have no other option but to sell their animals.
- There have been few, if any, country-level de-stocking programmes. The scaling up of programmes is challenging owing to the lack of reliable terminal markets/processing facilities for a large number of livestock and because institutions are generally weak.

Box 13. DE-STOCKING IN NAROK DISTRICT, KENYA

A number of de-stocking programmes were implemented in Kenya during the drought of 1999-2000. In Narok District, a project funded by the European Community/Community Development Trust Fund aimed at helping farmers to de-stock 4 percent of the district cattle population. The objective was to: (i) sustain the livelihoods of pastoral people; (ii) provide food relief (meat from the de-stocked herd) to destitute households; and (iii) reduce environmental stress. The project established 32 livestock-buying centres in key strategic areas; set up purchasing committees responsible for identifying beneficiary households; and hired casual labour for slaughtering the animals. Over a period of two months, the project succeeded in buying 4 683 cattle for a total of Kshs 7 956 705 (about US$80 000 in 2000), which were introduced into the local economy. The animals were then slaughtered and the meat distributed to poor households and students at primary and secondary schools in the affected areas, in accordance with targets established by local administrative staff.

The de-stocking project succeeded in sustaining the livelihoods of several pastoral households. However: (i) the animals purchased were often in poor condition and produced little and/or poor-quality meat; (ii) local committees often purchased more animals than they were able to slaughter in one day and, because of the lack of storage facilities, some of the meat became unfit for consumption; (iii) the project was implemented following a top-down approach, with pastoral households playing a passive role; and (iv) given the limited scale of intervention, the project had a negligible impact on the environment.

Source: Aklilu and Wekesa, 2001.

2.2.7. Re-stocking

Re-stocking programmes are advocated in the early phases of drought recovery as a way of balancing livestock populations with increased availability of fodder. In recent years, these programmes have been widely promoted by NGOs and governments across Africa as a method of rehabilitating destitute pastoralists who are rarely able to reconstitute their herd in the aftermath of a drought. It is widely felt that re-stocking should keep livestock prices stable after drought; sustain poverty reduction and wealth equalization when animals are given to the most destitute; and, if herders are confident that re-stocking programmes will be implemented, reduce the incidence of overstocking prior to drought. Finally, re-stocking is appreciated not only as a relief measure but also as an instrument for reversing the current trend of growing impoverishment of pastoral people (Heffernan and Rushton, 2000; Heffernan *et al*., 2001; Sidahmed, 1998). Re-stocking programmes involve:

- establishing targeting criteria for selecting beneficiary households, such as geographical location, income or consumption levels, household food intake, livestock owned, etc;
- determining the number, age, gender and species of animals to be distributed to beneficiary farmers; small animals are often preferred over large ones because of their faster reproduction rates and the lower degree of risk of holding many small animals *vis-à-vis* a few large ones;

- training relevant staff to select and purchase livestock (usually on the market), and vaccinating, branding and protecting the animals until they have been distributed to beneficiary households;
- establishing whether animals are to be provided to the farmers free of charge or whether a market/subsidized price will be charged; smallholders may also be provided with credit at below market interest rates for the specific purpose of buying animals;
- implementing agencies often require that beneficiary households delay selling or slaughtering their animals for some months; in these cases, a monitoring system should be set up, such as marking animals and recording livestock movements and sales;
- ensuring that complementary policies/programmes are in place to ensure success of the re-stocking programme: unless feed, water and animal health services, as well as food for human consumption, are available to farmers it is unlikely that any re-stocking programme will be successful.

The following are some of the issues and challenges associated with re-stocking programmes:

- Although difficult, for any re-stocking programme to be successful, it is essential to identify the optimal number of animals to distribute to beneficiary households. However, this will depend on household sources of income; timing of interventions; availability of animal feed, water and animal health services; household size; levels of education, etc.
- Livestock prices are high in the aftermath of a drought and animals may not be available at affordable prices. Traders are often the ultimate, albeit unintended, beneficiaries of re-stocking programmes: they first sell animals to the implementing agency at inflated prices and later buy them back from the beneficiaries at lower prices.
- Unless complementary interventions are undertaken (e.g. food distribution; free/subsidized provision of veterinary supplies), destitute households may be tempted, or need, to sell part of their re-stocked herds immediately to meet pressing needs, thereby transforming the re-stocking programme into a cash-transfer policy.
- Re-stocking programmes may lead to livestock being neglected during periods of drought and, in the event of inefficient targeting, to fraudulent claims for animals that had supposedly died but were in fact sold on.
- Economic benefits to re-stocked families may be of a short-term nature: returning to the status before drought serves little purpose if households remain vulnerable to shocks. Re-stocking programmes, therefore, should be implemented as part of a broader rural development plan aimed at making livestock keepers resilient to natural shocks.

Box 14. LIVESTOCK RE-STOCKING IN BOSNIA AND HERZEGOVINA

In the aftermath of the 1991-1995 civil war in the Balkans, the Government of Bosnia and Herzegovina and the international community formulated the US$330 million Reconstruction and Rehabilitation Programme for Agriculture and Rural Areas, structured around three major components: (i) farm mechanization; (ii) livestock re-stocking; and (iii) animal health services. The International Fund for Agricultural Development (IFAD) financed the re-stocking component of the programme, the short-term objective of which was to restore and improve the food security of beneficiaries and help them generate additional cash income and employment. The medium-term objective was to lay the basis for livestock farming in order to improve farmers' livelihoods and economic development. Beneficiary households included smallholder farmers with 1 to 5 ha of land. As more than 260 000 farm households (49 percent of the total) were estimated to be smallholders, the re-stocking programme primarily targeted refugees, returnees and households that had suffered substantial damage during the conflict. Additional eligibility criteria included: (i) technical competence in livestock production; (ii) ability to provide adequate shelter and feed for livestock; (iii) access to breeding services; (iv) access to adequate product storage and markets; (v) willingness to maintain breeding/calving records; and (vii) commitment to rebuilding and operating a farm on a continuous basis. For each female animal delivered, beneficiaries were expected to repay one or two female animals within 2 to 3 years. The programme distributed 3 862 pregnant heifers and 1 351 goats to 4 100 families in the first eight months of operation (April to December 1996), which was much faster than the two years originally envisaged.

A preliminary assessment of the programme concluded that: (i) the targeting criteria had not been strictly implemented; (ii) as farmers fully participated in the selection of animals, most beneficiaries expressed great satisfaction with the quality of the animals they received; (iii) farmers were poorly informed about the 'credit scheme': in most cases, reimbursement was not in kind but in cash; and (iv) the programme had a direct impact on household livelihoods, especially those of demobilized soldiers and women, most of whom looked after animals. Overall, the programme was found to be satisfactory and, given the general pressure for more animals to be delivered, IFAD launched a second-phase project in 1997, which included the delivery of 9 000 heifers, 5 700 sheep, 350 goats and 300 pigs to farmers both in Bosnia and Herzegovina and in the Republic of Serbia.

Source: IFAD, 1997; 1999.

3. Enhancing livestock productivity

If they are to engage in livestock production, households must have access to basic production inputs and mechanisms to cope with the risks inherent in such activities. And if they are to increase production beyond subsistence levels and use their livestock to rise out of poverty, they must also have access to production-enhancing input (including services) and output markets, both national and international. To that end, governments should ensure that livestock farmers have secure and fair access to:

- animal health services and veterinary supplies;
- affordable financial facilities;
- domestic output markets;
- international markets, i.e. trade rules and regulations are fair and equitable.

3.1. ANIMAL HEALTH SERVICES AND VETERINARY SUPPLIES: POLICIES AND PROGRAMMES

Animal health services comprise preventive/curative services and veterinary supplies. These may be provided by the public and private sectors: there may be public and private veterinarians and auxiliary animal health professionals; and there may be public and private producers and distributors of animal drugs. Some aspects of animal health systems, however, call for public interventions to preserve veterinary health, manage the externalities of contagious diseases and disease control efficiently, and ensure that smallholder farmers have adequate access to preventive and curative animal health services and drugs (Ahuja and Redmond, 2001; FAO, 2004; Umali and Schwartz, 1994; Umali *et al*. 1994).

- Some animal health services/goods are public goods that enjoy the properties of non-rivalry (can be used by many) and non-excludability (those not paying for the goods can use them), and are not supplied by the private sector. For instance, a farmer will have no incentive to control tsetse flies on open ranges because the benefits he generates will extend to the whole community free of charge. For the supply of public goods, therefore, someone must take charge of organizing collective action. This may be done at various levels, from voluntary cooperation in local communities to central government when public goods benefit a large number of people, such as for the control of zoonotic diseases.
- Lack of and/or conflicting information affects the delivery of animal health services, which may lead to opportunistic behaviour. Typically, a livestock farmer is rarely able unequivocally to judge the quality of a veterinarian's service or the effectiveness of the drugs he/she buys to treat her/his animals. Both the service and the drugs are either 'experience' or 'credence' goods, the value of which is impossible to assess *ex ante*. It is also difficult to ascertain their value after use as the physical condition of an animal will depend on a variety of elements, including proper diagnosis and drugs. In order to correct this type of market failure, government should increase the quantity and

quality of information to buyers, e.g. it could limit the issuance of business permits and licences only to qualified veterinarians and sellers of drugs.

- Some livestock services generate externalities. These occur when the actions of some stakeholders in the livestock production chain benefit or harm other actors, without the benefits being paid for or the damage compensated. For instance, a farmer who immunizes an animal against a contagious disease, such as food-and-mouth disease (FMD), reduces the risk that other farmers' herds will become infected, thereby generating a positive externality. However, since the farmer is not compensated for the externality produced, he/she might 'under-vaccinate' her/his herd. The result would be an under-supply of goods generating positive externalities, whereas the opposite occurs for goods that generate negative externalities. In these cases, government is expected to step in and support the production of goods that generate positive externalities (e.g. through subsidies) and prevent the over-supply of goods generating negative externalities (e.g. through taxes).
- When economies of scale are significant and transaction costs high, some goods will not be available on the market (at affordable prices) unless there is some degree of support from the public sector.[6] For instance, despite livestock keepers being willing to pay both for the drugs and the service providers' fees, the drugs may not be available on the market because the high production costs make it unprofitable for private investors to produce them for relatively small rural markets; or because high transaction costs in sparsely populated rural areas make the overall cost of the service – including fee, transport and time costs – prohibitively expensive. Even though markets work well, therefore, economies of scale and transaction costs may lead to socially undesirable outcomes.

Policy-makers in livestock departments have a whole range of options for improving the delivery of animal health services and veterinary supplies in rural areas. These comprise supply- and demand-side interventions, depending on whether their prime aim is to improve the capacity of the public and private sectors to supply animal health services to farmers, or to enhance the ability of livestock farmers to demand animal health services (Pica-Ciamarra and Otte, 2008). Table 4 gives a list of policy/programme options used by governments to improve the coverage and quality of animal health services and veterinary supplies.

[6] Economies of scale occur when the unit cost of production decreases with output quantity; transaction costs are indirect losses that reduce the profitability of market exchanges, such as time and paper costs.

Table 4. ANIMAL HEALTH POLICY AND PROGRAMME OPTIONS

3.1.1. Decentralization
3.1.2. Cost recovery of animal health services*
3.1.3. Joint human-animal health systems
3.1.4. Subcontracting*
3.1.5. 'Smart subsidies' to private service providers*
3.1.6. Community animal health workers*
3.1.7. Membership-based organizations
3.1.8. 'Smart subsidies' to livestock farmers*

* May be implemented by livestock departments/ministries.

3.1.1. Decentralization

Decentralization is an increasingly popular institutional reform measure aimed at enhancing farmers' access to public goods/services, including animal health services and veterinary supplies. It involves the transfer of responsibilities from the central to lower levels of government, such as regional and district authorities. Decentralization is based on the rationale that central government is ill-suited to handling such responsibilities because it has limited information about the types of services required locally, and has to meet high delivery costs. Conversely, local governments are said to have first-hand information about what is needed, to face lower transaction costs, and to have incentives to respond to local farmers' requests – as far as they are accountable to them. For any given level of the public budget, therefore, a decentralized system of animal health service delivery may provide more/better services/goods to livestock farmers (Bardhan and Mookherjee, 2007; Lai and Cistulli, 2005; Norton, 2004; Smith, 2001). As decentralization of animal health services is typically part of a broader process of institutional reform, the livestock department/ministry should:

- reorganize the delivery of livestock services in accordance with the main decentralization thrust, namely, de-concentration, devolution or delegation: de-concentration involves shifting administrative responsibility and resources to local governments; devolution involves shifting administrative and political decision-making power to local-level entities; delegation involves shifting responsibility for the production/delivery of specific services to a semi-autonomous organization;
- identify the services to be decentralized (de-concentrated, devolved or delegated), based on a thorough analysis of the advantages and disadvantages of central versus local delivery of public goods, which differ according to the form of decentralization;
- implement, monitor and evaluate the decentralization programme, including a transition phase. As decentralization entails costly organizational reforms, with savings and efficiency gains apparent only after a number of years, it should be seen as a tool for meeting long-term development objectives rather than as a response to budgetary constraints.

Decentralized animal health services are not necessarily associated with improved quality and wider coverage:

- Information asymmetry works two ways: the central government may not know which services/goods to provide; local governments may not know how to provide them, typically because of limited human resources.
- Some externalities exist at the local government level, similar to those at the farm level. Local authorities, for instance, may have disincentives to vaccinate livestock in their districts, particularly when their budgets are limited, on the grounds that: (i) vaccination might also benefit farmers in neighbouring districts where authorities have not vaccinated; and (ii) vice versa, local farmers might benefit from positive externalities generated by vaccinations in neighbouring districts.
- While administrative autonomy can be achieved without difficulty, financial independence is harder to attain, particularly in low-income settings. But administrative autonomy with little financial self-sufficiency reduces the political freedom of local authorities and thereby their capacity to be more efficient than central government.
- Local governments may be vulnerable to take-over by local elites, thereby supplying public goods that overwhelmingly benefit the better-off households.

Box 15. DECENTRALIZATION OF VETERINARY SERVICES IN UGANDA

Uganda's Local Government Act (LGA) of 1997 entrusted several political, administrative and fiscal powers to local governments, comprising districts, city councils and municipalities. Central government retains responsibility for security, national planning, immigration, foreign affairs, national projects, policy formulation and the supervision of local government activities. As to agriculture, local governments are expected to provide crop, animal and fishery extension services to farmers, and to support the cooperative sector. The effects of the LGA on the delivery of animal health services, including the changed role of the central and local governments and the private sector, are as follows.

The LGA distributes responsibilities between the public and private sectors and among central and local governments, taking account of externalities and the comparative advantages of different actors: the central government, for instance, retains responsibility for rinderpest, contagious bovine pleuropneumonia (CBPP) and FMD control, whereas the private sector is expected to provide clinical services to livestock farmers.

(Cont.)

Box 15. *(Cont.)*

Policy areas	Before LGA		After LGA	
	Funding	Delivery	Funding	Delivery
Control of animal epidemics and emerging disease	Central Gov.	Central Gov.	Central Gov.	Central Gov. Local Gov. Private Sector
Control of zoonoses	Central Gov.	Central Gov.	Central Gov.	Local Gov. Private Sector on contract
Provision of diagnostic facilities	Central Gov.	Central Gov.	Central Gov. Local Gov. Private Sector	Local Gov. Private Sector
Provision of clinical services	Central Gov. Private Sector	Central Gov. Private Sector	Private Sector	Private Sector
Tick control	Central Gov.	Central Gov.	Local Gov. Private Sector	Local Gov. Private sector
Tsetse control	Central Gov.	Central Gov.	Local Gov. Private Sector Central Gov.	Central Gov. Local Gov. Private Sector
Provision of veterinary drugs, vaccines, etc.	Central Gov. Private Sector	Central Gov. Private Sector	Private Sector Central Gov. for rinderpest, CBPP and FMD	Private Sector
Artificial insemination and embryo transfer	Central Gov.	Central Gov.	Private Sector Central Gov. in transition	Private Sector
Animal quarantine and livestock infrastructure	Central Gov.	Central Gov.	Central Gov. Local Gov.	Local Gov. through contract Central Gov.

Source: Uganda, Government of, 2001.

Following implementation of the LGA: (i) a number of public veterinarians deployed in counties and sub-counties have found themselves being supervised by sub-county chiefs who seldom have a university degree, which has led to conflicts between public administrators and government veterinarians. (ii) The deployment of public veterinarians at the district level is also said to create unfair competition and threaten the survival of private veterinarians operating in the districts. (iii) In many districts, the provision of animal health services to farmers has been inefficient because about 90-95 percent of the financial resources were used to pay salaries and allowances and only 5-10 percent to buy the necessary equipment and maintain animal health infrastructure. (iv) There are areas where no or very few private veterinarians are operating, with no or only very limited services available to livestock farmers.

Sources: Azuba-Musoke, 2001; Uganda, Government of, 2001.

3.1.2. Cost recovery of animal health services

Limited or dwindling government budgets make it difficult, if not impossible, for livestock departments to provide good-quality animal health services and veterinary supplies in rural areas. Recovering the costs of veterinary services involves charging the full or partial costs of public animal health services/animal drugs to end-users (rather than the entire population repaying them through taxation), which would ease a livestock department's budgetary constraints and increase the coverage and quality of such services. Major rationales of cost-recovery strategies are as follows: (i) there is evidence that smallholders are willing to pay for veterinary services and drugs, including public goods, from which they derive a private benefit; (ii) when a service is free, producers see it as having no value and may waste scarce public resources by making excessive requests for it; and (iii) since cost recovery is a demand-based strategy, it increases the accountability of government departments to fee-payers, thereby providing incentives for improving the effectiveness of public animal health services and goods (Dinar, 1996; James and Upton, 1995; Keynian *et al*., 1997). Introducing a cost-recovery component in the delivery of livestock services calls for the following:

- Identifying animal health services/veterinary supplies to be considered for cost recovery: these comprise services/supplies with a public-private goods component as well as strictly private goods.
- Establishing whether a fee or levy should be charged. A fee is charged to individual farmers and livestock keepers to cover the costs of providing services; a levy is charged on a specific segment of an industry, a given group of farmers or livestock operators with a collective entitlement to a service. As a general rule, fees are considered more effective because farmers pay for private, tangible services/goods, whereas levies are not clearly associated with specific activities.
- Once it has been agreed to introduce cost recovery, establishing a price/cost for the services. At the simplest level, this would require calculating the full cost of each service, namely, the value of all resources used or consumed for providing that service, including direct and indirect costs. In the case of public goods, however, one should discriminate between the private and collective benefits of the goods, and only charge for the benefits that farmers gain over and above those accruing to the general public. In any event, the price should not be indifferent, so as to ensure that the farmer does not make excessive demands for the goods/services involved.
- Establishing an institutional mechanism for implementing and monitoring the cost-recovery programme, with focus on the quality and coverage of services/goods and their impact on farmers' livelihoods.

Some issues associated with cost-recovery programmes are as follows:

- Establishing an equitable cost-recovery mechanism is technically demanding: (i) many livestock services are non-exclusive or rival (e.g. provision of information), and farmers may be tempted to 'free-ride'; (ii) it is difficult to separate the public from the private component of some services/goods, and hence to set the right fee to charge; (iii) the provision of some services involves large fixed costs, which could make the establishment of cost-recovery mechanisms meaningless; and (iv) both producers and other stakeholders (e.g. consumers) benefit from good animal health services and

drugs, thus posing the question as to whether/how the costs of services should be split between all potential beneficiaries.

- Government may reduce the budget allocation for animal health services and thus offset any revenue generated by the cost-recovery programme. This would limit its overall impact on service provision.
- Livestock farmers are often unwilling to pay for preventive veterinary services and drugs, and/or only medium-to-large livestock keepers may end up paying cost-recovery fees, unless targeted information and knowledge campaigns are successfully carried out.

Box 16. COST RECOVERY FOR CATTLE DIPPING IN ZIMBABWE

The Government of Zimbabwe previously always provided veterinary services free of charge to the livestock industry. These services included disease surveillance, investigation and diagnosis, cattle dipping in the smallholder sector, and vaccination against Newcastle disease, anthrax, FMD and rabies. In 1990/1991, Zimbabwe embarked upon an economic structural adjustment programme that involved institutional reforms in the provision of goods and services by the state. The veterinary services were reformed following a cost-recovery strategy, with small livestock farmers – who keep about 85 percent of the country's cattle and 99 percent of all sheep and goats – expected to pay the full cost of services/goods in the case of private goods and a share of their cost in case of goods with public/private goods components. One of the elements of the cost-recovery programme was the collection of a fee for dipping cattle, a service previously provided free of charge to farmers. Despite cattle dips to treat ticks and tick-borne diseases (especially East Coast fever) in the main leading to private benefits, the Government decided to continue supplying the service on a cost-recovery basis because the high fixed cost of building dipping tanks made it unprofitable for the private sector to supply it in rural areas. Initially, the dipping charge, which was set by local governments in consultation with livestock farmers, was a small percentage of total costs. However, it was regularly increased over the subsequent five years, by which time farmers had recognized the value of the service and begun to pay almost 100 percent of the costs.

Thanks to the cost-recovery mechanism, the livestock department was able to ensure that cattle-dipping services were provided, regardless of whether or not funds were provided by Central Government for this purpose. However, because of the recent economic crisis, the Government is no longer in a position to purchase sufficient quantities of acaracide, with the result that communal dippings have been mostly suspended and previously controlled animal diseases have begun to appear again.

Sources: Hargreaves, 2002; Phiri, 2006.

3.1.3. Joint human-animal health systems

There are similarities between human and animal diseases and in human and animal health service delivery systems. It is therefore possible to accrue savings by sharing the production and distribution costs of human/animal health services and drugs, especially in the remote rural areas of developing countries where transaction costs are high. For any level of public resources allocated, in fact, combined human-animal health systems may improve both the quality and coverage of animal health services (Roth *et al*., 2003; Schelling *et al*., 2005, 2007; Shears, 2000). Any government institution – namely, livestock and health departments – willing to establish a joint system of human-animal health service delivery should do the following:

- Identify priority areas where opportunities exist for establishing combined human-animal health delivery systems. These are typically regions where both human and livestock population densities are low, and where resources for disease surveillance, diagnosis and control are limited.
- Identify means of collaboration between public human and animal health authorities. The simplest option would be to share transport costs (e.g. vehicles for both doctors and veterinarians; shared cold chains) and some of the fixed costs (e.g. storage rooms and warehouses; laboratories for analyses). Additional savings could be made if staff were trained in simple animal and human health tasks, such as disease surveillance/reporting and animal/human vaccinations. It would be more difficult, however, to train staff in tasks such as human and animal surgery, and to have a common research agenda for human and animal health.
- Establish criteria for sharing the fixed and variable costs of a joint system of service delivery between human and animal health authorities. This should include an assessment of actual costs and of the positive externalities generated by human and animal health services, both for each other and for society as a whole.

Major challenges to establishing joint human-animal health systems include the following:

- There are no standard criteria for allocating fixed and variable costs between human and animal health authorities, particularly when externalities are considered. For instance, controlling brucellosis benefits livestock keepers (more milk produced), people (reduced infections and payments for treatment) and the public sector in general (reduced hospitalization and provision of drugs). How should the cost of controlling brucellosis be shared among producers, consumers and the public sector?
- Identification of criteria for cost-sharing is particularly difficult in the case of emerging diseases about which there is a degree of scientific uncertainty. What are the ultimate impacts of highly pathogenic avian influenza (HPAI) on human beings? Should animal or human health authorities compensate farmers when it is decided to cull their poultry flocks to prevent HPAI spreading to human beings?
- There is a shortage of public health personnel trained to deal with the complex interface between human and animal health. In the short term, therefore, the potential savings from a combined human-animal health system of service delivery are limited.
- Human health issues are traditionally accorded higher priority than animal health in policy debates and government budgets; this may make it difficult to forge constructive partnerships between human and animal health authorities.

Box 17. JOINT ANIMAL-HUMAN HEALTH SERVICES IN CHAD

In Chad, the vaccination rate is higher in livestock than among the pastoralists themselves, for whom animals are the major source of livelihood. Following consultations with nomadic communities, the Government concluded that a joint human-animal vaccination campaign might well improve the vaccination coverage among humans. Between 2000 and 2005, pilot campaigns were launched in two provinces for the delivery of human and animal health services. In particular, 14 vaccination campaigns for nomadic children, women and livestock were conducted in areas where the communities concentrate during the dry season: 149 255 livestock were vaccinated against anthrax, pasteurellosis, blackleg and CBPP; 4 653 children were immunized (three doses each) against diphtheria, whooping cough, tetanus and polio; and 6 284 women received at least two doses of tetanus vaccine.

The joint human-animal vaccination campaign generated savings in the order of 15 percent, largely thanks to the sharing of equipment (e.g. refrigerators) and means of transport. However, vaccines and consumables (syringes and needles), which accounted for the bulk of costs, could not be shared between the human and animal health authorities. Efficiency savings were also obtained because it was possible to vaccinate about 140 people per day compared with an average of 100 when only human vaccinations were carried out. Following this experience, Chadian public health and veterinary officials envisaged institutionalizing joint animal-human vaccination campaigns to cover the majority of rural districts.

Source: Schelling *et al.*, 2007.

3.1.4. Subcontracting

Public authorities may subcontract delivery of animal health services and veterinary supplies to private practitioners in order to improve both the quality and coverage of services. The assumptions here are that (i) inefficiencies/disincentives within the government bureaucracy would be reduced; (ii) there would be definite savings in the public budget, as many public veterinarians/animal health assistants would no longer be public civil servants; and (iii) private animal health service providers, assured of a minimum remuneration, would also be expected to supply goods and services not otherwise offered to rural households (Chapman and Tripp, 2002; Fassi-Fehri and Bakkouri, 1995; Rivera *et al*., 2000). Subcontracting public veterinary services to private actors calls for the following:

- Identifying public services/goods to subcontract to private service providers. In theory, the provision of all public goods may be subcontracted to private agents, but a trade-off exists between gains in efficiency through subcontracting and monitoring costs to ensure that the services/goods are provided effectively.
- Deciding and selecting who will supply the services/goods on behalf of the state, e.g. veterinarians, animal health auxiliaries, community-based organizations, wholesalers, retailers, NGOs or other private agents.
- Drawing up a contract setting out the tasks of, and compensation schedules for, private service providers. As a general rule, contracts should relate to simple tasks and compensation be based on output in order to facilitate monitoring (e.g. number of livestock vaccinated; number of abattoirs inspected).

Credit: FAO/24616_1859/A. Ariadi

- Setting up a monitoring system to ensure that contractual obligations are met. Since ineffective supply of some public goods may generate significant socio-economic losses (e.g. spread of animal diseases), government should be ready to provide the subcontracted services/goods itself in case the subcontracted agents do not fulfil their obligations.

Designing and effectively implementing an efficient system of subcontracting is a challenging task:

- Different contracts should be designed for service providers operating in regions with different livestock/population densities and levels of economic development. Offering the same compensation schedule to all subcontracted agents, regardless of where they operate, may lead to an under-supply (or over-supply) of animal health services in remote (peri-urban) rural areas, where markets are small (large) and transaction costs high (low).
- Subcontracting may distort the functioning of other markets because, having a guaranteed remuneration, the agents may provide private goods/services to farmers at below market prices, ultimately establishing a monopoly/oligopoly in the supply of private veterinary services.

- In some cases, private agents are unwilling to supply public services/goods that might undermine their credibility and/or have a negative impact on their private business, such as culling overtly healthy but potentially infectious animals.
- In many countries, the institutional infrastructure necessary to assess the performance of subcontracted agents is limited, thereby preventing government from designing and offering enforceable contracts to private service providers.
- Political/social concern about the downsizing of public-sector staff frequently creates obstacles to subcontracting services to private providers.

Box 18. SUBCONTRACTING ANIMAL EXTENSION SERVICES IN MALI

In 1991, the Government of Mali made a start on decentralizing and privatizing the supply of agricultural and livestock services. The *Projet d'appui au secteur prive de l'élevage* (Project for Private Livestock-Sector Support), funded by French Cooperation in the regions of Sikasso, Kayes and Mopti, helped regional agricultural chambers (RACs) to subcontract animal extension services to 120 private veterinarians and paraveterinarians in 4 500 villages. The subcontracted agents were also entitled to sell drugs, vaccines and other items (such as fly traps) to farmers privately. They were remunerated on the basis of numbers of villages visited (with a fixed rate of US$20 per village per year) and were required to report to RACs with regard to the number of training sessions organized in the villages. RAC officers visited at least 15 percent of the villages reached by the subcontracted agents to check that training sessions had been, in fact, held; payments were made thereafter, but one false record was enough to cancel the whole payment and contract. After some years, the Sikasso RAC improved the model by giving extension vouchers to villages rather than subcontracting private extension agents; villages could use the vouchers, valued at US$17, to purchase a variety of services provided by private veterinarians and paraveterinarians. The services available, costs and authorized trainers were set out in a booklet, and while farmers were free to request other services/goods they had to pay in cash if the costs exceeded the value of their vouchers. This system empowered the livestock farmers, because it both increased their bargaining power and created competition among extension agents. In the region of Sikasso, where about 40 veterinarians operated, 1 850 villages received advice on poultry diseases and 2 500 000 poultry were vaccinated against Newcastle disease; 1 250 villages received advice on sheep and goat diseases, and 15 000 small ruminants were vaccinated; 175 villages attended training programmes on trypanosomiasis control; and 500 fly traps were sold. The subcontracted agents also offered their services to farmers on a private basis (primarily for the sale of vaccines and drugs) and achieved average incomes of US$740 per year.

The public-private partnership between RACs and private veterinarians/paraveterinarians contributed to extending the coverage and increasing the quality of animal extension services in rural Mali. It also proved critical in stimulating a market for private animal health services and veterinary supplies in rural areas.

Source: Fermet-Quinet and Gauthier, 2002.

3.1.5. 'Smart subsidies' to private service providers

Economies of scale and transaction cost considerations sometimes make it unprofitable for private actors, including animal health service providers, to offer private services and goods in remote and underdeveloped rural areas. Government may use both 'pull' and 'push' strategies to provide incentives to private actors to operate in such areas. With the former, government simply ceases to provide veterinary/paraveterinary services, thereby opening up market opportunities for private agents. In the case of 'push' strategies, government provides direct or indirect subsidies to private service providers, such as credit facilities and microbusiness training, in order to reduce their transaction costs for operating in rural areas (DAC, 2007a; 2007b; Khanna, 2007; Shekara, 2001). These are often termed 'smart subsidies' as they aim at promoting market functioning without distorting prices or reducing stakeholder incentives. Whereas 'pull' strategies do not require sophisticated analyses and implementation mechanisms, 'push' strategies need to be appropriately designed and implemented. This includes:

- identifying areas where private practitioners will have to operate if they wish to be entitled to some form of public support; these should be areas of low population/livestock density and (relatively) low levels of economic development;
- establishing who is entitled to receive public support, e.g. private veterinarians, animal health assistants, animal health workers, NGOs or other actors;
- defining the type and amount of public support to be provided, such as grants, subsidies, preferential loans, tax rebates or exemptions, which provide different types of incentives to service providers; as a general rule, such support should be given only once (otherwise it becomes a subsidy), and be sufficient to promote the establishment of a sustainable market for animal health services/goods in the medium to long term;
- ensuring adequate provision of complementary public animal health services/goods in the areas covered so that farmers have good reasons for also requesting private animal health services/goods.

The following are some of the challenges associated with 'push' strategies that aim at creating markets for private animal health services and veterinary supplies in rural areas:

- Despite evidence that poor people are willing to pay for animal health services and veterinary supplies, rural households are often outside any significant cash economy and are thus unable to pay.
- Many developing countries lack qualified private service providers, including veterinarians, animal health auxiliaries and community-based animal health workers. Short-term training may be needed in order to create a market supply of animal health services/drugs in rural areas over the medium to long term.
- Complementary public animal health services (e.g. disease surveillance and control of epidemics) provided by the state are often poor, which reduces farmers' incentives to use their limited resources to buy public livestock goods and services.
- Providing public support to private service providers of animal health services/goods may set up barriers to new practitioners, unless government is ready to provide one-

off support to all prospective service suppliers. Since this is rarely the case, governments sometimes fix the prices of services and drugs. But in this way, they reduce competition and market efficiency.

Box 19. AGRICLINICS AND AGRIBUSINESS CENTRES IN INDIA

The Department of Agriculture and Cooperation (DAC) of the Ministry of Agriculture, Government of India, in association with the National Bank for Agriculture and Rural Development (NABARD), recently launched the Agriclinics and Agribusiness Centres Scheme to "supplement the efforts of government extension system" and "make available supplementary sources of inputs supply and services to needy farmers". The scheme aims to train agricultural graduates and provide them with loans to set up agriclinics and agribusiness centres in rural areas, thereby stimulating the supply-side of a market for animal health services and goods. In particular, agriclinics are expected to provide services and advice to farmers and livestock keepers; the agribusiness centres are intended to offer inputs and farm equipment, both for sale and for rent. The scheme works as follows: a two-month training course in entrepreneurship and business management is provided free of charge to agriculture graduates interested in setting up their own business in rural areas. Graduates then draft a business plan for their proposed agriclinic/agribusiness centre, with a maximum estimated cost of Rs. 1 000 000 (US$20 000) for individual, and Rs. 5 000 000 (US$100 000) for group projects. In association with NABARD, DAC provides a 25 percent subsidy on the capital required for setting up agriclinics/agribusiness centres: 10 percent is contributed by the participant and 65 percent is financed through banks on priority lending terms. The repayment period varies between five and ten years, and includes a maximum grace period of two years. The agriclinics/agribusiness centres are expected to be set up within six months of the disbursement of the first loan instalment. In order to help agricultural graduates set up the clinics and centres, the Government of India proposed a number of 'project models', including: private veterinary clinics; private veterinary clinics with a retail outlet for feed and medicine; and private veterinary clinics with small, private artificial insemination centres.

The scheme appears to work well in the relatively developed states and districts. However, it does not appear to be appropriate for backward districts because of very limited demand by farmers for private animal health services and veterinary supplies.

Sources: Baishya, 2009; Shekara, 2001; www.agriclinics.net.

3.1.6. Community animal health workers

A popular instrument for ensuring the supply of private animal health services in remote, low-income rural areas is the institutionalization of community animal health workers (CAHWs): local people trained to deal with the most common livestock diseases, using a small range of simple equipment and drugs. The CAHWs are considerably less expensive than fully trained veterinarians as they have lower expectations in terms of income and face lower transaction costs because they act locally. CAHWs can supply private services and be

awarded government contracts to supply a range of public goods to farmers (Curran and MacLehose, 2002; IDL, 2003; Peeling and Holden, 2004). Establishing a functional network of CAHWs calls for the following:

- Ensuring legal recognition of CAHWs, including identification of the services/drugs they are qualified to provide/sell.
- Establishing selection criteria for potential CAHWs, possibly in consultation with local communities. In general, CAHWs live locally; are experienced livestock herders; have other sources of income; are willing to set up their own business; and are known to, and trusted by, the community.
- Training CAHWs. Courses last anything from a few days to several weeks, and include subjects such as disease detection and prevention, animal treatment, accounting and bookkeeping, etc., all of which are necessary for the proper running of a small business. The cost of such training courses is generally modest.
- Holding regular refresher courses to review key topics, cover new treatments and husbandry practices, and provide opportunities for CAHWs to share their experiences.
- Providing basic equipment. CAHWs are often given a basic kit of equipment free of charge. This contains syringes, needles, thermometers and a small stock of basic medicines, thus allowing them to offer their services without delay.
- Establishing an institutional and legal mechanism to facilitate cooperation among CAHWs, animal health auxiliaries and veterinarians, who always remain responsible for the more sophisticated diagnoses and treatments. For instance, CAHWs could regularly report to veterinarians or to animal health auxiliaries who would then report to veterinarians.

CAHW initiatives have been implemented in almost 50 countries since the 1970s; some of the major challenges encountered are as follows:

- As the law stands in several developing countries, many of the services that could be provided by CAHWs – including diagnosis and treatment of animal diseases, and the handling and distribution of vaccines and drugs – are still considered as 'acts of veterinary medicines' provided only by registered veterinarians.
- The rapid, rather rudimentary training of CAHWs is sometimes insufficient to ensure correct diagnosis and medicines (use of appropriate drugs, dosage, duration).
- Governments are accustomed to providing CAHWs with drugs and equipment to start up their business. The long-term sustainability of CAHWs, however, depends on the existence of a regular distribution system or an efficient market for such basic inputs, which is rarely the case.
- Even though CAHWs are private actors, the tendency is for governments to consider them as a social appendage to the public sector because they provide services to the rural poor. Therefore, governments sometimes fix the fees for CAHW services, but that may undermine their profitability and sustainability.
- Both veterinarians and animal health auxiliaries may exert political pressure on government not to give legal recognition to CAHWs. The assumption here is that recognition of CAHWs would make it unprofitable for veterinarians/auxiliaries to work in rural areas.

Box 20. COMMUNITY-BASED ANIMAL HEALTH WORKERS IN SULAWESI, INDONESIA

The objective of the Decentralised Livestock Services Project in Eastern Indonesia, which started in 1996, was to help government to establish livestock-related institutions with a view to better responding to the needs of small-scale farmers, including the resource-poor. To that end, the project developed and tested new models of livestock service provision in four districts in north and south Sulawesi, including the establishment of CAHWs. Activities began with a participatory rural appraisal exercise in different communities. During the appraisal, livestock farmers identified animal diseases and poor access to veterinary services as among their most binding constraints, and agreed that the establishment of CAHWs might well be appropriate for improving access to, and the affordability of, basic animal health services. Each community nominated a representative, who was first trained as a CAHW and then given a soft loan to purchase veterinary equipment and drugs, which enabled him/her to provide basic clinical animal health services to community members against a fee. The district local services (DLS) gave legal recognition to CAHWs by issuing them with certificates that were renewable on a yearly basis. Monthly meetings were held to provide continuous training to CAHWs, allow them to exchange experiences and hold discussions with DLS. The CAHWs also set up an association to represent their interests and voice their concerns.

The project succeeded in improving the coverage and quality of animal health services in the four districts where it operated, and most CAHWs made good profits within about three-to-four months; this proved critical for sustainability of the initiative. Following the pilot phase, the Government also subcontracted CAHWs for the supply of public goods, including livestock vaccinations, with savings in the range of 20-40 percent over the previous centralized delivery mechanism.

Source: Leksmono and Young, 2002.

3.1.7. Membership-based organizations

Membership-based organizations (MOs) include producer associations, cooperatives, rotating savings and credit associations (ROSCAs) and other community-based organizations. MOs help their members gain access to animal health services and veterinary supplies because, by sharing the fixed costs among all members (e.g. a veterinarian's travel costs) and gaining bargaining power based on bulk orders, they can pay for the services of a veterinarian/animal health assistant and/or buy animal drugs at favourable prices (Kurup, 2002; Omore *et al.*, 1997; Owango *et al.*, 1998; Stringfellow *et al.*, 1997). Supporting livestock-focused MOs, therefore, could be a way of increasing the access of livestock farmers to animal health services and veterinary supplies. This would involve the following:

- Granting legal status to MOs to enable them to recruit/contract veterinarians/animal health auxiliaries and to buy veterinary supplies and/or sell them to their livestock farmer members.
- Defining rules to govern the relationships among the public, the private sector and MOs regarding the provision of animal health services/drugs. This is important, because MOs are a 'third actor' in the supply train for animal health services and

Credit: WrenMedia/N. Palmer

drugs; and as they usually operate under special laws (e.g. tax rebates), they may distort market functioning.

- Providing capacity-building for communities to facilitate the establishment of livestock-based MOs, including training to establish and collect fees, deal with third parties, share profits, maintain proper accounts, etc.
- Providing financial support as necessary (e.g. loans with grace periods; grants) during the start-up of an MO's activities.

Concerns associated with the capacity of MOs to provide services to their members include the following:

- Small size, homogeneity, internal cohesion and face-to-face interaction are critical for MOs to be effective. However, the smaller the membership of MOs the more difficult it is for them to be financially self-sustaining and able to request/supply animal health services to their members; on the other hand, as MOs grow in size, coordination and management difficulties tend to limit their effectiveness.
- The poor can seldom become members of financially self-sustaining MOs (because the fees are prohibitively high for them) and therefore do not benefit from the services/goods provided.
- There is no unambiguous evidence as to the financial sustainability of MOs, the majority of which were established through external support and are subsidized on a continuous basis – directly through grants and indirectly through soft loans from donors.
- In most cases, MOs were first established for dairy marketing in high potential areas and it was only at a later stage that they started also to provide animal health services. In other words, MOs are more likely to be formed in more advanced and in rural areas connected to markets (the absolute number of poor, however, is sometimes higher in developed than in backward rural areas).

Box 21. MEMBERSHIP ORGANIZATIONS IN GUJARAT, INDIA

Mehsana is one of the 19 districts of the State of Gujarat in India, and has a population of about 3 million, of which about 80 percent lives in rural areas. Marginal, small and landless farmers hold about 67 percent of all milk animals in the district. The State Department of Animal Husbandry provides livestock services to farmers but, because it spends about 95 percent of its annual budget on salaries, it can seldom provide sufficient animal vaccines and drugs to farmers. To address these constraints, the Mehsana District Cooperative Union, the main objective of which is to help its members to market their surplus milk, has also started supplying veterinary services and drugs to its members. The union follows a three-pronged approach: (i) At the village level, veterinary first aid is provided by the dairy cooperative societies (DCSs), to which villagers have always handed over their surplus milk. The union has equipped each DCS with a veterinary first-aid kit as a one-off gift and has trained a 'first-aid worker', who charges union members a token Rs. 1 per visit and sells drugs and re-agents. (ii) At the farm gate, veterinary services are provided by 35 veterinary mobile clinics, each comprising a veterinarian, an animal health auxiliary and a vehicle with driver. Each mobile clinic operates along established routes, and services are charged at the rate of Rs. 40 for every new call and Rs. 20 for repeat calls. The charges cover the costs of transport, drugs and the veterinarian's fee. A typical call costs some Rs. 77, the difference being paid by the union (i.e. through membership fees). In 1999-2000, the 35 mobile veterinary units operating in Mehsana responded to 234 196 calls (about 18 calls per day per mobile clinic). (iii) Finally, animal health camps are the union's approach to widespread health problems such as infertility, repeat breeders and metabolic disorders. Camps are organized on the initiative of a cluster of DCSs with specific herd health problems, and are attended by a large number of livestock keepers, veterinarians of the union and specialists from colleges, universities and the State Department of Animal Husbandry. A total of 22 424 animals were treated in such camps in 1999-2000.

The union demonstrates how farmer organizations, if well organized, can successfully supply their members with both animal health services and drugs/vaccines. However, it should be noted that India has a long tradition of supporting dairy cooperatives, which currently serve more than 10 million farmers in over 80 000 villages.

Sources: Kurup, 2002; www.indiadairy.com

3.1.8. 'Smart subsidies' to livestock farmers

One way of promoting a market for animal health services and veterinary supplies is to provide a 'smart subsidy' (typically a voucher) to livestock farmers for the purchase of livestock services/drugs on the market. This contributes to healthier animals, improved production and productivity and increased household incomes – one of the most critical conditions for the existence of a livestock services and drugs market (Auisi, 2007; Castañeda, 1998; Gregory, 2006). The distribution of 'smart subsidies'/input vouchers for specific services/goods is a typical form of public support to less well-to-do households. It involves:

Credit: ©FAO/22674/J. Spaull

- identifying and selecting livestock farmers entitled to receive input vouchers for animal health services and veterinary supplies (e.g. targeting parameters may include household income; livestock dependency; location, etc.);
- deciding on the value and characteristics of vouchers, which should not be equivalent to cash; for instance, the value of vouchers may be offset against the market price of a standard set of livestock services; exchanges of vouchers among beneficiaries may be prohibited; vouchers may be used only within a given period of time, etc.;
- establishing mechanisms for distributing vouchers to livestock farmers and for managing cash redemptions by service providers/drug sellers;
- defining a clear time frame; in theory, voucher programmes should run for only a limited period while subsidies are gradually removed as smallholders and service providers create and sustain a functional cash market for animal health services and vaccines/drugs.

Setting up a functional voucher system to help livestock farmers gain access to animal health services and veterinary supplies is a challenging task:

- The costs for government are often high. Over and above the value of vouchers, significant transaction costs are involved in distributing vouchers to hundreds, if not thousands, of eligible beneficiaries dispersed throughout the rural areas, and in setting up a voucher redemption system.
- Although vouchers are usually recipient-specific, a secondary market often develops whereby vouchers are sold and exchanged, and eventually redeemed at a lower value.
- Small-scale farmers may not be able to reap the benefits of input vouchers when there are few, if any, private providers of animal health services and veterinary supplies operating in the rural areas.

- Input vouchers might cause economic distortions, as they may force livestock farmers to buy predetermined animal health services that are not always the most appropriate.
- To promote and sustain a market for livestock services and related goods, voucher programmes should be in place for a specific period of time, such as five years. The financial commitment of governments, however, is typically of shorter duration.

Box 22. INPUT VOUCHERS TO ROMANIAN FARMERS

In 1997, Romania implemented a US$200 million (in 1997 prices) input voucher programme to help farmers buy key inputs to increase their agricultural production and productivity. The programme involved the distribution of vouchers to all farmers owning at least 0.5 ha of agricultural land (farms with less than 0.5 ha were considered as home gardens). Each beneficiary farmer was entitled to one voucher per hectare of land owned or leased, up to a maximum of 6 ha. The value of each voucher was set at US$18 for the autumn planting season of 1997, which represented about 30 percent of the average input expenditure per hectare, including seeds, fertilizer, pesticides and fuel. As the time between voucher distribution and the planting season was short, 90 percent of the vouchers were used to buy eligible inputs and only 10 percent were re-sold or used to buy other goods. The programme was designed by the Ministry of Agriculture and implemented through a number of government institutions/agencies; no ad hoc agency was established to manage voucher distribution and redemption. In particular, on the basis of cadastral records, local governments identified potential beneficiary farmers and communicated their names to the National Commission for Informatics, for consolidation and verification. The Printing House of the Central Bank printed about 10.2 million vouchers on security paper, and post offices distributed them to farmers. Commercial banks redeemed vouchers and charged a commission of only 0.5 percent on their value because the Ministry of Agriculture required that vouchers should be cashed within a maximum of three to four days.

The Romanian voucher programme is one example of a successfully designed and implemented 'smart subsidies' programme. However, no evaluation has been made of its impact on agricultural production and productivity, or of its capacity to establish self-sustaining markets and, ultimately, improve farmers' livelihoods.

Source: Castañeda, 1998.

3.2. LIVESTOCK-RELATED FINANCIAL POLICIES AND PROGRAMMES

Inadequate financial services (including credit and savings facilities) in rural areas prevent livestock farmers from making good use of their livestock and other assets and getting a foothold on the ladder out of poverty. Public actions are needed to facilitate access to credit for rural dwellers, including poor livestock farmers, because the private sector finds it unprofitable to operate in low-income rural settings owing to scarce and asymmetric information, high transaction costs, lack of farmer collateral, and highly co-variant, risky agricultural production activities (Hoff and Stiglitz, 1990).

Traditionally, governments in developing countries have set up state-owned specialized financial institutions to receive concessional loans from government for on-lending to agricultural producers at below market interest rates for specific types of inputs or investments. While these interventions have improved access to finance and contributed to increased agricultural production, overall, they have failed to create self-sustainable rural financial markets, essentially because they addressed the symptoms rather than the causes of inadequate rural financial intermediation. Since the 1980s, therefore, governments have put an end to public supplies of credit to farmers and have sought to address the causes of financial market imperfections and failures, the objective being to speed up the supply of credit and other financial services by private, formal/informal actors (independent of donated or subsidized funds). These actors include public and private commercial banks; savings and loan cooperatives; microfinance banks; rotating savings and credit associations (ROSCAs); NGOs; self-help groups (SHGs); credit unions; and others (Adams *et al*., 1984; Morduch, 2000).

Creating favourable markets for rural financial intermediation requires that governments should: (i) implement sound fiscal and monetary policies; (ii) create a neutral trade regime between agricultural and non-agricultural goods; and (iii) set up an effective legal and regulatory framework for rural financial markets. These policies, largely beyond the responsibilities of agricultural/livestock ministries, are by no means sufficient to promote rural financial markets because they do not solve a number of fundamental issues related to limited information and high transaction costs; lack of collateral; and highly co-variant, risky agricultural production activities. Other public actions are required, therefore, to stimulate the supply of, and demand for, financial services and products in rural areas (Coffey, 1998; Norton, 2004).

These public actions – which could be handled by a variety of public actors, including livestock departments – aim at promoting new business models in rural areas through the provision of incentives (grants, subsidies, information, technical assistance, institution-building, etc.) for financial institutions to begin offering their services and products in low-income rural areas. The underpinning assumption is that, despite there being an untapped market for financial services in rural areas, unless they receive some kind of assistance private entrepreneurs find it too costly (and risky) to implement innovative models of financial intermediation in low-income areas. In effect, private entrepreneurs face limited prospects: if they were to succeed in developing profitable business models, they would face immediate competition because others would immediately replicate their business strategy, and they would not be able to recover their investment costs; if they were to fail, they would have to bear all the losses. The implication is that, unless there is public support for promising start-ups to become financially viable, few financial institutions will experiment with new business models to expand their activities in rural areas and serve poor rural dwellers as well, including the livestock-dependent (Hausmann and Rodrik, 2003; World Bank, 2005b).

Table 5 lists different financial business models/strategies that have proved effective in serving rural/low-income households and which a government may decide to use for promoting rural financial markets. The following sections provide details on these models, accompanied by case studies. Some of them refer the livestock sector, too often overlooked by financial institutions.

Table 5. RURAL FINANCE POLICIES AND PROGRAMME OPTIONS

3.2.1.	Portfolio diversification and flexibility*
3.2.2.	Livestock as collateral for loans
3.2.3.	Warehouse receipt systems
3.2.4.	Mobile banking
3.2.5.	Branchless banking
3.2.6.	Member-based financial institutions
3.2.7.	Credit bureaus and scoring

* May be implemented by livestock departments/ministries

3.2.1. Portfolio diversification and flexibility

Financial institutions rarely provide their services to smallholder farmers because it is difficult to assess their creditworthiness and they lack collateral. Another reason is that, ultimately, agricultural production activities are notoriously risky owing to climatic variability, unpredictable pest and disease outbreaks, and other variables independent of farmer behaviour. There is, however, evidence that, by diversifying their rural portfolio, i.e. by financing a variety of farm and non-farm investments in rural areas, financial institutions may both reduce their risk exposure and make good profits from providing financial services to smallholder farmers. Portfolio diversification is not straightforward for financial institutions, as it involves radical changes in the way they screen potential borrowers and distribute loans (Klein *et al.*, 1999; Wenner *et al.*, 2007; World Bank, 2005c). A government may facilitate portfolio diversification through training courses, grants/subsidies for start-up and experimentation, development and dissemination of appropriate technologies, facilitation of experience-sharing with financial institutions of other countries/regions, etc. In general, in order to diversify their rural portfolios, financial institutions should:

- screen households eligible to receive loans by examining all their sources of income, rather than just requesting collateral against loans; for example, a small farmer who owns a few hectares of land, some scavenging poultry and a small handicrafts business might well be a reliable borrower because she/he is expected to have a stable, albeit relatively low, income; conversely, a farmer who depends on a single crop or animal species, or who is too dependent on irrigation may well have a higher average income but its variability would not make him/her a particularly reliable borrower;
- appreciate the complexity of the household economy as a whole by taking account of interrelationships between consumption and production decisions, household time preferences (e.g. current consumption is often valued more than future consumption) and risk-attitude – rather than only looking at the agricultural production function;
- offer potential borrowers tailored, flexible loans to match individual household characteristics; for instance, instalments may vary across the year; there may be few, if any, penalties for postponing one or more monthly payments; repayment terms may be extended under specific circumstances, etc. – tailored loans and flexibility help banks to address borrowers' difficulties before they get out of control and, therefore, to ensure that most loans are repaid in full.

Exogenous shocks (e.g. drought, floods) regularly affect rural areas and, as they have an impact on most, if not all, farmer activities, easily transform a good borrower into a bad one. Formal and informal insurance mechanisms and/or targeted safety net programmes for households (with a good repayment history) are thus powerful incentives for financial institutions to start diversifying their portfolios and to operate in low-income rural settings.

Portfolio diversification may in theory seem to be a profitable business model for financial institutions willing to operate in rural areas. In practice, however, there are serious constraints to implementation:

- The majority of financial institutions only have branches in urban and peri-urban areas. Opening new branches in rural areas involves high investment and maintenance costs, one reason being that the low population density in rural areas (few clients) makes the investment:return ratio unattractive. Moreover, bank officers may be unwilling to live and work in rural areas.
- Offering tailored and flexible loans to rural dwellers increases the unitary cost of loan assessment and management. Such loans may also contribute to liquidity constraints, especially for small financial providers, owing to seasonal demand for agricultural credit (in the sowing season).
- Limited human and financial resources may prevent governments from providing adequate support for financial providers to expand their business ventures.
- Financial institutions diversifying their portfolios into rural areas do not necessarily serve very poor farmers who lack collateral and live outside the cash economy.

Credit: ©FAO/22950/J. Koelen

Box 23. CAJA LOS ANDES IN BOLIVIA

Caja Los Andes opened in La Paz, Bolivia, in 1995 as the offspring of Procredito, a financial NGO founded in 1992 with support from the German consulting firm, International Project Consult. Over the last decade, Caja Los Andes has been expanding its business into rural areas, by means of: (i) strategically selecting the location of its rural offices, focusing on small town hubs in densely populated rural regions; (ii) developing a specific lending technology based on simultaneous assessments of all household production/consumption activities and associated cash flows; (iii) recruiting local agronomists to operate in rural areas and training them in basic economics and banking procedures, to include one year's on-the-job training; (iv) preparing a multiplicity of disbursement/repayment plans to match the needs of individual rural households (for instance, repayment instalments linked to the crop cycle; repayment schedules based on a family's revenue flow, etc.); (v) developing simple computer software that creates balance sheets and cash flow statements for each potential borrower, thereby allowing for decentralized loan disbursement (branch managers are responsible for loans of up to US $5 000, and regional directors for up to $20 000); and (vi) loan officers immediately visit clients who have missed a repayment instalment, and help them restructure their business before the situation gets out of hand. Defaulting clients are required to pay a penalty, whereas those in good standing are offered lower interest rates.

The experience of Caja Los Andes demonstrates the potential of sustainable financial operations in rural contexts. Today, Caja's loans to rural clients account for 9 percent of its overall portfolio and for 15.3 percent of all loans approved. However, poorer clients in more remote areas are not served by the Caja: branches have been opened in small rural towns in order to target clients with diverse income sources.

Sources: Pearce *et al.*, 2005; Vogelgesang, 2001.

3.2.2. Livestock as collateral for loans

Financial institutions prefer to lend – and at better rates – to borrowers who can offer collateral against loans. Most rural households in developing countries do not own real properties to use as collateral and are thus rationed on the credit market. But many of them possess – albeit not in a form that could be used as collateral – a wide array of tangible assets that have a market value: standing crops, live animals, farm machinery. Institutional/legal reforms to transform these assets into valuable collateral would contribute to developing rural financial markets (de Soto, 2000; Fleisig *et al.*, 2006; Safavian *et al.*, 2006). The following conditions are required for this to be feasible:

- Financial institutions should be allowed legally to accept a variety of goods/assets as collateral, such as large and small ruminants, poultry, farm machinery, etc. In other words, they should be able to repossess such assets in the event of default.
- Financial institutions should be trained (or able) to value livestock assets, i.e. the current and expected value of income to be derived from livestock in different production systems.

Credit: ©FAO/21420/ J. Spaull

- In theory, there should be no limit on the amount of movable assets a financial institution can accept as collateral, including livestock. However, such items are seen as valuable collateral only when there is a public/private register that records, documents and publicizes all livestock transactions. In fact, before disbursing a loan, financial institutions are obliged to run checks on property to ensure that it has not been used as collateral for securing other loans.
- A legal framework should be put in place to ensure that all claims on movable collateral are enforced in the event of default. The focus should be on speediness and simplicity, otherwise such items may be rapidly sold and/or transferred.

The following describes issues involved in establishing an institutional framework for financial institutions to accept livestock as collateral for loans:

- In developing countries, farmers are rarely, if ever, required to keep records and hold titles for their movable assets, including large and small ruminants and, particularly, short-cycle animals.
- Establishing a public register for livestock is anything but simple. This is because methods for identifying and tracking animal movements – such as hot-iron branding, tattooing, tagging and even implanting microchips – are expensive and not entirely foolproof.
- Financial institutions tend to offer only short-term loans to small farmers using livestock as collateral, but offer long-term loans to large commercial livestock farms wishing to invest in enhancing their productivity.
- In view of the fact that animal diseases are pervasive in developing countries, financial institutions may be unwilling to consider livestock as collateral, even when an efficient institutional and legal framework is in place.

Box 24. CATTLE AS COLLATERAL FOR LOANS IN URUGUAY AND THE STATE OF KANSAS (UNITED STATES)

Uruguay and the state of Kansas, both of which have a comparative advantage in livestock production, are among the world's most competitive beef exporters. However, their financial markets for livestock operators are markedly different: in Uruguay, no private bank would accept livestock as collateral, whereas in Kansas cattle are seen as possibly the best type of collateral for loans. (i) Uruguayan law makes it very difficult to create a security interest in cattle as it requires items of collateral to be enumerated, i.e. financial institutions are expected to identify each head of cattle used as collateral and to monitor their use by the owner, who might otherwise sell them without notifying the bank. In contrast, the law in Kansas allows for a binding agreement secured by 'a floating security interest' in, say, US$200 000 in cattle, with the bank having a 'continuing security interest' in the proceeds of the farm, regardless of whether the cattle have been sold and the money put into a bank account or used to buy a tractor. (ii) In Uruguay, it is extremely difficult to check whether there are prior superior claims on the collateral, whereas there are public registers in Kansas from which – at little cost – financial institutions can easily acquire information on the size and sequence of the security interests in a farmer's livestock. (iii) It takes about six months to two years, and a costly legal process, for a Uruguayan financial institution to repossess and sell collateral, and it is not allowed to repossess a borrower's other assets, such as the proceeds of collateral sales. In Kansas, cattle used as collateral may be repossessed and sold in as little as five days.

This comparison of practices in Uruguay and the state of Kansas shows how institutional reforms, which are often low-cost policy options, can be critical in facilitating access to finance for farmers and promoting livestock sector development. That said, both Uruguay and Kansas have an industrially advanced cattle sector. Therefore, the question remains as to whether reforming collateral laws is an effective way of extending access to credit also to small farmers in traditional livestock production systems.

Source: Fleisig, 1996.

3.2.3. Warehouse receipt systems

Warehouse receipt systems allow farmers to use their surplus crop or livestock production as collateral for loans. These systems work as follows: smallholders deposit their surplus crops or livestock products in a public or private warehouse; the warehouse issues a receipt certifying the deposit of the goods, including their quantity and quality; and the farmer uses the receipt, which has a commercial value and can be easily liquidated, as collateral for loans. Three parties are involved in this transaction: the farmer, who takes his/her surplus produce to the warehouse; the warehouse operator, who classifies the goods and determines their value; and the financial institution, which grants a loan based on the receipt issued by the warehouse operator (Coulter and Onumah, 2002; Coulter and Shepherd, 1995; Lacroix and Varangis, 1996). Public actions to support the establishment of warehouse receipt systems include the following:

- Identifying agents eligible to manage warehouses, including producers, farmer groups, traders, processors, exporters or ad hoc public/private institutions. The latter case is the most frequent.
- Legally allowing warehouses to define quantity, quality and grades of the stored products (so there is no need for interested parties physically to examine the goods) and to issue relevant receipts. Processed livestock products for which receipts may be issued include salted or chilled meat, skins and leather products, powdered milk, etc.
- Making warehouse receipts legally transferable for use as collateral for loans, i.e. upon presentation of a receipt to the warehouse, the holder will receive either the stored goods or their fungible equivalent.
- Setting up an information system on prevailing prices and trends to facilitate the use of warehouse receipts as collateral for loans. This is because swings in market prices determine changes in the value of agricultural/livestock commodities and, hence, in the value of warehouse receipts.
- Establishing a certification and inspection system for licensed warehouses to provide guarantees to actors in financial markets, as well as an institutional mechanism to address quickly potential conflicts relating to the quantity/quality of stored agricultural commodities.

Establishing an effective warehouse receipt system is demanding, for the following reasons:

- The costs of establishing and running a warehouse are high, but typically decrease the larger the quantity of produce stored. Because the surpluses of agricultural products are small in many developing countries, the public cost of establishing a warehouse system might be more than its potential benefit.
- Given the high transaction costs associated with numerous small deliveries, warehouse operators are often unwilling to serve farmers or farmer groups depositing only small volumes of commodities. Furthermore, smallholders find it difficult to accumulate large surpluses and meet the quality requirements of warehouses.
- Even when there are legal/regulatory mechanisms that inspire confidence in warehouses, financial institutions tend to grant loans on only a (small) proportion (50 to 60 percent) of the market value of stored goods.
- Storing livestock products necessitates some form of processing. Modern small-scale processing facilities and preservation technologies are, however, rarely available in rural areas or are prohibitively costly for small farmers, and traditional processing methods do not meet the quality requirements of warehouses.
- A warehouse system is economically self-sustainable as long as there are regular market price swings that allow the farmers to pay for storage (they deposit their agricultural products in the flush season when market prices are low, and collect them in the lean season when prices peak). However, increased storage by farmers reduces seasonal price variations and minimizes trade margins, thereby diluting the profitability of warehouses; in many countries, agricultural prices are even fixed by central government.
- Because of the uncertainties surrounding long-term price trends, financial institutions tend to provide only short-term loans when warehouse receipts are used as collateral.

Box 25. WAREHOUSE RECEIPT SYSTEM IN ZAMBIA

The Natural Resources Institute of the United Kingdom has been assisting a range of Zambian parties – including government, farmers, bankers, traders and millers – to draw up and implement a regulated warehouse receipt system, that is, a network of privately managed warehouses authorized to issue transferable warehouse receipts guaranteed by a public certification and inspection system. In order to serve the largest possible number of farmers, under the Zambian warehouse system: (i) A low capital threshold (US$50 000) is set for establishing warehouses that can store up to ten times their net worth; however, applicants must either own or lease storage space on commercial terms, meet a number of solvency criteria, provide a financial performance guarantee, be professionally competent, and willing to accept frequent unannounced inspections. (ii) The minimum grain deposit is set at between 10 and 30 tonnes in order to make the service available to the largest possible number of actors. Maize, wheat and soybean have been accepted by warehouses to date, although there are plans to expand the number of storable products. (iii) Warehouse operators are expected to charge market-level storage rates, i.e. to be financially self-sustaining. (iv) Robust commodity grading and weight standards have been set, and warehouse operators are trained/certified in commodity quality and quantity assurance (sampling, grading, weighing). This ensures that warehouse receipts are accepted as collateral for loans. (v) Warehouses were first established in urban areas and along main roads, and subsequently set up in the rural areas where agricultural surpluses are frequently recorded. (vi) The Zambian Agricultural Commodity Agency Ltd was established to issue and revoke warehouse licences, and to certify and oversee warehouse operations. (vii) A communication strategy was developed to inform, and gain the support of, all stakeholder groups with a potential interest in the programme, notably, farmers, traders, processors, bankers and policy-makers.

As of June 2005, loans for a total of US$2.18 million had been disbursed to rural dwellers through Zambia's warehouse receipt system. However, the question of whether the warehouse receipt system model (both in Zambia and elsewhere) can also be applied to livestock products needs to be further reviewed and analysed.

Sources: Coulter and Onumah, 2002; www.ratesecenter.org.

3.2.4. Mobile banking

Mobile banking is a management strategy that allows financial institutions to reduce their fixed costs and operate in areas where it is not economically profitable to maintain a network of fixed bank windows. It consists of mobile offices – usually trucks – that visit remote rural areas for loan analysis, disbursement and collection on a regular basis (weekly or monthly), thereby expanding the geographical coverage of banking activities, with a relatively small increase in costs (Coetzee *et al.*, 2003; Mallick, 2007; Opoku and Foy, 2008). Whether or not a commercial financial provider will decide to set up mobile banking services in rural areas will depend on the results of a cost-benefit analysis. Government policies and programmes, however, may reduce the costs or enhance the benefits of the cost-benefit ratio, thereby providing incentives for financial institutions to experiment with mobile banking delivery:

- Public authorities should establish a legal, regulatory framework for financial institutions to operate in rural areas through a network of mobile banking offices. For instance, the banking law should permit weekly openings and/or flexible opening hours for mobile bank offices.
- As mobile banks operate in remote, low-income areas, laws/regulations should be enacted to extend such transactions to poorer households: for instance, no minimum amount should be required to open a current account, savings accounts should be exempted from fees, etc.
- Subsidies, loans at below market rates, and fiscal rebates could be provided to financial institutions willing to establish mobile banking offices in rural areas, which would cost less than building and maintaining concrete booths. However, the majority of financial institutions still do not appreciate the potential profitability of rural financial markets. As cash transactions are involved, financial institutions may be willing to offer mobile banking services only in areas where there is less likelihood of crime (including hold-ups).

There have been very few cases of successful mobile banking in developing countries:

- Problems of inadequate information, high variability of agricultural production, lack of collateral, limited education of farmers, etc. are not resolved by mobile banking services.
- The inadequacy and/or seasonality of road networks (some regions are accessible only in the dry season) greatly limit the profitability of mobile banking.

Credit: ©FAO/22854/G. Diana

- Bureaucratic, rather than transport costs often constitute a major obstacle to poor people wishing to obtain loans. Unless the paper costs of securing loans, and of dealing with financial institutions in general, are reduced, mobile banking may not be the answer to providing financial services in rural areas.
- Policy-makers view mobile banking as a temporary measure for providing financial services in rural areas, typically in the aftermath of natural disasters such as in the earthquake-hit areas of Turkey in 1999 and Pakistan in 2005, rather than as a tool for establishing a functional financial market in rural areas (such as in Scotland).

Box 26. MOBILE BANKS IN MALAWI

The Opportunity International Bank of Malawi (OIBM) opened in 2003 with the stated objective of providing financial services to the poor. OIBM performs some of its operations in rural areas through a mobile banking network composed of two bullet-proof all-terrain 4x4 vehicles. One of the vehicles is a 5-tonne truck fitted with an automated teller machine (ATM), a counter for two banking staff and sufficient space for administrative work. The vehicle is equipped with a solar panel, a power generator, a global positioning system (GPS) tracking system and satellite technology that allow real-time transactions between the vehicle and the bank's headquarters; it is also attended by two armed officers of the Mobile Police Force. The other vehicle is a 3-tonne truck that uses point of sale (POS) technology to record transactions. The two vehicles cover 26 service points in five districts on a weekly basis, and their itinerary follows rural market days in designated villages. For a small fee, purportedly less than the bus fare to the nearest town, bank clients can deposit money, access their saving accounts and apply for small loans to start up or enlarge their business. Loans are usually given to groups of seven to ten members (primarily poor), thereby using peer pressure as a substitute for collateral. In addition, to reduce the bureaucratic burden on the poor who anyway often have no official identify documents (birth certificates, passports or driving licences), OIBM provides its clients with a 'smart card', called Malswitch, which has fingerprints embedded in a chip within the card and makes it possible to check a client's identity through scanning her/his finger on an ATM.

Thanks to its mobile bank network, OIBM currently serves more than 65 000 clients, the majority of whom are women living below the poverty line; on average, some 98 percent of all loans are fully repaid. However, OIBM charges relatively high interest rates; procedures to access credit are considered slow, also because of having few staff in the mobile units; and most loans are disbursed for non-agricultural investments.

Sources: Mallick, 2007; www.ford.procasur.org; www.opportunitycanada.ca.

3.2.5. Branchless banking

Branchless banking is a business model that allows both financial and non-financial institutions to offer banking services in rural areas through non-bank agents, and thus at reduced operating costs. There are two main models of branchless banking. In the first, a licensed financial institution expands its services in rural areas through a non-bank retail agent,

such as postal and retail outlets; in the second, a non-financial institution, such as a mobile network operator or a pre-paid card issuer, makes use of retail agents to offer customers e-money accounts. Both models make wide use of information and communication technologies, such as cell phones, debit and prepaid cards, and card readers to transmit transaction details between the customer, the retail agent and the institution providing the financial service (Donner and Tellez, 2008; Ivatury and Mas, 2008; Kumar *et al*., 2006; Lyman *et al*., 2006). An appropriate institutional framework should be put in place for branchless banking to develop, as follows:

- Non-bank actors, such as retail agents or post offices, should be legally entitled to perform certain financial operations on behalf of a licensed financial institution or a non-financial institution, such as a mobile network operator.
- Financial operations to be handled by non-bank actors should be clearly identified. These may involve simple operations, such as taking and disbursing cash, or more complex operations such as designing ad hoc financial products for customers.
- The responsibilities and liabilities of licensed financial institutions, non-financial institutions and retail agents should be defined and enforced in order to protect clients against misconduct.
- An effective information and communication technology platform should be set up because branchless banking can function properly only when transactions between customers, retail agents and banks, or issuers of non-bank e-money, can be recorded and communicated quickly, reliably and cheaply over vast distances.

Issues related to branchless banking include the following:

- Non-bank actors may be unable to handle cash transactions correctly, particularly when they involve more than the cash-in/cash-out functions of the typical bank teller, such as screening clients and disbursing loans.
- Non-bank actors in (remote) rural areas may not have enough cash to meet customers' withdrawal requests, both because of the seasonality of demand for credit (e.g. sowing season) and because an emergency (e.g. drought) may trigger requests for credit from most households in the regions affected.
- Branchless banking involves significant costs for training and supervision. This is because financial institutions must ensure that non-bank representatives behave correctly (misconduct involves not only administrative penalties but may also harm their reputation), and that loans are granted only following a thorough financial analysis.
- Problems of limited information, little or no education among the poor, high variability of agricultural risk, lack of collateral, etc. are not resolved through branchless banking. This limits the capacity of such a business model to serve the poor.
- Effective branchless banking requires that customers have access to, and knowledge of, communication technologies such as mobile phones and POS devices. The very poor, therefore, may not benefit from branchless banking models.

Box 27. BANKING CORRESPONDENTS IN BRAZIL

Over the last few years, the Brazilian Government has been attempting to foster innovations and experimentation in the banking system with a view to increasing the supply of financial services throughout the country. In particular, since 2000, the Central Bank of Brazil has allowed financial institutions to outsource their cash-in/cash-out and other functions to an array of retail agents (e.g. lottery kiosks, pharmacies and post offices) or 'banking correspondents'. This has created unprecedented opportunities for banks to spread their operations, because strong unions and strict rules on working hours and salaries have always made it expensive for banks to open new branches in undersupplied areas. Correspondents are remunerated on a fee-for-service basis: for every new client, every transaction made, every product sold, they receive a fee that varies from one financial institution to another and according to location and service provided. Most correspondents use POS devices, bar code readers and/or keypads for managing financial transactions. The relationships between the correspondents and the financial institutions are regulated by the Civil Code: banks are fully liable for their agents' acts but are also allowed to supervise their transactions and records, exactly as if they were undertaken by branch office employees.

In 2000, of 5 800 municipalities in Brazil, 1 600 lacked access to formal banking services; at the end of 2004, all municipalities had access to financial services through 38 168 'banking correspondents'. It is difficult to assess whether such correspondents also serve the poor. However, according to the World Bank, 50 percent of the clients of 'banking correspondents' of Caixa – the second largest Brazilian bank – earn less than R$200 per month (US$80); and 60 percent of the clients of Banco Postal – which was required to provide banking services to municipalities without them – are poor.

Sources: Ivatury and Mas, 2008; Kumar *et al.*, 2006.

3.2.6. Member-based financial institutions

Member-based institutions, such as cooperatives, village banks, SHGs and ROSCAs, may well be a compelling, low-cost option for extending financial services to poor, rural and remote areas. Either a licensed financial institution lends to farmer groups/associations, or the farmers themselves establish a ROSCA/village bank to facilitate the redistribution of local savings and promote local investments. Ultimately, because member-based institutions minimize screening and monitoring costs in financial markets, members have an incentive to check on one another and exclude risky borrowers from participation. The need for collateral is reduced as the group is held responsible for repayment (Chao-Béroff *et al.*, 2000; Grant and Coetzee, 2005; Paxton and Cuevas, 2002). A government may support the establishment of member-based financial institutions, both directly and indirectly.

- Member-based financial institutions, such as SHGs or village banks, should be granted legal status. This would make it possible for them either to be recognized as interlocutors for financial banks or to provide a variety of financial services themselves.

Credit: WrenMedia/N. Palmer

- Rural dwellers should receive training in group and financial management, including peer group pressure (with loans extended first to one member of the group and then to others, based on satisfactory repayment by the first borrower); on the rationale of dynamic incentives (with members first borrowing small amounts and subsequently increasing their loans on the basis of satisfactory repayment); on the justification for regular and fixed repayment schedules (with repayments made on a short [weekly] basis, starting almost immediately after disbursement); on the importance of charging market interest rates to ensure the self-sustainability of financial operations, etc.
- Government may provide grants/subsidies for farmers to establish cooperatives/associations and/or to begin delivering financial services to their members. However, in the medium to long term, member-based financial institutions are expected to be financially self-sustaining, i.e. to have generated enough revenue to cover operating costs.

There are several successful instances of member-based financial institutions operating in rural areas, but many have failed.

- In many rural areas, member-based organizations are allowed to have relatively few members, which makes it difficult for them to collect enough savings and/or obtain access to long-term financing from licensed financial institutions. In addition, when groups grow larger, the peer pressure mechanism becomes increasingly ineffective and farmers are unable to manage large financial inflows efficiently.
- Group members receiving loans are typically expected to start repaying the capital and interest only a few weeks later. Therefore, only those with multiple sources of income can participate in farmer associations/SHGs, and the very poor are often excluded.
- There is no unambiguous evidence to prove the financial sustainability of member-based financial organizations, the majority of which were established through external support and are subsidized on a continuous basis – either directly through grants or indirectly through soft-term loans from government or a donor.
- When member-based financial institutions break even financially – i.e. they are self-sustaining – it is most likely that they do not directly benefit the poorest rural dwellers, who have limited savings capacity.

Box 28. VILLAGE BANKS IN MALI

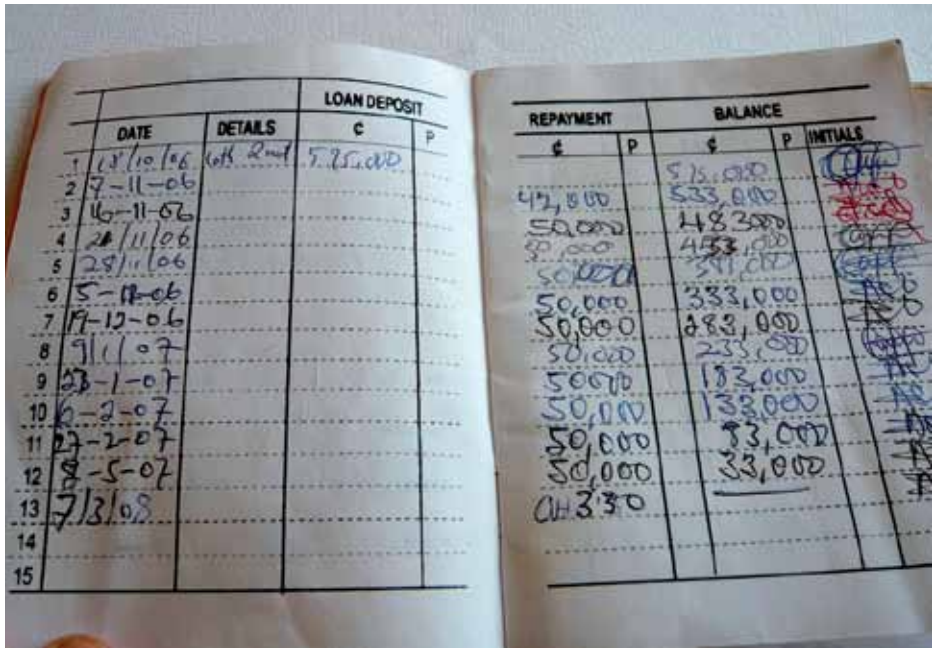
The state-owned National Agricultural Development Bank (*Banque national de développement agricole, BNDA*) of Mali has never been in a position to supply savings and loans tailored to the needs of smallholders living in remote rural regions. In the mid-1980s, German Financial and Technical Cooperation supported the establishment of local self-administered village savings and credit banks (*Caisses villageoises d'épargne et de crédit autogerées - CVECAs*) with the objective of helping villagers to mobilize their savings and obtain access to credit for production and consumption purposes. The CVECAs were established on the basis of a participatory process: German Cooperation introduced the concept of village banks to community members, who then voted on whether or not to set up a CVECA. Community members were also responsible for appointing bank staff, including the manager, treasurer and comptroller, who were all trained by German Cooperation. CVECAs receive loans from BNDA at preferential rates – averaging 20 percent per year – for onlending to local people at an interest rate of 30 to 40 percent. Collateral is provided by social pressure and movable assets, the latter including small livestock, bicycles and farming equipment. CVECAs pay 20 percent interest on savings.

Over a period of about ten years, more than 150 village banks were set up in the three regions of Mali where the project was operational. These accounted for a total of 65 000 members, i.e. about 70 percent of all economically active villagers had access to savings and loan facilities, and a total of 500 000 indirect beneficiaries. The average loan was relatively low, suggesting that poor people were among the borrowers; the repayment rate was about 95 percent, thereby allowing village banks to recover their administrative and financial costs. BNDA played a crucial role in supporting the functioning of village banks, and has not so far recorded any default in repayment by village banks, compared with a 50 percent default rate on the direct loans it makes. New and similar village banks are now emerging in other parts of Mali, on the people's own initiative.

Source: Adler, 2001.

3.2.7. Credit bureaus and scoring

The lack of, or limited, information about smallholders' capacity to make profitable investments and repay their loans constitutes a major constraint on the supply of credit by financial institutions. Credit bureaus are public or private firms that build up large databases on financial transactions by individuals, farms and firms. Such databases also provide an incentive to borrowers to repay their loans, because reputations (as good borrowers) are turned into collateral and even temporary breaches of a lending contract are made public. Credit bureaus could thus serve as an effective mechanism for sustaining financial markets (BASIS, 2003; Campion and Valuenzela, 2001; Miller 2003). Some reports indicate that 49 percent of small firms report credit constraints in countries without credit bureaus, compared with 27 percent in countries that have them (Rozycki, 2006). The public sector has a role to play in establishing credit bureaus:



Credti: Flickr/R. Strohm

- Such bureaus should be legally recognized concerns, i.e. institutions allowed to collect and process a variety of data emanating from regulated and unregulated financial institutions (banks, NGOs, etc.).
- Credit bureaus should be allowed either to collect only basic data on potential borrowers (e.g. name, address, gender, etc.) and their past credit transactions (e.g. unpaid loans, blacklisted clients), or to seek more detailed information such as employment status, average income, use of checking, savings and deposit accounts, etc. A trade-off exists between consumer protection (privacy, data accuracy and use) and the effectiveness of credit bureaus as a tool to support financial markets.
- Credit bureaus should be allowed to process and disclose the private information they obtain from regulated/unregulated financial institutions. These data are typically used to build so-called credit scorings, i.e. values providing an indication of the repayment capacity of single or group clients. In general, the information thereby processed is sold to financial institutions in order to ensure the self-sustainability of credit bureaus.

Establishing effective credit bureaus that help financial institutions serve (poor) rural households is anything but straightforward:

- As smallholders often obtain loans through group lending, it is often difficult to obtain information on each potential borrower and build up individual credit scores.
- The majority of rural dwellers have no regular transactions with financial institutions and do not pay income tax or possess an identity card. Crucial pieces of information to screen clients are therefore missing, and seeking different risk indicators to build credit scorings – such as agricultural productivity, membership in farmer organizations – is a costly undertaking.

- Unregulated financial institutions (e.g. NGOs), which provide a large amount of credit in rural areas, rarely gather and process information in a form that could be used by credit bureaus.
- A large share of the demand for credit in rural areas is for short-term investments, whereas credit scorings are only appropriate for assessing the long-term repayment capacity of prospective borrowers.
- Financial institutions operating in rural areas take it for granted that potential clients will rarely be mentioned in credit bureau reports; they are therefore unwilling to pay a fee for access to such reports.

Box 29. CREDIT BUREAUS IN PERU

Since the start of its operations in 1962, the Peruvian Public Credit Bureau has traditionally collected, processed and distributed information on clients with loan amounts exceeding the equivalent of US$4 500. This limit was set to reduce delays in processing the information, which was done manually. In 1998, with support from the Inter-American Development Bank, the Government of Peru created a system of dual credit bureaus: one for loans of more than US$4 500, and one for loans of less than that amount. At that time, there were 170 000 registers for loans of over US$4 500 and more than 2 million for loans of less, and it was found that many small loan clients had obtained up to eight loans against the same collateral. The present situation is that government retains control of the credit bureau in the case of loans exceeding US$4 500, whereas the management/updating of the database on smaller loans has been outsourced to a data processing firm. Credit bureau data are available on the Internet, and financial institutions can access the information using a code and password. With the old system it took three months to obtain a report on a potential borrower; the new Internet-based system has a time-lag of only 23 days.

Since the dual credit bureau system has been in place, requests for information (on credit ratings, refinancing, judicial proceedings, collateral, etc.) have increased from 400 to 6 000 inquiries per month. By early 1999, 51 out of 66 regulated financial institutions were reporting to the credit bureaus and it was planned to set up another 15 shortly thereafter.

Source: Campion and Valuenzela, 2001.

3.3. MARKETING POLICIES AND PROGRAMMES

In much of the developing world, the reasons why livestock markets function badly have to do with poor communication and transport infrastructure, lack of or limited information, unequal bargaining power among contracting parties, imperfect contract monitoring and enforcement, limited access to finance, etc. Failures and imperfections reduce the capacity of markets to indicate how livestock producers should best allocate their productive resources, thus constituting a net loss for society. For instance, a lack of information on distant markets that could absorb excess local supply will reduce incentives for livestock keepers to adopt productivity-enhancing technology because increased production would only lead to lower prices on local markets. (Key *et al*., 2000; Jabbar *et al*., 2008). There

are thus good reasons why governments should formulate and implement policies/programmes that boost market functioning.

Government interventions to promote market functioning have long consisted in controlling the price of major staples and cash crops – such as through administrative price controls, marketing boards, processing and wholesale parastatals – with the objective of keeping prices low (high) for consumers (producers). These policies have proved ineffective in most cases. Governments find it impossible to gauge the supply/demand balance (i.e. prices) with any accuracy in a context of limited, inconsistent or conflicting information, and when centrally fixed prices frequently cause over- or under-supply on markets (de Janvry *et al*, 1997; Kherallah *et al*., 2000; Reardon and Timmer, 2007).

Since the 1980s, the policy thrust has shifted to the formulation of policies/programmes that create an enabling environment for markets to work, i.e. reduce transaction costs and increase the information available to buyers and sellers. These include macroeconomic and institutional reforms to provide a minimum level of assurance to contracting parties – e.g. low level of inflation, efficient contract enforcement mechanisms, adequate infrastructure – as well as policies and programmes that help in coordinating the roles of various actors along the livestock supply chain by focusing on specific marketing activities and services – e.g. physical assembly; handling; storage; transport; processing; wholesaling and retailing of live animals, meat, eggs and dairy products; and in disseminating information on markets and food safety standards. These interventions address two major marketing constraints: (i) low volumes of marketed production, with small, dispersed consignments and high transport costs per unit of produce; and (ii) lack of or inconsistent/conflicting information on market prices and product quality and standards (Dorward *et al*. 2006; Duncan and Jones, 1993; Shepherd, 2007).

Macroeconomic policies are beyond the responsibility of agricultural-sector ministries and departments; the responsibility for sectoral public actions aimed at improving the marketing of agricultural produce is instead divided between a number of public and quasi-public agencies controlled at different levels of government. A livestock department could thus contribute to the design and implementation of policies/programmes to facilitate market access for livestock farmers. Table 6 presents options to improve the marketing of livestock and livestock products.

Table 6. LIVESTOCK MARKETING POLICY AND PROGRAMME OPTIONS

3.3.1. Livestock trader associations*
3.3.2. Livestock brokers or commission agents
3.3.3. Periodic markets*
3.3.4. Market-oriented farmer associations*
3.3.5. Contract farming*
3.3.6. Market information systems*
3.3.7. Commodity exchanges

* May be implemented by livestock departments/ministries.

3.3.1. Livestock trader associations

Associations of livestock traders are private entities that facilitate the trading of livestock and livestock products by collecting and disseminating market information among members (and non-members) for a (membership) fee. Information on production levels, market prices, quality standards, road conditions, etc. enables traders to identify areas of surplus/deficit (i.e. profit opportunities) without embarking on expensive search procedures. At the same time, by fostering competition among traders, information is expected to benefit both producers and consumers. However, market imperfections that disproportionately benefit certain traders (for instance, those with privileged access to some markets) and the high transaction costs of collective actions act as strong disincentives for traders both to establish associations and to cooperate among themselves (Lyon, 2003; Rademakers, 2000; Shepherd, 2005). There are thus rationales for government to support and sustain trader associations. Such policies/programmes call for the following:

- An assessment of potential regional/national markets for livestock and livestock products, i.e. examining whether it would be worthwhile for traders to set up associations for aggregating supply and demand in different areas and at different times.
- Provision of incentives for (livestock) traders to set up associations, with government avoiding the forced establishment of state-driven organizations. Such incentives might include the provision/dissemination of information on regional/national markets, technical and management assistance, grants/loans at preferential rates to cover start-up costs, etc.
- In some cases, it may be possible to forge public-private partnerships with trader associations. For instance, in addition to providing information on prices and training for members in handling and storage, associations may be requested to run public markets – such as cleaning and guarding marketplaces, or even owning and operating the markets themselves.
- As local trader associations find it difficult to obtain information on more distant markets, governments may also support so-called umbrella organizations to guide and represent them. Provided they are given adequate space and voice in the policy process, umbrella organizations may well be important interlocutors and act as a source of information for governments in formulating livestock sector policies.

Trader associations can certainly contribute to better marketing of livestock and livestock products. However:

- their membership is usually limited to medium to large traders as the relatively high direct/indirect costs exclude the small and part-time traders (most associations require members to pay relatively high membership fees; others accept only traders with a government licence); large traders, in turn, prefer to deal with a few large-scale producers rather than with many small livestock farmers; this generates few benefits for smallholder producers;
- even when associations represent a wide spectrum of livestock traders, the larger ones tend to take over and use them to further their own interests rather than those of all members;
- unless traders are trained to set up and run their associations, there is little chance they will function properly and be sustainable;

- in some areas, trader associations draw on traditional chieftaincy structures, which may lead to the exclusion of some traders on the basis of ethnic and religious affiliations, for instance;
- if only a few trader associations are established, they may assume a cartel-like behaviour at the local, regional and even national levels, thereby reducing competition on livestock markets; in other words, traders may agree on matters such as price-fixing, distribution of products between different markets, etc. to their own advantage;
- the economic and social returns to trader associations are difficult to quantity; policy-makers therefore tend to look on them only as a source of revenue (through taxation) rather than as a tool for improving market functioning; in effect, trader associations are rarely represented on government committees; they are rarely consulted and do not actively participate in any policy-making process.

Box 30. UGANDA'S NATIONAL DAIRY TRADERS' ASSOCIATION

The state-run Dairy Corporation Limited held the monopoly for the collection and sale of milk in Uganda until 1992, when the dairy sector was liberalized and several small-scale milk traders began to operate in the market. In the following years, the sector evolved as largely unregulated and there was little or no quality control, with potential risks to public health. In 1998, therefore, the Government of Uganda passed the Dairy Industry Act, which established the Dairy Development Authority (DDA) responsible for regulating the dairy market, especially in terms of setting quality standards and control. Small traders, plant operators and processors, however, found themselves increasingly unable to comply with the quality standards for milk and dairy products set by DDA. For that reason, in 1999, the Uganda National Dairy Traders' Association (UNDATA) was established, mainly to represent the interests of the informal milk marketing sector and of small processors (milk boiling and cooler operators). UNDATA's overall mission is to promote the marketing of high-quality milk and dairy products within the country.

By training its members on subjects relating to the quality and safe handling of milk, UNDATA has convinced many small traders to carry milk in hygienic metal cans instead of non-food-grade plastic jerry cans. Traders selling raw milk display stickers advising buyers always to boil milk before consumption. Some small-scale processors have also sought to increase the value of liquid milk by adopting more sophisticated technologies, such as batch pasteurization, fermentation and cooling, which also increase the safety of milk. UNDATA is now establishing milk quality standards, stipulating that all milk handled by its members should pass through a cold-storage chain. Today, the association has about 1 000 members handling more than 300 000 litres of milk per day.

Sources: Dairy Mail Africa, 2007a; 2007b; www.dda.or.ug.

3.3.2. Livestock brokers or commission agents

Livestock brokers or commission agents act as "middlemen to the middlemen" (Gabre-Madhin, 2001) linking traders and buyers. As a general rule, they provide information to traders on demand and supply trends (price) in distant markets; help traders find buyers; carry out buying/selling activities on behalf of traders; provide guarantees on the quality of products; and give formal and informal advice for the enforcement of contracts. Brokers charge a fixed fee – they rarely take a margin on the value of the transaction – in order to reduce their trading risks (Gabre-Madhin, 2001; Hill, 1966; Mulugeta *et al*., 2007). In industrialized countries where livestock markets are highly developed, such as Canada, New Zealand and the United States, brokerage is regulated in terms of details, whereas it remains largely unregulated in the developing world. In some developing countries, however, establishing a legal framework for brokerage activities would facilitate the marketing of livestock and livestock products. This would call for the following:

- Legal recognition of brokers or commission agents, and a system of licences that guarantee the trustworthiness of brokers.
- Rules and regulations governing the relationships between brokers, traders and buyers. Contracting parties are expected to define the details of each contract themselves (e.g. some brokers may only advise traders on the buying and selling of animals, while others may also arrange transport to distant markets). But traders' and brokers' responsibilities should be defined *ex ante* to reduce the possibility of misunderstandings and/or misconduct.
- Rapid dispute-settlement mechanisms to solve differences between commission agents, traders and buyers. It should be noted, however, that in some cases brokers also help enforce informal market rules by monitoring transactions, assuring the integrity of each party in the transaction, and guaranteeing that the negotiated price is paid.
- Whereas commission agents do not require significant working capital, governments may wish to provide them with financial support to start up their business concerns. The Punjab National Bank of India, for instance, gives preferential loans to dealers engaged in distributing cattle, feed, poultry feed, dairy feed, etc. (www.pnbindia.com); in other cases, brokers are paid for collecting marketing fees or documenting market transactions.

It is not certain whether public authorities in developing countries are capable of effectively promoting brokerage activities to facilitate the functioning of livestock markets:

- It may be difficult for public authorities to regulate and enforce brokerage activities, both because of limited institutional capacity and because – in underdeveloped rural settings – commission agents/brokers provide a variety of service to traders (e.g. transport services and extension of loans), many of which are already governed by a variety of laws and regulations.
- Brokerage may not be financially profitable, particularly when there are limited market opportunities for traders to sell livestock and livestock products at a profit on distant markets (e.g. low demand; poor transportation networks; strong local competitors).
- Commission agents may be tempted to collude in 'squeezing' the profits of livestock traders, with negative repercussions on both producers and consumers. In addition, it

is both institutionally demanding and costly for public authorities to create competition among brokers, such as through providing market information to the public at large.

- Owing to limited communication infrastructure, brokers tend to provide services only to large traders with access to advanced communication technology. As small livestock producers are rarely involved, livestock brokerage does not necessarily benefit them.

Box 31. LIVESTOCK BROKERS IN THE SUDAN

The Sudan is the largest country in Africa, extending over an area of 2.5 million km^2. The country's livestock population is scattered over distances of 600 to 1 200 km from terminal markets, depending on the migration patterns of nomadic peoples. In view of the high transaction costs that pastoralists face in marketing their animals, the country's livestock markets are broker-dominated. There are different layers of brokers in the Sudan: the first collects cattle and small ruminants from the scattered villages and delivers them to another broker in a primary market. The second broker hands over the animals to a third one in the same or a secondary market. The process continues until the livestock are bulked into larger lots and reach the terminal markets. Some of these brokers are independent, small-scale traders (*jallaba*) while others act as agents (*wakil*) or subagents for the large traders. Livestock changes hands a minimum of two and a maximum of six times between points of purchase. At the final point of sale and terminal market, prices may be two to four times the producer price. The final transaction in the terminal market is also processed through a broker, through the so-called 'silent auction system' whereby the seller tells a broker what his/her price range is for the cattle or flock of sheep she/he intends to sell, and the broker negotiates the price with the buyer in secret. The deal is closed when the broker has successfully completed negotiations with the seller within the price range offered by the buyer. The purchase price will only be known to the buyer, the seller and the broker. In the El Muwalih market of Omdurman, after closing a deal, the broker collects a fee of SDG 10 000 (< US$4) per head of cattle and SDG 2 000 (< US$1) per head of sheep from each party.

Given the distances involved, brokers are essential for livestock marketing in the Sudan – although the silent auction system is apparently inefficient because, ultimately, market prices remain private. However, an open auction system calling for immediate cash payment would not succeed in the Sudanese system, because livestock exchanges are based on a system of trust, with deferred payment guaranteed by the brokers.

Sources: Akliku *et al.*, 2002; Kidani, 2007.

3.3.3. Periodic markets

It is often extremely difficult for small livestock farmers to reach major markets owing to long distances, poor road conditions, transportation costs, transit fees and a variety of other problems along the routes. Periodic markets, which are held in small rural towns on

Credit: WrenMedia/N. Palmer

a weekly or fortnightly basis or at other regular intervals, represent a viable alternative for farmers both to save transaction costs and to market their livestock and livestock products. These markets are quite common in rural areas and, in terms of numbers of participants, are often the largest component of the overall marketing system in developing countries (Konaka, 1997; Mozambique, Government of, 2003; Mukerji, 1988). Whereas they largely generate private benefits, public support is often needed to establish periodic markets because of the public goods nature of marketplaces. This calls for the following:

- An assessment of the opportunities for sustainable periodic markets to develop, i.e. an analysis of potential demand for and supply of livestock and livestock products in a given area/region.
- Identification of villages/towns where basic physical infrastructure is needed for a periodic market. Fences, water tanks for livestock, animal health posts, etc. are goods/services that the public sector is expected to contribute.
- The public sector – central or local government – is responsible, or should entrust private actors with responsibility, for running marketplaces, including cleaning and protection, maintaining basic infrastructure, charging fees to users, etc.
- Government may sustain periodic markets by supplying public goods on market days (e.g. animal vaccination/extension services). In general, the more products/services available at periodic markets, the higher their sustainability (more people participate in market exchanges).

Periodic markets facilitate the aggregation of local demand for and supply of livestock and livestock products. However, they also face challenges:

- Periodic markets are location-specific and do not contribute to overall market functioning, and are therefore very much affected by local trends. Price variations are typically greater in periodic than in major daily markets.
- Periodic markets are often dominated by local commercial interests, e.g. few buyers

or few sellers, which could reduce the efficiency gains associated with lower transaction costs for market participants.

- Despite the smaller concentration of animals in periodic as opposed to daily markets, the unit cost of an animal health surveillance system is higher in periodic markets because of economies of scale in the provision of public goods. This acts as a strong disincentive for policy-makers to favour the establishment of (relatively small) periodic livestock markets.
- Local authorities/farmers may be unable properly to manage market infrastructure, and/or the revenue generated by a limited number of participants/transactions may make the cost of maintaining market infrastructure unbearably high.

Box 32. SAMBURU LIVESTOCK MARKET IN KENYA

Samburu District, one of the 18 districts that make up the Rift Valley Province of northern Kenya, is characterized by a harsh, arid and semi-arid climate, scrubland and limited rainfall. The inhabitants of Samburu are semi-nomadic pastoralists who use traditional production technologies and have little access to markets for their livestock. In 1991, the first periodic livestock market in northern Kenya was opened in the town of Suguta Marmar on the southern edge of Samburu District. The market is held every two weeks, and about 1 000 buyers and sellers participate, exchanging about 2 000 head of livestock. Samburu people participate in the market almost entirely as sellers rather than as buyers, as re-stocking is achieved by breeding their animals rather than by purchasing them. Livestock is usually purchased by large buyers, who transport it to cities by lorry. The cost of marketing livestock in Saguta Marmar differs, depending on whether large or small stock are exchanged: the average transport cost to market is Ksh. 42.5 per head of small stock and Ksh. 250 per head of cattle; the average council fee is Ksh. 36 and Ksh. 50, respectively. Overall, these transaction costs account for about 9 and 4 percent of revenue for small stock and large stock, respectively. Market prices are set by an auction system, which ensures that all participants receive the same information about prevailing prices.

The Samburu periodic market functions well, as demonstrated by the growing number of livestock farmers who trek their animals to the district from other regions because they are confident of getting the best possible prices there. The market also supports the livelihoods of pastoral people, particularly as it allows them to convert their livestock into cash, thereby integrating the pastoral system into the market economy – and for the better.

Source: Konaka, 1997.

3.3.4. Marketed-oriented farmer associations

Farmer organizations can help reduce transaction costs and facilitate trading of livestock and livestock products. They allow members to bulk-up their produce for sale, reduce unitary transport costs, increase their bargaining power and fetch better prices. In some cases, they also help farmers gain access to financial services (FAO, 2009; Holloway *et al*., 1999;

Uotila and Dhanapala, 1994). Farmer organizations produce private benefits. However, given the high cost of collective action for (small) farmers to set up associations and the overall benefits that efficient markets generate for society, government may consider supporting the establishment of market-oriented farmer organizations.

- An assessment should be made of potential regional/national markets for livestock and livestock products, i.e. to ascertain whether it would be worthwhile for farmers to set up associations for aggregating supplies at different times and places.
- To help farmers set up marketing associations, public support should be provided in the form of training, technical and management assistance, tax rebates, grants, loans at preferential rates to cover start-up costs, etc. In some cases, public authorities should support marketing associations for a number of years, until such time as they become competitive on markets.
- While public support is often critical for the establishment of market-oriented associations, government should ensure that farmer associations do not have an advantage over other actors, i.e. traders or trader associations. Excessive support may 'crowd out' other market agents, reduce competition and, ultimately, be detrimental to society.
- Legal recognition should be given to farmer organizations, thus allowing them to act on behalf of their members in market transactions. An effective institutional and regulatory infrastructure should also be set up to govern relationships and contracts among farmer groups and other actors along the livestock supply chain.

Some issues regarding marketing associations, and farmer groups in general, are as follows:

- Small size and homogeneity of membership facilitates farmer cooperation, but small groups cannot achieve the economies of scale essential for the profitable trading of livestock and livestock products. However, the larger the groups, the more difficult it is for farmers to run associations properly.

Credit: ©FAO Afghanistan/L. Rlung

- Farmer organizations, particularly those with small farmers among their membership, usually provide a variety of services to farmers, including financial assistance, technical advice and marketing support. Providing support to smallholder farmer associations, therefore, calls for more than just focusing on marketing.
- Governments tend continuously to support smallholder farmer associations with technical and organizational assistance, and credit/fiscal advantages. There is a risk of creating dependency, whereas the ultimate objective should be to set up marketing organizations that are politically independent and financially self-sustaining.
- Smallholder farmer organizations are typically located in rural areas where transport and communication infrastructure is deficient, and markets and public institutions are imperfect. The challenges facing farmer organizations, therefore, are greatest where they are most needed.

Box 33. MILK MARKETING ASSOCIATIONS IN ARMENIA

While dairying is the largest agricultural industry in Armenia, it only satisfies about 75 percent of consumer demand. The Agricultural Marketing Assistance Project (MAP), launched in 1999 by the United States Department of Agriculture (USDA), aims at sustaining milk production and marketing by establishing links between processors and producers. The former do not have access to a reliable supply of consistently high-quality milk; the latter have limited access to markets for selling their milk. MAP holds village meetings with dairy farmers to discuss the pros and cons of marketing associations, including opportunities and risks, costs and benefits; villagers then vote for or against forming an association. The milk marketing associations formed operate a so-called milk collection unit where farmers bring their milk, which the association then sells on to processors. MAP provides a milk cooling tank to newly established associations for the first four months of their activities, after which they become registered local entities. They then start repaying the cooling tank on a lease-to-own basis, with a leasing period of three to five years. The yearly interest rate charged by MAP ranges between 5 and 10 percent, which is lower than the 15 to 35 percent charged by commercial banks in Armenia. To ensure that associations obtain a reliable supply of high-quality milk, members are trained in farm management, animal health, cow feeding, calf-rearing and milk handling. As an additional incentive, the price of good-quality milk is paid at a premium – the farmer watches the milk being tested in the collection centre and signs a register confirming that the test is accurate.

The eight milk marketing associations established to date operate 17 collection sites, to which about 2 000 small farmers (about 2 200 cows) deliver their surplus milk. The typical seasonality that characterizes milk production, however, has not been sufficiently eliminated. This creates problems for cooperatives in terms of cash flows and distribution of farm income, and to milk processing firms that are unable to obtain continuous supplies of fresh milk throughout the year.

Sources: Engels and Sardaryan, 2006; Hovhannisyan *et al.*, 2004.

3.3.5. Contract farming

Contract farming involves arrangements whereby commercial processors/wholesalers/retailers purchase the right to buy some or all of a farmer's production at a predetermined price, and provide farmers with production-related services. The range of services to farmers varies widely (e.g. credit, feed, technical assistance, etc.), as do the terms of the produce-purchase contracts (quantity, price, quality premiums). Arrangements may be bipartite (only one company provides all services) or involve relations among multiple service providers delivering input, finance, extension and marketing services to farmers (Catelos and Costales, 2008; Costales *et al*., 2006; Eaton and Shepherd, 2001). While contract farming pertains to the private-sector domain, governments may consider designing programmes/policies that favour contract farming schemes, with the objective of promoting inclusive agricultural growth. Possible actions by public authorities include the following:

- Reducing search and screening costs for both contracting parties, e.g. through licensing/creation of a freely accessible database of reliable producers, processors and other relevant actors.
- Limiting the paper costs of negotiating contracts, including fixed and variable costs. For instance, public authorities could reduce fees on contract registration and/or define, in consultation with relevant stakeholder groups, standard types of contracts that parties may agree to.
- Creating a level playing field for contracting parties, bearing in mind that small farmers are often in a weaker bargaining position *vis-à-vis* large processors/wholesalers/retailers. For instance, laws could stipulate the major responsibilities/obligations of contracting parties; market prices could be posted publicly; and extension workers might also train farmers in marketing and contracting strategies.
- Designing a regulatory framework to avoid creating monopsonies by large processors or monopolies by groups of farmers. In other words, smallholder assets should not be a source of 'quasi-rent' for large processors and come to have low salvage value outside the bilateral contractual relationship. At the same time, smallholders should not unduly 'squeeze' the profitability of processors/wholesalers/retailers.
- Whereas an efficient, equitable judicial system is a key component of any enabling business environment, government may establish rapid, low-cost dispute-settlement mechanisms for parties involved in contract farming schemes.

Contract farming offers wide scope for giving resource-poor farmers more access to markets. However, there are challenges:

- Large processing and other firms tend to discriminate against small producers for a number of reasons, including lack of collateral and higher transaction costs when dealing with many small farmers rather than with a few larger ones, etc. In other words, contract farming does not always effectively promote inclusive growth of agriculture.
- Many smallholders live outside the formal economy and cannot or can rarely deal with formal large processors, wholesalers and other actors.
- Limited availability of financial and human resources within government makes it difficult to establish (and enforce) a legal institutional framework to ensure equitable

contracting. The outcome of contract farming, in terms of distribution levels, thus remains a topic open to debate and controversy.

- Contract-growing arrangements have been largely implemented for plantation crops and some staples, and have only recently been expanded to livestock products, particularly dairy and poultry. There is thus limited, if not inconsistent, information about how pro-poor contract-growing arrangements for livestock products should be designed and implemented.

Box 34. PRO-POOR CONTRACT POULTRY FARMING IN MALAYSIA

As part of a broader national strategy to eradicate poverty, raise rural incomes and develop local entrepreneurship, the Sarawak Economic Development Corporation (SEDC) has, since 1998, supported poultry farming contracts involving Dayak farmers, a marginalized ethnic group native to the interior of Borneo. Under the scheme, interested farmers (aged 18 to 45 years) are required to complete application forms, based on which SEDC selects participants for a trial phase. The farmers thereby selected: (i) are trained in broiler health management, disease prevention, chicken slaughtering and processing, and enterprise management and bookkeeping; (ii) participate in three or four trials where they raise broilers under contract to SEDC, which sells them on to a subsidiary supplying chickens directly to controlled state outlets, including schools, hospitals and army bases; during each trial, farmers are expected to rear to maturity about 300 to 400 day-old chicks over a 45-day cycle, with an acceptable mortality rate of 7 percent; and (iii) SEDC extends credit to farmers to meet the costs of building sheds to specified standards, hiring labour and purchasing equipment.

Evidence to date suggests that the productivity of contracted farmers has improved: most poultry farmers participating in the scheme have reported net gains in their real incomes. The scheme represents one of the few public-sector attempts to raise rural incomes through contract farming, thereby demonstrating that contract farming *per se* does not discriminate against smallholders. It also makes it possible for the public sector to increase revenue, which SEDC reinvests for rural development in the Sarawak region.

Source: Morrison *et al.*, 2006.

3.3.6. Market information systems

Market information systems (MISs) aim to provide farmers, traders and other actors along the supply chain with short-term information on price levels (to guide marketing decisions) and medium-/long-term information on market trends (to guide investment decisions). Information is the key element of any MIS and, since market information is a public good, some degree of public-sector intervention is needed to set up and maintain a system of information collection, analysis and dissemination (CTA, 2005; Shepherd, 1998; www.agmarknet.nic.in). Support for the establishment of MISs calls for the following:

- Selecting products/commodities to be included in MISs. As few farmers are specialized producers, and those who are specialized have their own sources of information. MISs should generally cover a variety of commodities to guide decisions on purchases/sales and help farmers programme their investments.

Credit: ©FAO/1464/G. Napolitano

- Selecting area coverage, because MISs can cover local, regional, national and even international markets. The wider the area coverage, the more livestock farmers can be guided in their marketing and investment decisions. There is, however, a trade-off between the costs and benefits of establishing wide-scope MISs, because the majority of livestock farmers sell their produce on local or regional markets only.
- Establishing mechanisms for collecting information. This includes identifying and contracting different sources of information, such as public officers, producers, traders, wholesalers and other public and private stakeholders along the supply chain.
- Setting up a system for data analysis and the dissemination of information. At the simplest level, data can remain unprocessed and posted on notice boards in major markets; more or less sophisticated statistical analyses can also be performed, and information disseminated through a variety of means such as FM radios, mobile phones and satellites. There is a trade-off between data analysis and the speed at which information is disseminated, which is crucial for guiding marketing and investment decisions.

Common issues associated with MISs include the following:

- Establishing and maintaining an MIS is costly. Financing options include not only taxpayers' money but also cost-recovery mechanisms – such as levies or fees charged to users – because farmers are expected to receive private benefits from the information collated/disseminated.
- MISs tend to focus on a limited number of agricultural products because budget and institutional constraints prevent governments from collecting, analysing and disseminating information on several commodities. This greatly reduces the systems' impact on farming and marketing decisions.
- MISs rarely disseminate timely information to guide marketing and investment

decisions. Typically, MISs publicize monthly price averages per commodity/market, whereas weekly or daily information on price levels would enable smallholders/traders to take appropriate marketing and investment decisions.

- MISs are often set up with the support of international organizations/NGOs, without, however, sufficient consideration being given to their self-sustainability. Because farmers are rarely charged for information once donor assistance phases out, governments fail to make adequate budget allocations for the functioning of MISs and/or to integrate them into existing government structures.
- Even if farmers were willing to pay for market information, establishing a system of fee collection would be extremely complex because information is a public good that can be disseminated at very little cost.

Box 35. LIVESTOCK MARKETING INFORMATION SYSTEM IN THE UNITED REPUBLIC OF TANZANIA

Since 1994, the Tanzanian Ministry of Water and Livestock Development has been implementing the Tanzania Livestock Marketing Project (TLMP), which was funded by a loan from the African Development Bank. TLMP provides information on prices to livestock producers, traders, buyers and sellers, and to the Ministry of Agriculture for improving the design of agriculture-related policies/programmes. The project builds on a network of so-called 'market monitors': public officers operating in primary, secondary and tertiary livestock markets in 14 high livestock producing and consuming regions (Dar es Salaam, Arusha, Kilimanjaro, Singida, Tanga, Tabora, Mbeya, Rukwa, Mwanza, Mara, Shinyanga, Dodoma, Morogoro and Iringa). These monitors are responsible for six major daily, fortnightly and monthly activities: (i) sample selection; (ii) livestock classification (weighing, grading, sexing, aging, numbering and logging location of origin); (iii) recording market transactions (quantity and price per head); (iv) entering data into a computer; (v) processing data; and (vi) preparing and disseminating market information reports. Information on average prices per live-weight-kilogram for cattle, sheep and goats, with different grade-sex combinations, is disseminated weekly and monthly, and made available to livestock market managers, planners, traders, producers and decision-makers by means of ad hoc market bulletins, newspapers and a dedicated website (www.lmistz.net). Through an SMS (text message) system, interested stakeholders may also request and obtain information on price and volume data by market for different animal classes and grades.

The project is part of a broader programme aimed at increasing the volume of wholesale meat for local and export markets, and at rehabilitating/constructing marketing infrastructure, including a modern abattoir in Dodoma municipality. Whereas the infrastructure components have been implemented successfully, the MIS is not working properly: MIS data are not always generated in a transparent manner and lack authenticity; and the information obtained through the system takes too long to be disseminated and put to good use by stakeholders along the livestock value chain.

Sources: ADF, 2006; www.mitm.go.tz

3.3.7. Commodity exchanges

Commodity exchanges are places where trade, with or without physical commodities, is facilitated through a low-cost system of 'price discovery' (usually bidding) and an agreed set of rules on produce quality, agents' conduct and contract details. Commodity exchanges help to make market transactions both rapid and low-cost, including on-the-spot and derivative transactions, thereby reducing transaction costs and benefiting buyers and sellers directly. They can be established by the public and private sectors alike, although government remains responsible at all times for regulatory and supervisory activities (Gogging, 2007; Okolla, 2002; USAID, 2007a). Establishing a functional agricultural commodity exchange requires the following:

- A large, or potentially large, market is needed for agricultural goods, including livestock products, to ensure that the volume of agricultural products sold/bought is sufficient to justify public investments in the commodity exchange.
- A system of commodity grading and specification is needed. This system should include descriptions of a standard or base variety for each product, which represents the unit of exchange for sellers and buyers. Licensed inspectors would be expected regularly to verify the accuracy of grading and certification.
- To stimulate competition among buyers and sellers (thereby ensuring market transparency and reduced marketing transaction costs), the commodity exchange should adopt a system of price discovery, such as bulletin boards where bids and offers are posted, or an 'open outcry' system whereby market actors call out their bids and orders.
- To facilitate transactions, public authorities could define, in collaboration with stakeholders, the terms and conditions of standard contracts to be adopted on the exchange. Such contracts should include, as a minimum, details on quantity and quality of the commodity, price, delivery date, names of parties involved, consequences of non-performance, etc.
- As it is not feasible for all farmers to participate directly in commodity exchanges, the latter are usually dominated by brokers whose (minimum) duties and rights should be specified by public authorities. Brokers are responsible for trading on behalf of an unlimited number of buyers and sellers and pay a fee to participate in the exchange, which may be associated with the number or value of transactions performed.
- Rules, codes and procedures should be defined for contract enforcement and dispute settlements, which are critical for creating the necessary trust that enables a market to work efficiently.

Commodity exchanges are an attractive policy option to facilitate the functioning of agricultural markets. However they face challenges:

- In several developing countries there are not enough large-scale sellers and/or buyers of agricultural commodities – including livestock products – for a commodity exchange to function profitably.
- Small livestock producers would rarely be able to benefit from a commodity exchange: first of all, they are unable to comply with the quality/grading standards established by the exchange; second, given their limited agricultural surplus, they will

participate in the exchange only if they are members of large marketing cooperatives.

- It is a challenging task to define and enforce low-cost mechanisms that unambiguously define and assess the grade, weight and quality of the unprocessed livestock products dominating markets in developing countries.
- Commodity exchanges work through brokers. However, in a few developing countries, brokerage is a well-established institution, and intermediaries have a bad reputation in most of them. In addition, brokers may oppose an institutional mechanism aimed at increasing market transparency, including commodity exchanges.
- Commodity exchanges often build on existing warehouse receipt systems, although such systems operate in only a few developing countries. Warehouse receipts – certifying the deposit of goods in the warehouse, as well as their quantity and quality – can be used both as collateral for loans and for trading on commodity exchanges.

Box 36. ZAMBIA AGRICULTURAL COMMODITY EXCHANGE

The Zambia Agriculture Commodities Exchange (ZAMACE) – established in May 2007 with the support of USDA – is a private institution that provides buyers/sellers of agricultural and non-agricultural goods with a transparent exchange mechanism. ZAMACE is owned by its members, brokers who have bought seats on the exchange and represent 11 major institutions/organizations in Zambia, such as the Millers' Association of Zambia, the Grains Traders' Association of Zambia, and the Zambian National Farmers' Union. Members have specified a clear set of standards for the major agricultural products traded on the exchange; rules to guarantee security of transactions; and an arbitration system to solve possible disputes. On the exchange, traders make their bids through brokers who take a commission of 0.15 percent on the value of transactions, from both the buyers and sellers. There is no official minimum set on the quantity of any commodity traded but, in practice, 30 tonnes is the minimum. ZAMACE is also linked to the Malawi Agricultural Commodity Exchange, thereby giving its members access to regional markets.

ZAMACE provides valuable support for market transactions in Zambia. In the first six months of operations, it recorded transactions valued at over US$8.1 million, although small farmers have only marginally benefited because it is not profitable for them to sell small volumes of produce through the exchange. A number of pilot projects have been launched to help them pool their agricultural commodities and trade them on the exchange as a group. However, the Government regularly intervenes on agricultural markets, thereby constraining market functions and reducing the effectiveness of ZAMACE. For instance, in 2008, exports of maize were banned in response to a 40 percent drop in production during the 2007/2008 farming season.

Sources: USAID, 2007a; www.zamace.com.

3.4. LIVESTOCK TRADE POLICIES AND PROGRAMMES

Reduced barriers to trade and increased economic integration among countries create opportunities for livestock sector development. But they also generate risks associated with transboundary animal diseases and other negative externalities related to public health and the environment. The objective of livestock trade policies is to maximize, for each country, the net benefits from livestock trade, by either importing or exporting livestock and livestock products.

International/regional trade in livestock and livestock products is primarily affected by tariff and non-tariff policy measures. The former modulate imports/exports through a variety of monetary instruments, such as import duties, export subsidies and border fees, levies and charges. The latter make use of non-price instruments to regulate trade movements, such as quantitative restrictions (e.g. import quotas), contingency measures (e.g. antidumping measures), technical requirements (e.g. certification procedures) and sanitary and phytosanitary standards (SPSs) (Morrison and Sarris, 2007; www.wto.org)

Acknowledging that, in whatever form, unjustified barriers to trade generate net economic losses, the 153 members (as of August 2008) of the World Trade Organization (WTO) have agreed to facilitate international trade – including trade in agriculture and, within agriculture, in livestock and livestock products – via the reduction/elimination of all forms of trade-distorting policies such as export subsidies, import tariffs, domestic support or production subsidies, although they recognize that economic and social rationales may justify some form of temporary support for national producers and markets. Negotiations among WTO member countries began in early 2000 on ways of removing barriers to trade in agricultural products, but agreement has still to be reached on the so-called 'modalities'. Agreement on modalities will determine the scale of tariff reductions for a variety of agricultural products as well as future levels of subsidies to agriculture in WTO member countries (Anderson and Martin, 2006; www.wto.org).

In 1995, WTO member countries ratified the Sanitary and Phytosanitary Agreement. This allows member countries to set their own sanitary standards provided they are based on science, or simply to base their sanitary requirements on international standards, guidelines and recommendations. WTO recognizes the World Organisation for Animal Health (OIE) as responsible for the development and promotion of international animal health standards, guidelines and recommendations for live animals and livestock products. OIE standards and recommendations are used as a permanent reference for SPS livestock measures in the majority of WTO member countries (Peterson and Orden, 2005; www.oie.int).

Overall, the prospects for increased integration of livestock markets appear good. However, as livestock are marginally traded by the majority of the world's countries, and as developing countries are often unable to have a voice in international fora, it is difficult for them to influence international trade rules and regulations affecting livestock. Nevertheless, livestock departments/ministries in developing countries retain a certain degree of freedom to design and formulate policies/programmes, mainly national-level, that facilitate trade in livestock and animal products. What follows reviews some of the major trade policy measures that affect livestock sector development, including measures designed and implemented by a livestock department.

Table 7. TRADE POLICY AND PROGRAMME OPTIONS

4.3.1.	Export support measures
4.3.2.	Import restriction measures
4.3.3.	Export restriction measures
4.3.4.	Sanitary and phytosanitary standards*
4.3.5.	Disease-free export zones*
4.3.6.	Commodity-based trade*
4.3.7	Trade-enhancing infrastructure investments*
4.3.8	Quarantine zones*

* May be implemented by livestock departments/ministries.

3.4.1. Export support measures

The objective of introducing export support measures for livestock and livestock products is to make them competitive on international markets while minimizing the risks of over-supply on national markets. These typically consist of subsidies, low-cost loans, tax relief or other measures that give producers incentives to export livestock and livestock products on international markets. WTO regulations stipulate that such export support measures may not be linked to the volume of exports and should preferably be of a temporary nature (covering only the time necessary for livestock producers to gain shares on international markets). This avoids them becoming permanent features of support for livestock farmers, which would distort market functioning (OECD, 2000; Peters, 2006; www.wto.org). The implementation of a programme of export support measures calls for the following:

- Analysing national and international trends in demand, supply and prices of livestock and livestock products, and of the potential competitiveness of (a segment of) national livestock producers on international markets.
- Identifying appropriate support measures – in terms of type (e.g. tax exemption or subsidy?), level (5 percent or 10 percent of market price?), and duration (e.g. one or three years?) – for national producers to become competitive on international markets. The greater the support the higher the direct/indirect costs to governments, although such costs should be offset by any such programme's medium-to-long-term effects on the livestock sector.
- Setting up an institutional system to implement the programme, including targeting and allocation methods. This may involve establishing new institutions/agencies or changing the role of existing ones.
- Designing technical/institutional assistance interventions for livestock farmers. This would enable them both to participate in and to benefit from programme implementation over the short term and, most important, to become competitive on international markets once the export support measures have been withdrawn.

There are several drawbacks to export support measures:

- They may end up sustaining an uncompetitive sector over the short and long term.

In effect, by ensuring a minimum level of remuneration for livestock farmers, such measures reduce their incentives to invest in efficiency-enhancing technologies.

- It might be difficult for policy-makers to withdraw export support measures, not only because of beneficiary opposition but also because of possible negative consequences for society as a whole, such as increased unemployment.
- Export support measures may result in a net loss for society, as they could reduce the availability of animals and animal products on national markets and keep prices high for consumers.
- The overall cost of export support measures over the years is often uncertain, as this depends on changes beyond the direct control of government. These relate, among other things, to prices on international markets; input prices (e.g. feed, labour); the response of trade partners/competitors; and changes in SPSs.
- Export promotion measures may lead to inflation, because employees in the sector may demand wage increases that are not commensurate with any increases in labour productivity.

Box 37. PIGMEAT EXPORT SUBSIDIES IN THE EUROPEAN UNION

Pork exports from the European Union (EU) have gradually lost their competitiveness since 2000 owing to deterioration of the euro/United States dollar exchange rate that favours dollar-based world pork producers. This loss in export competitiveness, coupled with increased imports, has generated an oversupply of pigmeat within the EU. In October 2007, therefore, the European Commission introduced the Private Storage Aid Scheme, under which a community subsidy was provided to livestock operators willing to store pigmeat for a period of three to five months at their own expense and risk. This subsidy was intended to cover storage costs and enable operators to market their meat at a later date, when prices had recovered. In December 2007, however, the EU discontinued the scheme as applications had reached the 100 000 tonnes limit for which funds were available and because market prices had not improved as expected. (Furthermore, feed prices had increased even though, in November 2007, the EU lifted all duties on cereal imports.) The EU subsequently introduced export support measures under which pig farmers who had previously applied for private storage aid were entitled to receive an export subsidy of €31.10/100 kg for pork carcasses and cuts, amounting to about 25 percent of the prevailing EU average pork carcass price.

The EU pork export subsidies, which led to many complaints from pork producers in the United States, Canada and Australia, were removed in August 2008 when the price of pig carcasses had increased and feed prices were falling. However, the high cost of feed, and of all inputs in general, combined with stricter environmental regulations, led to negative returns to the EU pork industry in 2008.

Source: EU, 2007; www.thepigsite.com.

3.4.2. Import restriction measures

The objective of import restrictions, such as tariffs and quotas, is to limit the participation of foreign companies on national markets. They also aim to stimulate national livestock systems by temporarily protecting the sector from international competition. Import tariffs, usually levied at the border, may be specific and/or *ad valorem*, depending on whether they are levied as a fixed charge or as a proportion of the value of the commodity imported; two-part tariffs, including both a specific and an *ad valorem* component, may also be levied. Import quotas impose a ceiling on imports of certain products. However, under the terms of WTO agreements, almost all import restrictions that were not in the form of tariffs, including quotas, have been converted to tariffs – a process known as tariffication – and the new rule for market access in agricultural products is 'tariffs only' (Anderson and Martin, 2006; www.wto.org). The design and implementation of import restriction measures calls for the following:

- Identifying livestock subsectors/products that might develop as a result of import restriction measures, including an assessment of benefits to producers and society as a whole. Import restriction measures, to protect sectors where development is considered critical to national economic growth/food security, should be designed to ensure that short-term losses (e.g. high market prices for consumers) are offset by medium-to-long-term benefits.
- Deciding whether or not to protect the sector through import tariffs or quotas, and implementing the best system for administering such measures. Tariffs tend to be preferred over quotas because: (i) they generate a revenue for government (under an import quota system, however, a licensing fee may be charged on importers); (ii) there is less opportunity for fraud/corruption because, under a quota system, public authorities decide on allocations among eligible importers; and (iii) they do not provide incentives for smuggling as there are no upper limits to the quantities imported.
- Formulating a medium-to-long-term strategy to remove tariffs/quotas. This should include efficiency-enhancing investments in the livestock sector – e.g. in animal health services, livestock-related infrastructure, etc. – for producers to become competitive on international markets once import restriction measures are phased out.

The following are just a few of the concerns associated with import restriction measures:

- While import restrictions may contribute to increasing prices of meat/dairy products on national markets, they are often accompanied by welfare losses for society. Such price increases are not necessarily offset by medium-to-long-term sector development or by higher government revenues.
- Following the introduction of import restrictions and increased profitability for the protected sector, farmers are expected to invest in productivity-enhancing technologies. However, the import restriction measures reduce investment incentives for livestock operators, who are granted privileged access to local markets.
- Tariffs/quotas are effective only when regularly adjusted to respond to changing market conditions, both international and national. Drought and outbreaks of transboundary animal diseases, for example, determine changes in the supply of and demand for livestock/livestock products, which could make existing tariffs/quotas detrimental to society.

- Once import tariffs/quotas have been established, both local producers and policy-makers may oppose their removal. This is because they create a competitive edge for the producers and generate revenue for policy-makers. Ultimately, national governments may be tempted to set up import tariffs for revenue-enhancing purposes only.

Box 38. PORK IMPORT TARIFFS IN CHINA

China is the world's largest producer of pigmeat (43 million tonnes in 2007) and a major importer of pork, particularly of frozen cuts from the United States and Canada that are subject to a 12 percent *ad valorem* import tariff. In the summer of 2006, outbreaks of 'blue ear disease' (porcine reproductive and respiratory syndrome) began to decimate the country's pig population, with more than 2 million pigs infected and 400 000 slaughtered. As the infected pigs were highly contagious – an entire pig farm can be infected within the space of three to five days – the virus spread rapidly inland from the coastal areas and to the west. In August 2007, the virus was reported in 25 of the country's 33 province-level Divisions, including Sichuan, the largest pork-producing region. Owing to reduced supplies of pigmeat, by April 2008 the price of pork had increased by over 150 percent compared with two years earlier. As pork is the most affordable meat for Chinese consumers, the increased market price and pork-induced inflation forced the Government to intervene. Government first released part of its strategic pork reserves and then relaxed a number of import restriction measures. In particular, in May 2008, the Ministry of Finance reduced the import tariffs on frozen pork, from 12 to 6 percent over the period June to December, and on soybean meal (a major component in pig feed) from 5 to 2 percent.

In 2008, China imported almost 2 million tonnes of pork, up from only 700 000 tonnes in 2007, mainly from the EU, Brazil and the United States. In addition, all hog farms in the largest hog-producing areas received subsidies equivalent to US$15 for each gestating sow and others received US$15 for each breeding boar. The number of pigs for sale increased by almost 7 percent, the sow population grew twofold over the previous year, and pig prices appeared to stabilize. Finally, in January 2009, the Government introduced a new market intervention scheme, the National Swine Price Alert System to Prevent Extreme Price Falls (temporary implementation), to monitor price trends and ensure sufficient farmer returns. As pork is the most important meat for Chinese consumers, maintaining stable supplies and prices through self-sufficiency is the key objective of the aforementioned system.

Sources: Eunjung Cha, 2007; www.thepigsite.com.

3.4.3. Export restriction measures

Restrictions under this heading, such as tariffs or quotas, have the objective of containing exports, increasing availability of key products on national markets, keeping prices low and, ultimately, benefiting both local consumers and society as a whole. They are typically applied to selected agricultural products (e.g. rice); raw materials (e.g. steel); environment-related commodities (e.g. wood); and strategic products (e.g. arms). Export tariffs may be

ad valorem, specific or compound, i.e. a combination of *ad valorem* and specific tariffs; quotas set a ceiling on exports of certain products. As export restriction measures alter prices and distort both national and international markets, WTO recommends that they should be applied only rarely and, in any case, removed within a maximum of four years (Ellis, 2008; Mitra and Josling, 2009; www.wto.org). The following regards the implementation of export restriction measures:

- National and international markets are analysed to assess whether exports of selected livestock products effectively generate losses for society, for instance, because of increased market prices or environmental degradation caused by unsustainable production practices.
- A socially desirable level of national supply should be defined in order to set appropriate export tariffs/quotas (incorrect evaluations at this stage may undermine the overall accomplishment of export restriction measures). And an institutional mechanism should be introduced to administer the tariffs/quotas, including a transparent allocation mechanism for export quotas.
- By increasing competition on national markets, export restriction measures may favour investments and innovations in the sector concerned. However, farmers/livestock operators may need to be (in part) compensated for foregone revenue in the short term; unless incentives are provided to invest in efficiency-enhancing technologies, some may exit the sector all together.
- Given the difficulties in measuring *ex ante* the ultimate impact of any export restrictions, a Monitoring and Evaluation system should be established to assess continuously the impact of such measures on both producers and consumers, and make adjustments as necessary.

There are several concerns associated with export restriction measures:

- Given existing levels of supply and demand, export restriction measures may be inappropriate for several products. For instance, a national market may be too small or prices too low for livestock operators to make even a small profit from sales to local consumers.
- Introduction of export restrictions may lead to reduced investments in the livestock industry, job losses, and some producers leaving the sector, thereby making such restrictions meaningless.
- Governments have rarely, if ever, been able to use export restriction measures as a tool for fostering competition and innovations in key productive sectors.
- Governments may be tempted to introduce export restriction measures (which are easy to administer) for the sole purpose of generating revenue (e.g. from export tariffs) rather than seeking to achieve specific socio-economic objectives.
- Export restriction measures alter the balance of payments and may cause a country to lose its international market standing. When, and if, export restrictions are removed, the cost of regaining international market shares may be high.

Box 39. BEEF EXPORT BAN IN ARGENTINA

Argentina's inflation reached double figures in 2005. Rising consumer demand, capacity constraints, a monetary policy centred around a fixed nominal exchange rate, and growing wage pressure appeared to be the major causes of price increases. As beef is a major component of the Consumer Price Index, action was taken to contain inflation, including restrictions on beef exports. Indeed, in March 2006, the Government imposed a 180-day ban on beef exports. The ban did not, however, require exporters to cancel either contracts previously entered into with foreign buyers or bilateral country-based agreements, and did not include the so-called Hilton Quota (28 000 tonnes of high-quality frozen cuts destined for the EU, free of tariffs). However, following widespread complaints from cattle farmers, by the second half of 2006 the Government had eased the beef export restrictions by setting an export quota for June to November that was equivalent to 40 percent of all exports during the same period in 2005. Additional quota relaxations in July and September 2006 allowed for the export of about 70 percent of all beef exported in 2005. The ban was eventually lifted and replaced by a 15 percent export tax.

The export restriction measures, which were expected to increase the supply of beef on the national market by about 600 000 tonnes, kept prices low and helped to contain inflation, but were largely ineffective, if not downright harmful to the Argentinean economy. First of all, while there has been an increase in the supply of Argentinean beef on national markets, this has not translated into a downward trend in prices because the meat cuts consumed within the country are very different from those sent for export. Second, continuous changes in the rules/regulations have undermined the investment incentives for cattle farmers, some of whom have switched from beef to soybean production: according to one estimate, the cattle population has dwindled by 7 percent since 2006. Third, the long drought of 2008/2009 in the central-north of the country decimated the cattle population. Traditionally one of the largest world's beef exporters, Argentina currently ranks seventh; and it may even consider importing beef in coming years.

Sources: McDonnell, 2006; www.beefmagazine.com.

3.4.4. Sanitary and phytosanitary standards

Animal health and food safety standards and regulations may act as barriers to trade in livestock and animal source foods. The 1995 WTO Agreement on Sanitary and Phytosanitary Measures acknowledged a country's right to protect itself from risks to human, animal and plant life and health, but requires that SPS measures be based on scientific grounds (risk assessment) to avoid countries using them as trade barriers. The SPS Agreement also provided that, if a country adopts an SPS measure that conforms to an internationally agreed standard, the measure is consistent with the SPS Agreement, i.e. the country has no obligation to provide a risk assessment; the measure is considered as non-discriminatory; and the country becomes immune from legal proceedings under WTO regulations. A developing country willing to comply with international SPS standards should do the following:

- Upgrade its SPS standards to the scientific and technical standards published by OIE. The OIE Terrestrial Animal Health Code details the health measures to be used by veterinary authorities for the safe trade of animals and animal products, and reorganizes public agencies/departments (including veterinary services) to ensure that SPS regulatory regimes are enforced.
- Provide training/services for stakeholders along the livestock supply chain to make use of the technologies/husbandry practices needed to comply with SPS standards. This includes financial support, if necessary, as some investment may be needed to meet SPS standards.
- Establish strong, constructive links with livestock stakeholders. Whereas the SPS Agreement stipulates that importing countries should accept other members' measures as equivalent, it is up to the exporting country to demonstrate objectively that the approach taken to comply with international SPS measures is effective. This can only be done by partnering with stakeholders along the supply chain.
- Be ready to accept audits by importing countries. OIE standards provide a framework for importing countries to conduct audits of exporting countries, and in particular to check that exporting countries comply with OIE standards regarding the quality of veterinary services and animal health.
- Participate in OIE meetings in order to contribute to the definition of animal health standards and procedures. This may require countries to have overseas representations as well as the human, technical and financial capacity to provide technical inputs.

The following are issues related to international SPS standards on animals and animal products:

- Some developing countries find it extremely difficult to comply with recommendations contained in the OIE Terrestrial Animal Health Code. Such countries rarely have high-quality veterinary services, and farmers may lack the technical and financial resources necessary to comply with international SPSs. While most animal disease risks are legitimate, some could be 'fabricated' to restrict trade unjustly. Developing countries, however, may find it difficult to prove that some SPS trade restrictions are illegitimate. In addition, the WTO dispute settlement mechanism, whereby a complainant may impose a penalty on an offender (e.g. punitive tariff), is often unattractive to developing countries because such a penalty may be more harmful to the national economy than to an offender.
- Few developing countries can afford to participate in developing the SPS standards established by OIE. Many argue that while such standards mostly reflect the needs and fears of the industrialized world, they are not necessarily appropriate for developing countries.
- Paradoxically, international standards may allow developing countries to create non-tariff barriers to other developing countries. For instance, a country such as Malawi could refer to international standards in order to ban beef imports from Zambia, even though it does not itself apply SPS standards.

Box 40. INTERNATIONAL SANITARY AND PHYTOSANITARY STANDARDS ON BOVINE SPONGIFORM ENCEPHALOPATHY (BSE)

BSE is a fatal neurological disease that affects adult cattle. It is most likely spread by the consumption of meat and bonemeal containing the infective agent; If humans eat diseased tissue from cattle, they may develop the human form of 'mad cow disease' known as variant Creutzfeldt-Jakob disease. OIE has established guidelines for products authorized for import based on the BSE risk status of the exporting country: negligible risk, controlled risk or undetermined risk, depending on an assessment of the risk to animal and human health in the importing country. The risk status is based on four criteria, as set out in the OIE Terrestrial Animal Health Code: (i) an assessment of the incidence of BSE; (ii) an established programme for the detection of possible BSE cases; (iii) compulsory notification and testing of possible BSE cases; and (iv) the existence of approved laboratory and testing procedures for tissues collected in the surveillance programme. In May 2009, OIE published a list of member countries categorized by BSE risk. Argentina, Australia, Chile, Finland, Iceland, New Zealand, Norway, Paraguay, Singapore, Sweden and Uruguay were recognized as negligible-risk countries. OIE guidelines recommend that all beef from negligible-risk countries be authorized for import, provided it can be demonstrated that the cattle had not been exposed to BSE and were born after the date of an effective feed ban to control the spread of the infective agent. Another 32 countries, including Brazil, the United States and the United Kingdom, were recognized as controlled-risk countries. For such countries, OIE guidelines recommend that all fresh meat and meat products, except for meat mechanically separated from the skull and vertebral column of over 30-month-old cattle, be authorized for import, as long as control procedures are in place. Recommended control procedures include ante- and post-mortem inspections of all cattle for human consumption, a ban on certain non-approved stunning or slaughtering processes, and verification that the meat or meat products have been produced and handled in such a manner that they have not been contaminated with specific material at risk (such as brains and eyes) or that the meat from over 30-month-old cattle has not been mechanically separated from the skull and vertebral column. The OIE guidelines recommend that "deboned skeletal muscle meat (excluding mechanically separated meat) from cattle of 30 months of age or less" be authorized for import from all countries, without regard to BSE risk, provided risk materials are removed and the cattle were not subjected either to a stunning process involving a device to inject compressed air or gas into the cranial cavity, or to a pitching process.

As OIE cannot oblige countries to conform to its guidelines/standards, certain countries (such as Japan and the Republic of Korea) have set their own, more stringent import requirements. On the international market, therefore, there exists a variety of different BSE-related import restrictions that impair the ability of exporting producers to sell specific products where they are most highly valued, decrease the range of products eligible for export to any particular market, and increase operating costs.

Sources: USITC 2008; www.oie.int

3.4.5. Disease-free export zones

Official OIE recognition of the absence of certain diseases – including FMD, rinderpest, CBPP and BSE – is critical for WTO member countries to engage in international trade of livestock and livestock products. An OIE member country may also declare itself free of other animal diseases provided it can provide the necessary sanitary guarantees. The possibility of exporting livestock products and/or live animals is thus largely determined by the capacity to achieve and maintain a disease-free status, the cost of which may be prohibitively high for many developing countries. However, OIE accepts the alternative option of applying the same principle to smaller, more manageable areas or zones within a country, which are then recognized as disease-free (export) zones (McLeod and Leslie, 2001; Zhao, 2004; www.mifugo.go.tz). This calls for the following:

- Identifying livestock/animal products that could be exported at a profit if SPS standards were to be met. This requires an analysis of national, regional and international markets, and recognition of national livestock production systems as well as of the sanitary status of the country *vis-à-vis* international standards.
- Selecting areas for the establishment of disease-free zones and investing in the necessary institutional and physical infrastructure for this purpose. Whereas building infrastructure (e.g. fences) may be relatively straightforward, it is more challenging to find staff who have sufficient technical knowledge of SPS standards and are capable of managing export processing zones. It may be more appropriate to forge public-private partnerships to manage animal disease-free zones, including disease surveillance and disease control mechanisms.
- Assessing the cost of establishing disease-free zones (which depends on current disease status and quality of veterinary services) against the projected gains associated with expanded exports and other benefits for society (e.g. employment opportunities). It is the difference between the costs (largely public) for compliance and the value of exports (mostly private) that ultimately determines the economic viability of disease-free export zones.

Many governments face serious challenges in establishing and maintaining disease-free export zones:

- Is it difficult to quantify *ex ante* the overall cost-benefit ratio of setting up disease-free export zones. First, even when this is on a small scale, the costs necessary to comply with international SPS standards may be high and recovered only in the medium to long term (it takes time to gain shares on international markets). Second, the benefits, including private gains for stakeholders in the supply chain (e.g. employment generation) and public benefits in terms of reduced animal diseases and improved trade balance, are difficult to measure.
- Changes in SPS standards and in importing country procedures may make it difficult to manage a disease-free export processing zone effectively over the long term, especially in view of the human and financial constraints facing many developing country governments.
- OIE disease-freedom is often not accepted without further verification by major trading nations/blocks, such as the United States and the EU, which reduces incentives for countries to establish disease-free export zones.

- The presence of disease-free export zones may well contribute to asymmetric livestock sector development in some regions, because of public and private 'over-investment' in such zones.

Box 41. FMD DISEASE-FREE ZONE IN BOTSWANA

Livestock play a critical role in the economy of Botswana. The beef export market underpins the livestock industry: it is estimated that almost 90 percent of all beef produced is exported for an overall value of more than US$40 million. Therefore, control of FMD is critical for the country to maintain its position on international markets. Botswana has adopted a policy for FMD control based on effective prevention, rapid detection and quick-response mechanisms. For FMD control purposes, there are two types of disease-free zones in the country: (i) areas where vaccination is practised; and (ii) areas where vaccination is not practised (two importing countries, namely, Japan and the Republic of Korea, make a distinction between FMD-free countries where vaccination is practised and those that are FMD-free without vaccination). Both zones are protected by disease-control fences, which separate the cattle from wildlife (major carriers and transmitters of FMD). There are also strategically placed livestock quarantine areas where both vaccinated and non-vaccinated cattle are kept before being slaughtered/exported. Implementation of this system comes at a high cost to the Government, which covers all implementation costs, including vaccination against FMD, fence maintenance, disease surveillance, extension and training to farmers.

The existing FMD control system, which involves strict enforcement of disease-freedom in the major producing areas of the country, has allowed Botswana to export livestock on international markets for many years. Although affected by sporadic FMD outbreaks in recent years, Botswana has always been able to contain their spread and reduce any losses caused by trade interruptions. However, it is not certain whether the current benefit-cost ratio will also justify the system in the future, when increased international competition on livestock markets is anticipated.

Source: Mapitse, 2008.

3.4.6. Commodity-based trade

The safety of livestock products depends not only on their area of origin but also on their characteristics. Because some raw or processed livestock products are safe to consume regardless of whether or not animals are sick, this may allow countries to engage in the trading of processed livestock products even when certain animal diseases have not been eradicated. For instance, cow's milk is a safe commodity with respect to BSE because the BSE agent is not present in the milk of infected cows. A commodity-based approach to trading of livestock products, therefore, may provide developing countries with access to international markets (COMESA, 2008; Thomson *et al*., 2009). Countries willing to adopt a commodity-based principle for the purpose of exporting livestock products should do the following:

- Identify the livestock commodities (e.g. beef, milk, cheese) that they may export for a profit, considering both the status and trends of international markets and their comparative advantages in livestock production, processing and marketing of animal-source foods.
- Provide scientific evidence that exporting processed livestock products from disease-affected areas is equivalent to importing livestock products from disease-free countries/areas, in terms of both animal and human health risk. International standards (which are detailed in the Codex Alimentarius) should be applied, such as maximum residue levels for veterinary drugs or specific hygiene practices in slaughterhouses.
- Commodity-based export policies require investments both in structural facilities (laboratories and testing equipment; export-quality slaughterhouses) and in human capital (training and dissemination of information). Despite the fact that the benefits of commodity-based policies largely accrue to the private sector, positive spill-overs can be expected on the entire economy (e.g. increased foreign earnings/reduced public health costs), which may justify investments by the public sector.
- Exporting countries should be ready to accept inspections and audits by importing countries that wish to be assured that a credible food safety system is in place.

Both technical and institutional constraints limit the feasibility of commodity-based export policies:

- Most developing countries have a comparative advantage in exporting low-cost raw agricultural products/live animals for processing elsewhere, as few of them have the necessary facilities for processing in-country.
- Limited financial and technical capacity make it difficult for some developing countries to set up and manage export-quality processing plants/slaughterhouses to international standards. In many cases, donors have been the major financiers of such plants, which often operate at limited capacity.
- Although a commodity-based approach is accepted by OIE, specific standards and procedures for a number of processed commodities are still to be developed. However, many developing countries do not have sufficient scientific resources to prove the safety of certain livestock commodities, and continue to invest in creating disease-free areas to boost exports.
- Governments may assume that commodity-based trade would immediately generate foreign earnings. However, the process involved in gaining international market shares is lengthy and uncertain, and it may be years before the benefits of commodity-based measures finally offset initial investment costs.

Box 42. A MODEL EXPORT SYSTEM FOR DE-BONED BEEF

Thomson *et al*. (2009) propose a model that would help countries affected by transboundary animal diseases to export de-boned beef on international markets. De-boned beef – from which lymph nodes and risky material associated with BSE have been removed – is safe for human consumption, irrespective of whether or not the country where the meat is produced is recognized as free from so-called transboundary diseases (e.g. FMD). The proposed model builds on three major components: (i) an export-grade abattoir and meat processing facility where de-boned beef cuts can be prepared in accordance with international standards; (ii) a traceability system to ensure that beef cattle come from a well-defined region affected by only a few, if any, animal diseases; and (iii) a quarantine holding facility where cattle can be isolated for at least three weeks and treated/vaccinated. This would ensure that the animals subsequently slaughtered are not infected with other animal diseases/zoonoses.

The proposed model would ensure the trading of safe livestock products: on the one hand, the processing facilities would be managed in line with the requirement for 'a compartment', as defined by OIE; on the other hand, the de-boning process and removal of lymph nodes, and other material at risk associated with BSE, would further increase the safety of the product. For de-boned beef, it was estimated that, on average, the BSE virus survives in one out of 154 million infected carcasses. If cattle were also vaccinated against BSE, the risks to human health would be almost entirely eliminated.

Source: Thomson *et al*., 2009.

3.4.7. Trade-enhancing infrastructure investments

Poor infrastructure and logistics raise transaction costs and prevent developing countries from profitably trading on international and intraregional livestock markets. Many governments have therefore designed and formulated public or public-private programmes to build livestock-related infrastructure, such as quarantine areas, export quality slaughterhouses and tanneries, with the aim of facilitating the trade of livestock and livestock products (Nordås and Piermartini, 2004; WTO, 2004). Public investments in livestock-related infrastructures call for the following:

- Assessing existing international market opportunities, and ascertaining whether livestock producers would be able to compete on regional/international markets once key livestock-related infrastructure had been built.
- Identifying public and private costs and benefits of given trade-related infrastructure for livestock/livestock products. Since both the public and private sectors are expected to benefit from increased trade in livestock products, institutional mechanisms could be devised to share the investment costs of export infrastructure.
- Establishing a self-sustaining institutional mechanism to manage and maintain trade-related infrastructure, including user, export and membership fees, etc.
- Identifying (and subsequently providing) the technical and financial services necessary to enable livestock farmers to use trade-related infrastructure and tap into international/regional livestock markets. This might also involve a traceability system and compliance with international hygiene standards.

Credit: WrenMedia/N. Palmer

Building infrastructure may appear to be a relatively easy way of promoting the trade of livestock and livestock products. However, there are challenges:

- Livestock farmers in developing countries are rarely competitive in terms of international market prices; trade-enhancing infrastructure may not be sufficient to facilitate exports of livestock/livestock products.
- Livestock farmers often find it difficult to produce export-quality livestock/livestock products, and the transaction costs to take the animals to export-quality infrastructure may be particularly high. Trade-enhancing infrastructure may therefore become a private good for the benefit of a few large livestock producers, with the smaller and poorer producers excluded. Ultimately, inequitable access to trade-related infrastructure may contribute to asymmetric development at the national/regional levels.
- It takes time for a country to gain a share on international markets. Therefore, returns on trade-related infrastructure will be positive only in the medium to long term.
- Inadequate human and financial resources may reduce the efficiency of trade-related infrastructure that is critical for a country to gain and maintain shares on international/regional livestock markets.

Box 43. DJIBOUTI LIVESTOCK EXPORT FACILITY

Livestock is the main source of livelihood for more than one third of Djibouti's population (the vast majority of livestock producers are poor nomads engaged in traditional and non-commercial subsistence pastoralism), and accounts for 10 to 20 percent of national GDP. The Government has always given low priority to the livestock sector; most farmers lack access to basic services and infrastructure, such as animal health services, processing and marketing facilities. However, following repeated drought over recent years, which has led to rapid urbanization and deteriorating living conditions in the towns, the Government decided that investing in the livestock sector could well contribute to improving the well-being of rural dwellers and to overall economic growth. Because of its geographical position and the deep-water port, compared with other countries in the Horn of Africa, Djibouti was considered to have a comparative advantage in terms of the quarantine and export of livestock to the Arab Peninsula. Construction of the Djibouti Livestock Export Facility – a US$2.1 million project funded by the Djibouti Chamber of Commerce, the United States Agency for International Development (USAID) and the Red Sea Livestock Trade Commission – started in 2004. Completion of the facility was subsequently entrusted to a private firm (owned by an investor from Saudi Arabia) that had invested in it. The facility was officially opened in November 2006.

The objective of the facility, which includes holding pens, quarantine facilities and veterinary services for some 80 000 animals per month, is to certify the health of camels, goats and sheep to be exported from the Horn of Africa (including Djibouti, Somalia and Ethiopia) to importing nations on the Arab Peninsula. The facility is currently run by a private company and, since starting operations, has increased livestock exports by 500 percent. However, both exporters and buyers are raising issues in relation to monopoly practices on the part of management. In addition, regular droughts in the region and outbreaks of animal disease may reduce the facility's effectiveness in promoting livestock sector development in the region.

Sources: USAID, 2007b, 2009.

3.4.8. Quarantine zones

Quarantine zones comprise infrastructure where animals are kept in complete isolation, with no direct contact with other animals, in order to undergo observation for a specified period. During quarantine, the animals are subjected to various tests and treatment so that the veterinary authority may be sure that they are free of/not affected by certain diseases (Paarlberg *et al.*, 2004; www.dfat.gov.au). Quarantine establishments may be set up both by importing (e.g. Malaysia) and by exporting countries (e.g. Somalia), and require the following:

- Identification of a holding ground where animals can be kept in quarantine, and construction of appropriate infrastructure, including fences, animal health posts, laboratories, etc.
- Identification of the appropriate level of quarantine; and formulation of laws/rules to regulate quarantine activities, including animal health inspections, vaccination,

Credit: Fotolia.com/Redzaal

treatment of animals, fees, and disinfecting procedures. Quarantine rules may differ according to animal species and diseases involved, but, in any case, for quarantine to be effective to any degree, the livestock should be isolated and contained for at least 14 to 21 days.

- Quarantine measures and practices should be constantly reviewed and adjusted to take account of the changed disease status of a country, changed requirements of trading partners and scientific developments in animal health diagnosis and treatments.

When setting up quarantine zones, governments should be aware of the following:

- It is difficult to identify an appropriate level of risk because aiming at zero risk of animal disease transmission is impossible, from scientific and managerial standpoints. However, countries may wish to follow the international risk-assessment procedures established by OIE.
- Lack of human and financial resources may not only delay quarantine activities (quarantine requests should be treated expeditiously) and restrict/slow down trade between regions and countries, but may also make quarantine ineffective. For instance, in the Yemeni quarantine stations (in Aden, Mukulla and Mukha) there is very little isolation of animals, which are quarantined for only two to ten days depending on the time of the year and number of animals involved.
- Financial and knowledge barriers may prevent some developing countries from adopting technologically advanced and least-trade-distorting quarantine measures. For instance, setting appropriate quarantine fees, which take account of private/public costs and benefits, is a challenging task, and incorrect evaluation may even contribute to reduced livestock trade.

Box 44. QUARANTINE FACILITIES IN MALAYSIA

The Animal Quarantine Service of the Department of Veterinary Services (DVS) has adopted strict quarantine measures for imported livestock in order to prevent the introduction and spread of animal disease in the country. Although, in Malaysia, all imported animals are required to have been certified as healthy and free from infectious and contagious disease by the veterinary authority of the exporting country, quarantine measures are considered necessary to ensure that a disease-incubating animal is detected. Quarantine requirements, such as the period of confinement in the quarantine stations, differ according to the species of animal concerned, the purpose of import and the trading partner. Basically, Malaysia differentiates exporting countries into two categories: scheduled countries, including Australia, New Zealand, United Kingdom (including Northern Ireland, Ireland, Singapore, Brunei, Japan and Sweden) and non-scheduled countries, namely, all others. Livestock from scheduled countries do not need to be quarantined, whereas exporters in non-scheduled countries should book space at the quarantine station before the animals are expected to arrive in Malaysia. Animals in quarantine are subjected to sanitary measures such as vaccination, and blood or other clinical tests deemed necessary by the veterinarian authority. No animal is released from the quarantine station without being certified free of disease.

Quarantine facilities are provided at all major entry points into Malaysia, such as KLIA Sepang, Kelang Port, Penang, Padang Besar and Rantau Panjang. The quarantine stations generally seem to work well. For instance, cattle imported from Cambodia are quarantined for a minimum of ten days; they are re-vaccinated against FMD and serum samples are collected randomly from 30 percent of the animals, for detection of FMD antibodies. The cattle are subsequently transported by sealed truck to approved slaughterhouses or holding farms only if there is no evidence of infectious or contagious disease.

Source: www.jphpk.gov.my.

4. Sustaining livestock productivity

Rapid changes are taking place on national and international markets, accompanied by a growing inter-connection between rural and urban areas, both within and between countries/regions. This necessitates that livestock operators, including small farmers, should be able to adapt and respond to new opportunities for (and threats to) efficient, equitable livestock sector growth. In particular, in the medium to long term, livestock farmers will be increasingly required to produce safe, healthy food and to adopt environmentally sustainable production practices. Whereas large, capital-intensive production units almost always have enough resources to respond to changing consumer demand and market conditions, smallholders may well be squeezed out of the market. *A priori* this is either bad or good, depending on whether or not alternative business or employment opportunities exist. But, in the medium to long term, unregulated (or badly regulated) growth in the livestock sector will doubtless have a negative impact on the environment and public health, and, not least, on poverty levels. That being the case, and to ensure growth in the livestock sector over the medium to long term, governments are expected to invest in two major areas:

(a) research on animal health, feeding and breeding, and other aspects of animal husbandry, to help livestock farmers respond both efficiently and sustainably to changed market conditions;
(b) livestock-environment policies/programmes to ensure that livestock farmers, including large- and small-scale operators, adopt environmentally sustainable livestock production practices, and to minimize the negative externalities of livestock sector growth on the environment.

4.1. LIVESTOCK RESEARCH POLICIES AND PROGRAMMES

Investments in livestock research – and agricultural research in general – have given positive returns, promoted sector growth and helped reduce poverty. In reviewing 292 studies and reports on agricultural research, Alston *et al.* (2000) found a median rate of return (measured via a variety of economic and non-economic variables) of 40 percent. The resources allocated to research in agriculture and to livestock within agriculture, are however dwindling in developing countries owing to ever-greater budget constraints and limited incentives for private-sector investments in livestock research (Roseboom, 2004).

Policy-makers are expected to revise old and formulate new policies and mechanisms to enhance the scope and effectiveness of livestock research – structures and processes for setting priorities; drawing up agendas, financing, organizing, delivering, monitoring, evaluating and assessing the impacts of (livestock) research, extension, education, and technology and information acquisition and exchange (Omano and Naseem, 2005) – on four major grounds.

First of all, as research results are often public goods with attributes of non-excludability and non-rivalry – i.e. all stakeholders, including non-payers, may benefit from research outputs – incentives to invest in research are undermined in the public and private sectors

because of spill-overs of research outcomes.[7] Second, even when research outputs are private goods, the private sector rarely invests in activities that benefit the poor because they have limited purchasing power and are seldom seen as potential clients. Third, research is often risky and uncertain in terms of timing, budget and output, which further reduces incentives for the private sector to invest in livestock research. Finally, economies of scale make it profitable only for very large investors to undertake research, because the risks and uncertainties associated with outputs decline the greater the size and scope of a research portfolio.

In the developing world, research has largely been carried out and funded by public or quasi-public institutes and agencies, but limited resources have often led to discouraging research results. In recent years, however, developing country governments have formulated a variety of policies/programmes both to improve the effectiveness of public research and to attract private-sector funds and capacity. These include institutional reforms of national agricultural research systems as well as 'push and pull' strategies – the former subsidize research inputs; the latter pay for research outputs – to sustain all basic, applied and adaptive research (Asopa and Beye, 1997; Kremer and Zwane, 2005; Roseboom, 2004). (i) Basic or fundamental agricultural research builds upon abstract principles of pure natural science and, while it does not have a directly relevant implication for the poor over the short term, it constitutes the basis for developing new technologies, techniques, varieties and strains in the medium to long term. (ii) Applied agricultural research seeks to solve well-identified biological, chemical, physical or social problems, and therefore targets specific farmer groups or segments of population. (iii) Adaptive research, which is usually carried out on-farm – with the farmer contributing land, labour, knowledge and other inputs – aims at discovering and demonstrating technologies and practices that can be implemented by farmers both practically and effectively.

The following sections deal with common approaches to improving the effectiveness of research in agriculture, including the livestock sector.

Table 8. POLICY AND PROGRAMME OPTIONS FOR LIVESTOCK RESEARCH

4.1.1.	Decentralization
4.1.2.	Matching research grants*
4.1.3.	Levy-funded research*
4.1.4.	Competitive research funds*
4.1.5.	Strengthening intellectual property rights
4.1.6.	Participatory livestock research*

* May be implemented by livestock departments/ministries

[7] The spill-overs of research outcomes are relevant for both the private and public sectors. For instance, some governments may have less incentive to fund and carry out research activities because it is expected that research outputs will sooner or later be available on the international market and free of charge. What would be the incentives for the Guinean Government to carry out research on trypanosomiasis if neighbouring Côte d'Ivoire were to invest heavily in trypanosomiasis eradication and control? In these cases, cross-country (international) research programmes may be a way of reducing the free-riding problem at the country level and helping to raise adequate funds to address common development constraints.

4.1.1. Decentralization

Decentralization means transferring responsibilities from central to local governments, based on the assumption that local governments are more efficient at delivering public goods because of their first-hand knowledge of local needs and lower delivery costs. In recent years, decentralization has been applied to a variety of government functions, including agricultural research, which, in many countries, has always been highly centralized (Chema *et al.*, 2003; Lai and Cistulli, 2005; Smith, 2001). A programme for decentralizing livestock research calls for the following:

- Identifying the type of activities to be decentralized, including basic research, applied research and on-farm research. As a general rule, decentralization targets both applied and on-farm research, which might be better executed by regional and local research institutes. Basic research tends to remain centralized.
- Deciding whether to use a commodity or agroclimatic approach. The former involves the creation of specialized research centres focusing on a few agricultural commodities such as rice or milk; the latter the setting up of research centres in different agroclimatic zones of a country in order to address constraints in specific regions. The two approaches certainly overlap, because agroclimatic conditions largely determine the portfolio of viable agricultural/livestock activities.
- Devising and implementing institutional mechanisms to facilitate interactions between local research institutes and end-users. The purpose is to bring researchers closer to farmers, which is critical to the effectiveness of decentralized research.
- Reforming research-funding mechanisms because, without financial autonomy, administrative decentralization is not sufficient to improve the efficiency of national agricultural research systems. As a general rule, a mix of central and local taxes/levies is used to finance local research centres.
- Establishing an M&E system to assess the quality of, and returns to, investments in decentralized research centres and institutes. The focus should be on impact indicators because the entire decentralization exercise aims at enhancing public-sector capacity to respond to farmers' needs.

Decentralization of agricultural/livestock research does not necessarily lead to improved coverage and outcomes, for the following reasons:

- Unless decentralization is backed up by an efficient system of agricultural extension, which is not always the case in developing countries, the impact of research outputs on agricultural sector growth and the livelihoods of the resource-poor will be negligible.
- In spite of decentralization, part if not all of the budgets of decentralized/local research institutes often remains under the control of central government. Local research programmes, therefore, are often influenced, if not dictated to, by the centre, thereby reducing the efficiency gains normally associated with decentralization.
- When funded by local governments, decentralized research institutes may be more subject to pressure from local lobbies. Their research portfolios may thus favour the relatively better-off rather than the community as a whole.
- Local governments may have less incentive to fund decentralized research institutes

because, owing to spill-over effects, research outputs may be appropriated by neighbouring administrative units free of charge.

- Sizeable research institutes may be more productive than small, decentralized institutes owing to economies of scope across their research programmes, internal knowledge spill-over and economies of scale arising from shared fixed costs. However, large central research centres may lose much of their efficiency because of their distance from the 'reality on the ground', problems of coordination and absence of external competition.

Box 45. DECENTRALIZATION OF AGRICULTURAL RESEARCH IN MALI

Mali launched a wide-ranging reform of its national agricultural research system in 1993, when the Institute of Rural Economy (*Institut d'économie rurale, IER*), the country's principal research agency, was converted from the status of a government department to a semi-autonomous self-accounting institution. In an attempt to improve effectiveness, IER decentralized its research activities and now comprises six regional research centres located in different agroecological zones (Kayes, Sotuba, Sikasso, Niono, Mopti and Gao), nine research stations and 13 research substations. The regional research centres concentrate on six domains, including livestock (cattle, camelids, small ruminants and poultry), and about 20 percent of their staff are specialized in livestock-related research. Administrative and financial responsibility remains at the local level, thereby enhancing the accountability of research centres, stations and substations. One third of IER's budget is funded by the Government and the other two thirds come from the World Bank, the United States Agency for International Development (USAID), the Netherlands and other donors; internally generated funds account for only 1 percent of the total budget. A national user committee and regional user committees have been set up for end-users to participate in the programming, evaluation and validation of all research programmes at the local level.

Decentralization of IER's activities has led to better-quality research in Mali, which has outperformed neighbouring countries in many research-related indicators. However, the majority of the technologies generated appear to target better-off farmers, who constitute about 20 percent of the farming population. Most (51 percent) of the livestock research budget, for instance, is used for large ruminants; less attention is given to sheep and goats (26 percent) and poultry (16 percent), which are largely kept by the livestock-dependent poor.

Sources: Beye, 2002; Stads and Kouriba, 2004; www.ier.ml.

4.1.2. Matching research grants

Matching grants are designed to develop collaborative public-private research agendas in a specific agricultural/livestock domain. The public sector cofinances research not normally undertaken, or only partially so, by the private sector, such as when significant fixed investment costs are involved or there is a likelihood of its outputs being appropriated by non-payers. By 'crowding-in' investments by the private sector, matching grants are expected to

expand a country's overall agricultural/livestock research portfolio (Biggs, 1999; Carew, 2001; Janssen, 1998). Setting up matching research grant programmes calls for the following:

- Identifying domains/areas where private firms may be willing to invest, typically including applied and adaptive research for which they may claim credit for part of the result; on which the returns are highly uncertain and/or remunerative only in the long term; and which involve high initial investment costs.
- Determining the overall cost of specific research activities and the ratio between public and private contributions. In theory, the larger the externalities generated by the expected output, the less the private sector is willing to invest and, hence, the higher the public contribution necessary to attract private investors. The typical ratio is however 1:1, i.e. for each dollar received from the public sector, the private sector contributes one dollar, either in cash or in kind.
- Establishing clear criteria for identifying and selecting eligible private research partners – e.g. technical capability, availability of human and financial resources, bidding procedures, and screening and evaluation methods.
- Setting up a mechanism for allocating matching grants to selected institutions as well as an M&E system to ascertain whether recipients of matching grants are in fact conducting specific research and generating the agreed deliverables.

Matching grants can be an effective tool for improving the scope and coverage of agricultural research. However they face challenges:

- Matching grants are largely, if not only, used to sustain applied/adaptive (not basic) research, which ensures that only private investors have sufficient incentive to undertake specific activities.
- It is almost impossible to quantify *ex ante* the costs and benefits – including the externalities – associated with most research activities. In practice, it is not easy to determine the optimal level of matching grants which, ideally, should be different for each and every activity.
- Miscalculated matching grants may end up 'crowding out' private investments: when the public contribution is too small to provide incentives for the private sector to increase its research investment beyond what it would have funded on its own, private firms may simply reduce their budgets by an amount equal to the matching grant.
- Owing to imperfect correlation between research inputs and outputs, it is difficult, and costly, for the public sector to ensure that matching grants are allocated exclusively to agreed research activities. Therefore, public authorities often award matching grants with the proviso that there should be some degree of collaboration among public and private research centres.
- In many developing countries, few private firms/institutes undertake agricultural and livestock research; this inevitably limits the effectiveness of any matching grant programme.

Box 46. MATCHING RESEARCH GRANTS IN MALAYSIA

In May 2005, the Ministry of Science, Technology and Innovation of Malaysia established BiotechCorp, a government-owned agency responsible for identifying value propositions in both research and development (R&D) and commerce, and for supporting such ventures via financial assistance and developmental services. BiotechCorp has set up a matching grant programme, which finances R&D activities expected to deliver new or improved technological applications that use biological systems, dead organisms, or derivatives thereof, to make or modify products or processes for specific use. Applicants for matching grants must be majority-owned Malaysian companies, which: (i) have the majority of their business activities and employees within Malaysia; (ii) have ownership of, or the right to use, any intellectual property needed to commercialize the anticipated innovation; and (iii) have appropriate research capacity. The maximum funding per project is set at RM1.0 million (about US$275 000), with BiotechCorp matching 'dollar-for-dollar' in accordance with agreed monitoring indicators, provided the grant is used within two years of the approval date.

As of end-December 2008, BiotechCorp had allocated almost US$3 million through its matching grant programme. Among other things, these grants were for livestock-related research (recombinant animal vaccines; marker-assisted breeding programmes; improved animal feed through biotechnology applications). Whether or not the R&D projects funded through the matching grants programme directly benefit the resource-poor, especially smallholder livestock farmers, is an open issue. However, there is no doubt that BiotechCorp has been successful in attracting private-sector investments in livestock research.

Sources: www.biotechcorp.com.my; www.biodiv.org/convention.

4.1.3. Levy-funded research

Commodity levy programmes finance specific agricultural or livestock research though charging a levy per unit of output (in quantity or value) to identified stakeholders. The underlying basis of such programmes is the assumption that some research outputs produce private benefits – i.e. they could be paid for by the main beneficiaries – and that a mechanism is needed to coordinate individual producers so that they provide sufficient research funds. Commodity levy (or check-off) programmes may be managed by the public and private sectors (e.g. by an industry organization, such as one finds in several industrialized countries), with farmer participation either compulsory or discretionary (Alston *et al.*, 2003; 2004; Klerkx and Leeuwis, 2008). Setting up a commodity levy programme calls for the following:

- Identifying agricultural/livestock subsectors that can support a commodity levy programme. For instance, it would be difficult to establish a programme for a subsector dominated by thousands of small players – including producers, processors and traders – or for a sector where the output is too small to generate significant research funds.
- Specifying the research activities to be funded through the levy. Funds are usually used for research that produces immediate benefits for end-users, thereby encouraging farmers to participate.

- Identifying the levy-payers who, on paper at least, can be stakeholders along the value chain. In most cases, however, farmers or a subgroup of agricultural producers (e.g. exporters) are expected to pay the research levy.
- Defining the characteristics of the levy: Is the levy charged on the quantity produced/sold, or on the value of production/sales? Is it linked to farm size/number of livestock heads? Is it progressive, regressive or neutral? The characteristics of the levy are critical as they determine the amount of funds to be raised and, ultimately, the research undertaken.
- Setting up an institutional mechanism for levy collection – which very much depends on the characteristics of the levy (e.g. a levy charged on sales will most likely be collected by actors in the marketplace, such as wholesalers) – with responsibility entrusted to either the public or private sector.

Issues regarding the effectiveness of levy-based research programmes include the following:

- In many developing countries there are few opportunities to design and implement effective commodity levy programmes because the agricultural/livestock sector is dominated by thousands of smallholder operators and there is no way to record their production/consumption/sales at low cost. Commodity levy programmes are practicable only in countries where the majority of produce transits through formal markets and/or where there is some concentration along the value chain – at the production, processing or marketing level.
- In several instances, research issues to be investigated (e.g. backyard poultry) are at a level of the supply chain where it is impracticable or impossible to charge a levy

Credit: Nicolas de Normandie

(e.g. thousands of backyard poultry farmers). The more a sector is underdeveloped and unorganized, the greater the difficulties in setting up a levy-funded research programme.

- Governments may reduce investments on public research by an amount equal to the collected levy, thereby limiting the contribution of a commodity levy programme to efficiency outcomes normally associated with (the presumed) increased accountability of researchers to levy-payers.
- In many developing countries, research institutes are understaffed/inefficient and few livestock operators would be willing to pay to support the national agricultural research system.

Box 47. BEEF CATTLE COMMODITY LEVIES IN CANADA

In 2002, the Government of Canada established the Canadian Beef Cattle Research, Market Development and Promotion Agency, which is run by a 16-member board of directors (including cattle producers and importers) and finances research for developing the Canadian beef industry. The agency is funded through a mandatory non-refundable levy of US$1 per head of cattle, which is applied both to Canadian beef cattle marketed domestically and (in order to avoid penalizing local producers) to imported beef cattle and the carcass equivalent of imported beef and beef products. Overall, about US$2 million per annum is generated through the levy. The fees are collected through the Provinces, which use their existing tax-collection systems (based on auction markets, inspectors and other actors who handle cattle sales in Canada) and through Customs. The agency allocates the fees thereby collected to two major research programmes: one related to beef production, and the other to beef marketing.

The agency has funded a number of research projects on beef quality, food safety, development of drought-adapted forage, and investigation of alternative feeding strategies. In the second half of 2009, it also commissioned a comprehensive evaluation of the extent to which its research investments had increased the supply of Canadian beef and improved the industry's competitiveness.

Sources: Canada, Government of (2002); www.cattle.ca.

4.1.4. Competitive research funds

Competitive research funds aim at mobilizing available capacity using 'calls for research proposals' to allocate funds. These calls are meant to generate competition for research funds and, hence, to favour more efficient allocations of limited public resources and enhance overall returns. Competitive research funds can be seen as a form of subcontracting, whereby government selects the priorities but then contracts universities, foundations and other organizations/institutes to conduct agricultural and livestock research (Carney *et al.*, 2000; Echeverría, 1998; World Bank, 1999). The establishment of competitive research funds calls for the following:

- Identifying issues/questions for review by local research institutes, including areas of research (e.g. technology development or animal husbandry management) and expected outputs (e.g. improved breeds or reduced post-harvest loss). To the extent possible, research domains and objectives should be decided on the basis of consultations with potential bidders.
- Establishing an institutional mechanism to define the rules and operational procedures regulating competitive funds, such as eligibility criteria for potential competitors; application procedures; screening and selection criteria; procedures for releasing funds, etc. As a general rule, the stricter the rules, the lower the number of potential bidders and the screening/evaluation costs; but also the lesser the likelihood that research institutes/centres will propose innovative (and potentially beneficial) research methods and approaches.
- Setting up an M&E system, because recipients of research funds are expected to conduct research-specific activities and generate agreed deliverables.

There are issues and concerns associated with competitive research funds:

- As a general rule, competitive research funds are used to finance targeted, short-term activities, i.e. they largely finance applied and adaptive, rather than, basic research. However, basic research is critical for long-term development of the agricultural/livestock sector.
- In many developing countries the shortage of agricultural research institutes/centres makes it difficult for a competitive research fund to work properly (i.e. there is no competition). In these circumstances, it is worth investigating the viability of a regional fund, although this may 'crowd out' local research capacity. The latter partly explains why managers and staff of national research institutes may oppose any move to establish competitive research funds.

Credit: ©FAO/D. Gwenaelle

- The costs involved in setting up and managing competitive research funds are not negligible, inasmuch as they cover the preparation of proposals, screening of applications and monitoring the use of funds. In addition, competitive research funds are seldom large enough to generate the economies of scale needed to reduce administrative costs to the minimum.
- In many developing countries, the increase in competitive funding mechanisms has been driven more by donor interests than by an objective assessment of demand- and supply-side components of research outputs.

Box 48. COMPETITIVE RESEARCH FUNDS IN EASTERN AND CENTRAL AFRICA

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) was established in 1993 by the national agricultural research institutes of ten countries of Africa. The objective was to increase the efficiency of agricultural research in the region and thereby stimulate economic growth, food security and export competitiveness through productive and sustainable agriculture. In 2004, ASARECA launched a competitive research grant programme to finance regional integrated agricultural research for development projects. In particular, every five years, ASARECA draws up strategic plans that set out its priorities and form the basis of a competitive research grant scheme; at the beginning of every February, potential applicants are invited to submit proposals for grants. These proposals are expected to be consistent with ASARECA's strategic plans; be submitted by institutions from more than one member country; and provide details on the executing organization and project team, duration of project and conformance with prescribed project guidelines. Research projects must have a minimum value of US$50 000 up to a maximum of US$300 000 over a three-year period; funds are not meant to cover core or permanent costs. Research proposals that meet this criteria pass on to a second stage where external reviewers assess their technical merits, including economic, financial and social impact elements. The ASARECA Grant Authorizing and Advisory Board is responsible for final decisions in this regard.

The ASERACA Strategic Plan for 2006 to 2015 acknowledges the importance of livestock research to achieve the goals of economic growth, improved food security and poverty eradication. The ASARECA Animal Agriculture Research Network has identified a number of areas for implementing livestock research projects, including animal health; livestock feed and water resources; animal genetic resources; farmer organizations; and policy analysis.

Sources: www.asareca.org; ASARECA, 2005; A-AARNET, 2005.

4.1.5. Strengthening intellectual property rights

Defining and enforcing intellectual property rights (IPRs), which bestow on the 'creator' of an 'innovation/invention' the exclusive right of use for a certain period of time, may be a powerful tool for encouraging private companies to invest in agricultural/livestock research. In most countries, IPR laws are structured around the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which establishes the minimum levels of pro-

tection that governments should give to the intellectual property of other WTO members. The World Intellectual Property Organization, a specialized agency of the United Nations, promotes the protection of intellectual properties and assists countries in developing IPR laws and programmes consistent with the TRIPS Agreement (David and Hall, 2006; Forero-Pineda, 2006; Lele *et al.*, 2000). Establishing and enforcing intellectual property right laws/programmes calls for the following:

- Selecting IPRs to be protected, such as patents, copyrights, trademarks and trade secrets. For instance, some countries grant patents on genes and transgenic animals; others refuse to allow the patenting of transgenics.
- Specifying how institutions/organizations or individuals can acquire IPRs, i.e. how their research outputs can be registered and protected through IPR laws.
- Establishing the level of protection to confer to IPRs, usually in the range of 20 to 40 years. This level should be decided by weighing incentives for research investment against the monopoly power granted to investors in IPRs. Sherwood (1997), for instance, identifies three different levels of protection: non-robust; TRIPS-compatible, largely to support imports; and investment-stimulating, which occurs only at a protection level higher than that established by the TRIPS Agreement.
- Defining a system for enforcing IPRs, i.e. applying effective, dissuasive and proportionate remedies and penalizing persons using IPRs illegally. This is possibly the most crucial element in IPR policy because, unless such rights are sufficiently enforced, there will be limited incentives for private actors to invest in agricultural/livestock research.

Heated debates on the subject of IPRs make it extremely difficult for governments to strengthen such rights.

- It is challenging to identify the correct balance between the legitimate interests of IPR holders and those of end-users, i.e. the size and distribution of benefits associated with IPRs. The benefits of IPRs are, in fact, variable over space and time because they depend not only on the characteristics of the innovation but also on the time horizon and the region's/country's level of development.
- IPR regimes may create temporary monopolies and restrict imitators' access to technology. When poverty reduction is at stake, this may have a negative impact on society, and is the main reason why many developing countries oppose pharmaceutical IPRs.
- As there are no rewards for innovations that cannot be embodied in products (i.e. cannot, directly or indirectly, be sold on the market), IPRs do not provide incentives for undertaking basic research.
- Public/private research institutes and large firms are able to comply with all the rules and procedures involved in having their intellectual inventions protected. However, as farmers and local communities are rarely, if ever, in a position to patent their inventions, there is a risk of these inventions being misappropriated by others.
- There is little enforcement of IPRs in many developing countries, which reduces the effectiveness of IPR laws and regulations. It also generates a bias towards research outputs primarily marketed in industrialized countries with functional rule of law.

Box 49. LIVESTOCK BREEDS IN HUNGARY'S PATENT LAW

Hungary is one of the few countries that grants patent protection for animal breeds, as specified in Articles 110 and 111 of the 1995 Law on the Protection of Inventions by Patents. Article 110 reads as follows: "(1) An animal breed shall be patentable if it is distinct and new and has been given a denomination suitable for registration. [...] ... patentability shall also be subject to reproducibility of the animal breed. (2) The animal breed shall be deemed distinct if it clearly differs in one or more assessment characteristics from any other breed whose existence is a matter of common knowledge at the date of priority. (3) The animal breed shall be deemed reproducible if its assessment characteristics remain unchanged through several generations. [...]." Article 111 details the rights and obligations associated with patent protection, as follows: "(1) A patent granted for an animal breed shall confer on the patentee an exclusive right in respect of (a) production for the purposes of commercial marketing, the offering for sale or the marketing of the propagating material, as such, of the animal breed, (b) the repeated use of the animal breed for the commercial production of another breed. (2) The animal itself (individual), sperms, ova, eggs suitable for hatching, embryos, or any other biological units or parts influencing or controlling propagation (e.g. parts of genes, cells) shall be considered propagating material. (3) [...]. (4) Patent protection shall have a duration of 20 years from the date of filing of the application."

As of today, the limited protection for confidential test data submitted to obtain marketing approval of new patents gives rise to other questions about the law's effectiveness; problems in the Hungarian judicial system continue to hinder protection of patent rights; current Hungarian patent law does not explicitly recognize the importation of a patented product as meeting the requirements of the law, which could open the door to the licensing of copy products from abroad.

Sources: WIPO, 1995; www.ustraderep.gov.

4.1.6. Participatory livestock research

Research outputs are sometimes of little use to potential end-users, for a variety of reasons: the output itself does not address binding constraints on development; it can be applied only by a limited set of farmers; extension services are unable to disseminate findings; and so on. Participatory research consists in designing and carrying out activities in close collaboration with livestock operators, so as to ensure that research outputs both respond to the needs and capacities of farmers and are immediately applied (Conroy, 2005; Morton *et al.*, 2002b; Wella and Roeleveld, 2000). Setting up a participatory research programme calls for the following:

- Establishing mechanisms for interaction between researchers and farmers, including contract, consultative, collaborative and collegiate participation. These mechanisms aim to ensure that: (i) farmers participate in problem definition, trial design, experimentation and evaluation; and (ii) research activities address any binding constraints on livestock farmers, in order to provide them with incentives to participate in research experimentation.

- Training researchers before involving them in participatory research, which requires making use of approaches that balance hard science and soft skills. For instance, researchers should know how to select partnering farmers; how to build up trust; how to communicate research findings, etc.
- Setting up a system of incentives for researchers to conduct/take part in participatory livestock research. Participatory approaches do not, in fact, satisfy the strict criteria of science. They thus remain unappreciated in academic circles, which makes them unattractive to most researchers.
- Setting up an M&E system that allows for the review and adjustment of participatory research methodologies. Participatory research outputs are context-specific and cannot easily be scaled out. Therefore, from a policy perspective process lessons are just as, if not more, important than the research output *per se*.

A number of issues should be considered when promoting participatory research:

- Participatory research is risky in terms of process and outcome (often riskier than academic research), which, together with difficulties in establishing budgetary requirements, makes it unattractive to policy-makers. In several cases, participatory research is or has been funded through donor contributions.
- As participatory research addresses local problems, it tends to be biased by the short-term needs of farmers, which may be inconsistent with a country's overall development agenda. For instance, poor livestock farmers may attach little value to research aimed at increasing the quality, rather than the quantity, of agricultural produce.
- The greater the degree of control that livestock farmers have over research trials, the less will participatory research produce data conforming to scientific standards – and, hence, the lower the incentives for researchers. However, if the objective is to produce technology (rather than scientific knowledge) for use by farmers in a given area, there is no need to produce scientifically valid data.
- Evaluation of participatory research requires the existence of control groups, which are often difficult to identify and monitor. Farmers contributing to participatory research programmes are rarely, if ever, picked randomly, but are selected in accordance with criteria such as resource endowments and educational level.

Credit: ©FAO/24605_a4_0008/G. Bizarri

Box 50. PARTICIPATORY GOAT RESEARCH IN INDIA

The BAIF Development Research Foundation (India) and the Natural Resources Institute (United Kingdom) have been implementing a joint research project, launched in October 1997, to identify and address constraints affecting goat production in a number of villages in south Rajasthan and Karnataka, India. The project aims at developing technologies to ease or remove constraints identified in collaboration with goat-keepers: researchers and farmers are roughly equal partners in the research process and related activities. The initial phase of the project consisted of a number of collaborative researcher-farmer rapid rural appraisals to identify major characteristics and constraints in prevailing goat production systems. Limited access to adequate feed resources was ranked as the most binding constraint. In the second phase of the project, numerous trials were conducted with resource-poor goat-keepers and a variety of treatments were tested to address identified constraints. Most trials involved selectively supplementing locally available high-quality feed such as grain and tree pods; some also involved de-wormers to improve feed use. The trials were each designed in collaboration with a treatment and control group in the same village, by selecting either treatment and control goat-keepers within similar socio-economic classes or treatment and control animals belonging to the same owners.

Monitoring indicators, including fortnightly measurement of productivity parameters per goat (e.g. milk production) and monthly meetings with participants, have shown that goats in the treatment groups had higher conception rates than those in the control groups. As feed supplements consisted of plant material that was widely available on common land/roadsides and could be harvested in the slack agricultural season, it has been possible to identify production-enhancing, low-cost technologies that can easily be adopted by the majority of goat-keepers in the semi-arid regions of Rajasthan and Karnataka.

Source: Conroy *et al.*, 2002.

4.2. LIVESTOCK-ENVIRONMENT POLICIES AND PROGRAMMES

Livestock production generates both negative and positive externalities on the environment. The pollution of land and water with animal waste (nitrogen and phosphorous), overgrazing and soil compaction represent the major environmental threats directly caused by livestock production systems. Animal waste also produces noxious emissions such as methane and nitrous oxide; soils are polluted by fertilizer and pesticides used for feed crops; and pressure to clear land for pastures or to grow animal feed is a major cause of deforestation, thereby contributing to CO_2 emissions and reduced biodiversity. At the same time, properly managed livestock production systems may contribute to environmental sustainability: livestock are a major source of organic manure in mixed farming systems; they can preserve soil fertility in arid and semi-arid lands that might otherwise become wasteland; and they can sustain wildlife (de Haan *et al.*, 2001; Mearns, 1997; Steinfeld *et al.*, 2006).

A comprehensive environmental policy agenda is needed to mitigate the ecological footprint of livestock production systems and enhance the positive contribution of livestock

farming to the environment. This includes a variety of policies/programmes (e.g. land titling programmes and fiscal policies; awareness and communication campaigns; research and technology policies) that are often beyond the capacity and scope of livestock authorities. However, some policies/programmes could be designed and implemented by livestock departments/ministries because they address specific livestock-environment issues. These may be broadly grouped into two broad categories: command and control measures; and market-based measures. The former would be based on rules and regulations for the private sector (e.g. ceilings on stocking density); they therefore require that government be capable of monitoring and rewarding/penalizing certain behaviour on the part of livestock farmers. The latter aim for market prices that internalize the environmental costs and benefits of livestock systems, including all externalities, so that livestock farmers' investment and production decisions are environment-friendly (Drucker and Latacz-Lohmann, 2003; Stavins, 1998; Steinfeld *et al.*, 2006).

Command and control, and market-based livestock-environment policy instruments are not mutually exclusive; neither is one category of instrument better than the other in terms of impact on the environment, or productivity and/or poverty levels. For example, establishing an upper threshold on discharges from livestock, taxing discharge, charging grazing fees or zoning livestock production are alternative policy instruments to reduce the negative environmental externalities of livestock production systems. It is therefore up to policy-makers to identify the instrument or combination of instruments most suitable for addressing context-specific livestock-environmental issues. Table 9 lists livestock-environment policy/programme options for improving livestock-environment relationships.

Table 9. LIVESTOCK-ENVIRONMENT POLICY AND PROGRAMME OPTIONS

4.2.1.	Controlled grazing*
4.2.2.	Co-management of common pastures*
4.2.3.	Livestock zoning*
4.2.4.	Discharge quotas*
4.2.5.	Payments for environmental services*
4.2.6	Marketing of environmental goods*
4.2.7	Environmental taxes

* May be implemented by livestock departments/ministries.

4.2.1. Controlled grazing

Controlled grazing programmes regulate livestock farmers' use of grazing areas to ensure that production practices are environmentally sustainable, thereby reducing the impact of negative externalities (e.g. soil erosion and water pollution) and expanding the positive externalities (e.g. improved pastures and conservation of wetlands and wildlife habitat) of livestock production systems (Mearns, 1997). Controlled grazing programmes build on rules and regulations that govern access to and use of circumscribed grazing areas by livestock farmers, and are a typical command and control measure (Gollehon *et al.* 2001;

Johansson and Kaplan, 2004); the literature refers to land co-management when the rules and regulations governing access to and use of land and common resources are generated by the community itself. Effective controlled livestock grazing schemes call for the following:

- Reviewing the extent and magnitude of environmental externalities associated with livestock grazing (trends in the availability of grazing areas and forage production, changes in soil characteristics, etc.) and of livestock production systems (number of producers, herd size and composition, production technologies, etc.).
- Identifying environmental objectives/standards to be achieved through controlled grazing, i.e. by reducing livestock pressure on the land. In general, the more ambitious the environmental objectives, the greater the costs – in terms of foregone income – for livestock farmers (at least in the short term) and the benefits for society as a whole. Therefore, adequate consideration should be given to trade-offs between environmental and socio-economic variables.
- Defining rules that limit/regulate livestock access to grazing areas, in line with established environmental targets. These rules/regulations should be consistent with the prevailing socio-economic and institutional framework: for instance, establishing maximum stocking densities or limiting manure emissions per hectare are two options for reducing livestock pressure on land. The latter option, however, is more complex, and will be successfully implemented only when adequate human and financial resources are available.
- Providing adequate incentives and training for farmers to comply with the newly established grazing rules and regulations, including awareness and information campaigns, financial compensation, penalties, creation of alternative income opportunities, etc.
- Putting in place an effective mechanism for enforcing grazing laws/regulations, and measuring their impact both on the environment and on farmer livelihoods.

Designing and introducing effective grazing control programmes is challenging, for a variety of reasons:

- Each country/region is characterized by a variety of agroecological zones and livestock production systems. Controlled grazing mechanisms are typically enforced only in specific zones, because defining and implementing regional and subregional grazing schemes is unworkable. This may limit both the attractiveness of such interventions for policy-makers and their overall impact on the environment.
- There is a tendency to overlook the important socio-economic impact of controlled grazing mechanisms and to focus only on mitigating the negative externalities associated with livestock grazing.
- Farmers are rarely, if ever, given sufficient (financial) incentives to reduce livestock pressure on the land. Such incentives are critical for resource-poor farmers with limited access to alternative sources of income, if they are to be able to comply with land-access and -use rules.
- Unsecured and ambiguous access to agricultural land and grazing areas, which characterizes many developing countries, might make controlled grazing mechanisms both ineffective and unsuccessful.

Box 51. CONTROLLED GRAZING IN SENEGAL

In the early 1980s, the German Agency for Technical Cooperation (GTZ) financed the design and implementation of a controlled grazing scheme in the pastoral areas of Senegal's Central Ferlo Region, which was recording increasing soil fertility losses. The scheme covered an area of 1 500 ha around a major borehole and was structured as follows: 200 ha were set aside for regenerating vegetation and 100 ha for livestock routes; and six 200-ha plots were established, each managed by different farmer groups. Of these, three were assigned a stocking density of 14 tropical livestock units (TLU = 250 kg live weight) per hectare and three a stocking density of 10 TLU/ha. The impact of the scheme was assessed by monitoring the evolution of environmental and socio-economic parameters over the period 1981 to 1992, both in the controlled grazing areas and in areas where no changes were promoted. (i) There were no differences in the production of herbaceous layer between the controlled and non-controlled grazing areas, even in years with adequate rainfall. (ii) Ligneous vegetation regenerated better in controlled grazing areas than in non-controlled zones. (iii) In abundant rainfall years, there was an over-accumulation of biomass in controlled grazing areas, which hindered plant growth in the following years. (iv) In drought years and dry seasons in general, livestock recorded higher fertility and lower mortality rates and larger weights in controlled grazing areas than in non-project zones.

Overall, the controlled grazing experiment made no significant contribution to reducing environmental degradation, and only during drought years were there any significant differences in livestock productivity between controlled and non-controlled grazing areas (but larger variations in production were recorded in the former). Fixing stocking rates in arid and semi-arid areas, which are characterized by extreme variability in rainfall and primary grass production, is not necessarily the best strategy for reducing the negative externalities of livestock on the environment.

Source: Thebaud *et al.*, 1995.

4.2.2. Co-management of common pastures

Open access to pasture lands can lead to overgrazing and overexploitation of natural resources. Whenever a farmer is in a position to decide freely on the number of animals to graze in an open-access pasture, his/her choice will depend on a comparison between his/her private costs and the benefits he/she can expect to accrue (e.g. between the time he/she needs to pasture one more animal and the additional milk the animal will produce). Each additional animal on the open-access land will impose a negative externality on other farmers, because it will reduce the amount of biomass available. However, even though the farmer might be aware of the negative externalities his/her behaviour generates, he/she will be reluctant to reduce the number of animals he/she pastures because the other farmers will continue to pasture all of theirs. The total number of animals grazing on the open-access areas, therefore, will surpass the carrying capacity of the land (Birner and Gunaweera, 2001; Hardin, 1968; Yan *et al.*, 2008). Governments could facilitate the establishment of common rules and regulations regarding the use of common pastures. These may include the following:

- Identification of open-access pastures that are becoming degraded because of overgrazing, including an analysis of the land tenure system and of the rules and regulations governing access to, and use of, natural resources by different stakeholder groups.
- Promotion of a participatory process to quantify the contribution of overgrazing to natural resource degradation. This is critical, because farmers often misjudge the causes and overlook their own contribution to environmental degradation.
- Definition of a comprehensive land co-management plan that, by taking account of existing common and private resources, and of potential sources of conflict among different stakeholders, sets out new rules for the common use of grazing land, including the rights and duties of different users.
- Provision of the necessary legal, financial and technical support for effective land co-management, including the securing of land tenure rights, helping farmers to create collective institutions, defining ad hoc rules and regulations to facilitate the sustainable use of common pastures, etc.

Supporting participatory land co-management is anything but straightforward, however.

- Participatory processes for effective co-management of pasture land are complex, time-consuming and risky, particularly when the aim is to give voice to all stakeholder groups, including the poorest, and when frequent conflicts arise. Also, many governments are unwilling to invest resources in activities when the outcome is, at best, uncertain.
- Good co-management schemes increase land productivity and/or diminish land degradation, thereby augmenting the value of assets and leading to the risk of private appropriation. New conflicts on resource appropriation can thus break out, within the community, with neighbouring communities or among local and central governments.

Credit: ©FAO/G. Napolitano

- Governments often find it difficult to provide an adequate legal basis for rules governing access to, and use of, common property resources. This is because it is difficult to bring into the legal framework all the bundles of traditional rights attached to open-access pastures.
- Returns on land co-management can be reaped only in the medium to long term, whereas farmers are obliged immediately to face costs caused by reduced livestock production. Community members, therefore, may lack incentives to support co-management schemes unless they are compensated for any foregone income, at least during the start-up phase of a programme.

Box 52. CO-MANAGEMENT OF GRAZING LAND IN KENYA

Approximately 75 percent of Marsabit District in the Eastern Province of Kenya is classified as rangeland. Different ethnic groups populate the area and keep a variety of livestock – including camels, goats and sheep, and cattle (in higher-rainfall areas) – which exert significant pressure on grazing areas and contribute to desertification. In 1990, GTZ launched the Marsabit Integrated Development Programme (MIDP) aimed at supporting rangeland rehabilitation through the promotion of environment-friendly grazing practices. In particular, MIDP supported the establishment of so-called environmental management committees (EMCs), composed of elders, traditional leaders, women and young people, responsible for organizing community workshops to identify sustainable land-use practices within their communities, from both a technical and a social perspective. Twenty-nine EMCs were established and jointly agreed upon a harmonized natural resources management protocol. Notable items in the protocol related to water resources management, access to grazing land by residents and non-residents, tree conservation measures and wildlife protection. After a promising start, however, the EMCs began to encounter problems: farmers had little incentive to be members of committees; the legal status of ECMs was unclear; and there was poor integration and coordination among EMCs in different neighbourhoods – to the extent that vast areas of rangeland remained unused owing to conflicts among different pastoral groups and communities. GTZ therefore grouped the 29 EMCs into four larger units corresponding to different major grazing areas, and facilitated a series of consultative meetings, bringing together district- and local-level government authorities, NGOs active in Marsabit, traditional authorities and EMC members, to help pastoral groups agree on measures to reduce banditry, theft and murder and on regulated access to range resources in neighbouring territories.

The participatory, broad-based process successfully promoted environment-friendly husbandry practices throughout Marsabit District. Vegetation has regenerated; wildlife poaching has declined; agreement has been reached with regard to dry-season grazing-reserve rules and temporary restrictions have been agreed on with regard to areas that can be entered during the rainy season; and, ultimately, environmental degradation has been halted.

Source: Haro *et al.*, 2005.

4.2.3. Livestock zoning

In terms of access to input and/or output markets, economic development is often associated with the concentration of industrial livestock production systems in strategic areas. These areas, however, are not necessarily the most appropriate when environmental externalities are factored in. Livestock zoning, which consists of siting livestock production units in predetermined agro-ecological areas, may be one way of mitigating the negative environmental externalities associated with concentrated livestock production systems. It may also contribute to the development of some regions through forward and backward linkages generated by livestock production systems (Gerber and Menzi, 2006; Steinfeld, 1997; World Bank, 2008b). Designing and implementing livestock zoning programmes calls for the following:

- Systematic collection of data on current livestock production systems, with focus on geographical location, prevailing technologies (e.g. heads of livestock per farm/per hectare, capital intensity of technology, etc.), and their overall impact on the environment.
- Identifying agroecological zones appropriate for given livestock farming, particularly for industrial livestock production systems. Typically, livestock farms should be away from densely-populated areas and located in regions that are (or will be) endowed with adequate infrastructure, including livestock-specific installations (e.g. waste collection and treatment facilities, slaughterhouses, etc.).
- Negotiating zoning agreements with current landowners and defining the characteristics of zoning permits. Are permits given free of charge or sold on the market? Are they tradable or not? And so on.
- Providing incentives to livestock operators to shift/start their production activities in the identified areas, such as tax incentives, subsidies for relocation, technical and administrative assistance, etc.
- Training farmers in the use of environmentally sustainable production practices, and providing incentives such as grants to build waste-control facilities; training in manure and carcass disposal; odour and fly control, etc.

Designing and implementing livestock zoning policies/programmes may well be problematic, for a number of reasons:

- The identification of appropriate sites for industrial livestock production units is anything but straightforward because it requires: (i) a full understanding of environmental externalities associated with a given livestock production system; (ii) assumptions on advancements in livestock-related technologies that should influence the selection of livestock production sites; and (iii) a territorial development plan setting out the role of livestock.
- A precondition for any successful zoning policy is the existence of good infrastructure that allows livestock and animal products to be transported over large distances at lower cost. However, because the building and maintenance of infrastructure is beyond the responsibility of livestock departments, zoning programmes are often constrained by available infrastructure.
- Livestock operators are expected to bear significant costs for shifting their produc-

tion units and are likely to oppose any zoning programme unless they have sufficient (financial) incentive.

- Relocation is challenging, and it typically works only when farmers move to nearby areas.

Box 53. SITING LIVESTOCK IN WISCONSIN (UNITED STATES)

The Livestock Facility Siting Law, which became effective in Wisconsin in May 2006, regulates the siting of new livestock farms (with more than 500 animal units) and the expansion of existing livestock units (by more than 20 percent and with over 500 animal units) in terms of location, animal heads, odour control, and waste and nutrient management. In particular, local governments are authorized to approve or deny siting and expansion requests, in order that they can plan and determine the landscape of their communities. For instance, a local government may prohibit livestock operations in "a non-agricultural zoning district" or may prohibit "livestock facilities over a certain size if there is at least one agricultural district which allows operations of all sizes". However, in approving livestock siting, local governments must comply with the terms of the law relating to: (i) property line and road set-backs (i.e. "livestock structures should be set back more than 100 ft from any property line or public road or right of way"); (ii) nutrient management (i.e. "land application of waste from a livestock facility ... should comply with the nutrient management technical standards of the Natural Resources Conservation Service"); (iii) odour management (i.e. "a livestock facility shall have an odour score of at least 500 ... odour score is based on predicted odour generation (based on size and type of livestock facility), odour practices, and the proximity and density of 'affected neighbours'"); (iv) waste storage facilities (i.e. "the waste storage capacity should be adequate for reasonably foreseeable storage needs"); and (v) runoff management (i.e. "the predicted annual phosphorus runoff to and from each existing animal lot to the end runoff treatment area ... shall be less than 15 lb if no part of the animal lot is located within 1 000 ft of a navigable lake or 300 feet of a navigable stream").

The Department of Agriculture, Trade and Consumer Protection of the State of Wisconsin has conducted a number of information campaigns and capacity-building activities to assist local governments and producers to comply with the siting law. However, incorporating the siting standards into local ordinances has proved more difficult than expected, thereby opening up the law to challenges from many livestock operators.

Sources: Wisconsin Department of Agriculture, Trade, and Consumer Protection, 2007; www.lesis.state.edu.wi.us.

4.2.4. Discharge quotas

Livestock manure is a source of nitrogen, phosphorus and many micronutrients that improve soil fertility. However, pathogens, excess nutrients and organic matter from livestock manure may contaminate soil and water. The establishment and implementation of discharge quota systems, which set ceilings on the quantity of livestock manure that can be released in the soil, may contribute to reducing the negative externalities on the environ-

ment generated by some livestock production systems (OECD, 2004; Vukina and Wossink, 2000; World Bank, 2005d). Designing and implementing a discharge quota system calls for the following:

- Identifying livestock production systems that contribute to environmental degradation through excessive manure discharge, depending on the numbers and species of farm animals, production technology, soil characteristics, etc.
- Defining a discharge-pollution equation and setting environmental targets necessary to identify the maximum acceptable quantity of manure discharge from livestock. When reviewing the manure-pollution interface, account should be taken of farm characteristics, prevailing technologies and production practices in order to avoid setting overambitious environmental objectives.
- Setting discharge quotas and establishing a quota allocation mechanism. For instance, manure quotas: may be based on numbers of animals or farm sizes; can or cannot be sold/bought on a dedicated market; may be provided free of charge and shared equally among livestock farmers; or may be sold, auctioned or allocated in accordance with predefined parameters (e.g. livestock per unit of land).
- Setting up an institutional mechanism to implement the quota system, which implies issuing and allocating manure quotas, providing adequate incentives for livestock farmers to respect the system – including financial support and technical assistance when necessary – as well as monitoring and evaluating its impact both on the environment and on farmer livelihoods.

Constraints on the design and effective implementation of discharge quota systems for livestock include the following:

- It is difficult to identify the 'optimal' discharge quota because several agro-ecological and biological parameters contribute to determining the level of pollution caused by manure. A lax quota would be ineffective at containing pollution; too binding a quota could lead to excessive socio-economic costs, for both farmers and society as a whole, in terms of reduced availability of and increased prices for, animal-source foods.
- Discharge quota systems do not directly benefit livestock farmers and often represent a net cost for them, at least in the short term. Many farmers therefore oppose the introduction of manure quota systems unless they are well compensated and/or an effective communication/awareness campaign is conducted to convince farmers of the long-term benefits of reduced discharge from livestock.
- Discharge quota systems often require farmers to maintain records of their livestock/land/production activities. In some developing countries, (small) farmers are often unable to comply with this requirement and, as a result, may be forced to quit livestock farming altogether.
- Implementing and monitoring discharge quota systems calls for high-quality technical and institutional capacities beyond those available to governments in many developing countries. In addition, evaluating the ultimate impact of a manure quota system on the environment is difficult because of the variety of environmental laws/rules that both govern/affect agricultural (and livestock) production activities and have a bearing on the environment.

Box 54. MANURE PRODUCTION RIGHTS IN THE NETHERLANDS

Quotas for animal manure production were introduced in the Netherlands in the 1980s, as part of a mix of policy measures to deal with the excessive release of nutrients into the soil. Under the country's Manure Act of 1986, each farm was required to calculate an annual reference level of manure production in phosphate terms, obtained by multiplying the number of animals on the farm on 31 December 1986 by a given 'phosphate' parameter associated with each animal species. Farms with a manure:land ratio of less than 125 kg of phosphate per hectare, or 'deficit farms', and new farms were allowed to increase animal numbers until that level was reached. Farms with a ratio of more than 125 kg of phosphate per hectare could expand their activities only by extending their land areas to reach the threshold of 125 kg of phosphate per hectare. The manure reference level was not tradable and could be transferred only under specific circumstances (marriage, inheritance or transfer of the entire farm), which constrained both the land market and livestock sector growth. As of January 1994, therefore, manure quotas were allowed to be traded and denominated 'manure production rights'. A farm's manure production right was divided into two parts: a land-based quota, which amounted to 125 kg of phosphate per hectare, and a non-land based quota, calculated with reference to specific animal categories (turkeys, pigs and chickens). The non-land quota was made tradable within animal categories to prevent further increases in swine production, which was allegedly causing serious environmental problems. Trading in manure production rights/animals took place through brokers, but transactions had to be approved by relevant government authorities to ensure that purchasing farmers had an appropriate manure disposal plan. The manure production right systems, however, were unable to create a balance between the production and disposal of animal manure. Therefore, in 1998, the Netherlands Government introduced the so-called Mineral Accounting System (MINAS), which is essentially a tradable permit approach for nitrogen and phosphorous applied as fertilizer. The system applies to pig, poultry, mixed livestock and cattle farms with stock rates above a set density (in all, about 50 percent of all Netherlands livestock farms) and to arable farms. MINAS farmers are required to declare the mineral surplus on their farms, whereby the surplus is estimated as the difference between the volume of nitrogen and phosphate supplied in the form of fertilizer and feed, and disposed of in the form of products and manure. Farmers exceeding their surplus quotas can 'trade' by giving excess manure to farms that have not reached their quotas. Those exceeding the quotas are charged. As many as 90 percent of farms pay no charges because they supply manure to arable crop farms with unused manure capacity.

MINAS did succeed in reducing nutrient emissions but its implementation was extremely complex. It was therefore abolished in 2006, following an October 2003 decision by the EU Court of Justice stating that the Netherlands Government had failed to implement certain elements of the EU Nitrate Directive and that the application limits for animal manure were too high. In January 2006, the Netherlands adopted a manure policy based on application rather than mineral loss standards. Compared with MINAS, the new policy set stricter limits on the use of nitrogen and phosphorus.

Sources: Oenema and Berensten, 2005; Verburg, 2009; Wossink, 2003.

4.2.5. Payments for environmental services

Payment for environmental services (PES) schemes are an increasingly popular tool for increasing positive externalities generated by agricultural production systems, including livestock. PES schemes provide incentives/compensate farmers for the production of environment-related goods/services not priced on the marketplace – compensation being linked to an estimated value of the goods/services produced. For instance, livestock farmers might be paid to adjust their husbandry practices in order to protect forest areas, with their compensation schedule linked to an estimated value of the preserved forest areas (FAO, 2007b; Landell-Mills and Porras, 2002; Pagiola *et al.*, 2005). Compensation is provided by the state or by associations, not through a market mechanism (see section 4.2.6). Setting up PES schemes calls for the following:

- Identifying one or more environmental good or service that can be provided by livestock farmers as long as they are adequately compensated. Examples include preservation of forest areas and biodiversity; maintenance of soil fertility; protection of water resources and landscapes, etc.
- Appreciating the production/consumption decisions of livestock farmers, including with regard to herd and farm size, production technology, access to input/output markets, level of education, etc., to define a compensation schedule that provides sufficient incentives for farmers to supply certain environmental goods. In view of the nature of differences among livestock farmers, multiple compensation schedules may be needed.
- Providing technical and, in some instances, financial assistance for farmers to produce and supply given environmental goods/services. This is critical when PES programmes are introduced for the first time, and when resource-poor farmers are expected to participate in them.
- Setting up an institutional mechanism for implementing the PES scheme, including funding, targeting, timely payment of farmers and monitoring.

Issues to consider when designing and implementing PES programmes include the following:

- PES programmes call for high-level technical and managerial capacities rarely available in developing countries. For instance, valuing environmental goods and services is anything but straightforward; drawing up a compensation schedule attractive to farmers is a challenging task because of the variety of factors affecting husbandry practices.
- Very little value is placed on the environment in developing countries, and policy-makers may be reluctant to invest resources in programmes that have no immediate and tangible benefits for taxpayers. For this reason, many PES schemes in developing countries have been funded by donors.
- PES programmes often require farmers to make land-fixed investments, such as for fencing or boreholes. However, in several developing countries, pervasive land tenure insecurity discourages land-fixed investments.
- PES programmes have been implemented on a small scale to date, i.e. their overall impact on the environment has been minimal. Defining a policy framework to pro-

mote application of PES programmes at the country level is a daunting task, sometimes because of the existence of several agro-ecological zones and different livestock production systems.

Box 55. A SILVOPASTORAL PES SYSTEM IN NICARAGUA

Silvopastoral systems are land-use systems whereby trees and/or shrubs are combined with pasture production for livestock. These systems are expected to generate economic benefits for farmers, i.e. increased biomass availability, livestock productivity and household income, as well as environmental benefits for society – i.e. reduced soil erosion, biodiversity conservation and carbon fixation in soil and standing trees. In the Matiguás-Río Blanco area of Nicaragua, a World Bank Global Environment Facility project has attempted to encourage the adoption of silvopastoral practices by livestock farmers in degraded pasture areas. The project has developed 28 indices of carbon sequestration and biodiversity conservation associated with different types of land uses. These indices are aggregated into a single environmental services index (ESI) for each farm. Farmers are given a one-time payment as an incentive to join the programme and are then compensated for any positive changes in the total ESI scores of their farms. The project started in 2004 and, after one year's operation, more than 17 percent of all farms in the region had made some changes in land use, including the sowing of improved grasses in degraded pastures, planting high-density tree stands and establishing fodder banks.

Following project implementation, the area of degraded pasture decreased by more than half and that planted to annual crops fell by almost one third. It is to be noted that, whereas non-poor households converted an average area almost double that of poor households, poor farmers recorded the largest proportional changes in ESI points because the programmes allowed for multiple land-use options, some of which were appealing to resource-poor households.

Sources: Pagiola *et al.*, 2007; Pfaff *et al.*, 2000.

4.2.6. Marketing of environmental goods

Livestock production systems generate multiple outputs, including animal food, manure, draught power, and both positive and negative environmental externalities. As a general rule, markets exist only for meat, milk and other livestock products such as skins and leather, which leads farmers to overlook their other livestock outputs. Public actions to create a market for some of the environment goods/services associated with livestock farming – such as wildlife protection or biogas – could well provide incentives for farmers to shift towards more environment-friendly husbandry practices (Boyd *et al.*, 1999; Drummond *et al.*, 2007; Suyanto *et al.*, 2005). Setting up a market for livestock-related environmental goods and services involves the following:

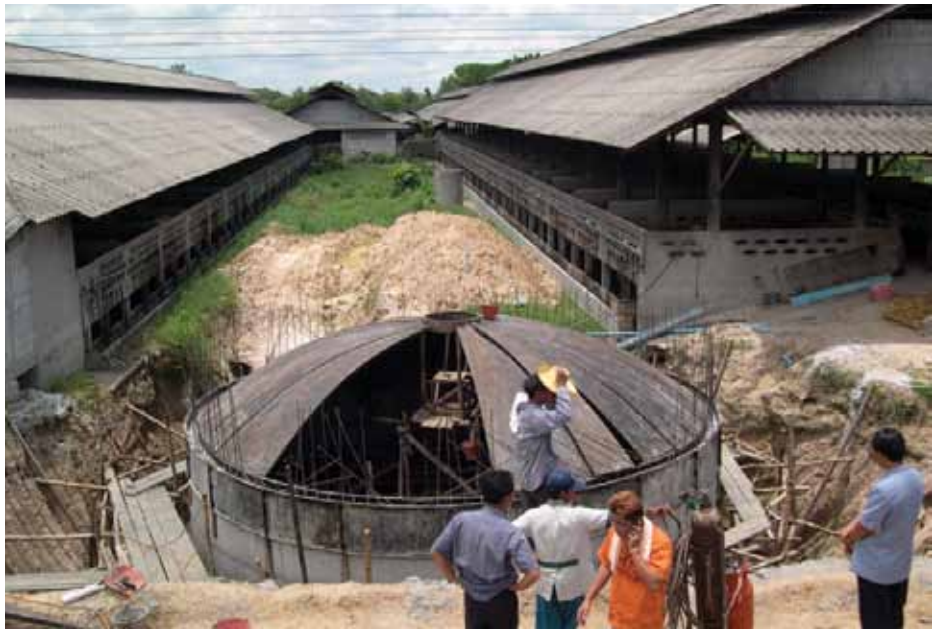
- Identifying opportunities for market-based livestock-environment development, i.e. areas where a market may develop for by-products generated by livestock farming.

For example, would ecotourism enterprises flourish if wildlife were protected? Are there any potential buyers for the biogas produced by animal waste?

- Analysing major livestock production systems to ascertain whether markets for livestock by-products are as remunerative for farmers, if not more so, than markets for traditional livestock products. This is a precondition for the feasibility of any market-based livestock-environment scheme.
- Providing public goods necessary to ensure the smooth and fair functioning of a market for livestock-related environmental by-products, such as information campaigns; infrastructure development; and ad hoc rules and regulations governing the newly established market.
- Promoting a participatory process to help livestock farmers: (i) adjust their husbandry practices to produce identified livestock-environment-related goods, including technical and financial assistance; and (ii) sell the livestock by-products they produce.

The following issues should be considered when designing and implementing livestock-environment market-based programmes:

- Identifying and measuring the prospective costs and benefits for farmers to produce and market livestock by-products is a challenging task owing to the lack of benchmark data.
- A market for environmental goods, and in particular for livestock-associated environmental goods/services, might be difficult to develop in many developing countries, either because the environment is poorly valued (e.g. people are not willing to pay for access to natural reserves) or because there is little demand for non-food livestock items (e.g. biogas).



Credit: ©FAO/LEAD/P. Gerber

- The production and sale of some livestock by-products may require relatively high technical (i.e. for biogas) and managerial (i.e. for natural parks) skills on the part of farmers and, not least, significant investments. Therefore, unless adequate external support is available, smallholders may be unable to participate in and benefit from market-based livestock-environment schemes.
- National and local governments may lack the capacity/willingness to support the establishment of a market for livestock-related environmental goods. This is because benefits for the public sector are largely indirect and materialize only in the medium to long term. In effect, in most cases, donors have sustained the establishment of markets for environmental goods.

Box 56. BIOGAS PROCESSING FOR SMALL-SCALE FARMERS IN CHINA

The rapid expansion of livestock production poses a number of challenges in terms of waste disposal, particularly in rapidly growing Asian countries. The Eco-Farming Project for China, launched in late 2008 with World Bank support, aims to generate environmental and economic benefits from the integration of biogas in farming and rural household cooking. There are three components to the project. (a) The integrated eco-farming system component targets about 400 000 to 500 000 farmers in Anhui, Chongqing, Guanxi, Hubei and Hunan to help them integrate biogas into livestock farming; in particular, beneficiary households, which are required to possess at least three pig equivalents of livestock and 2 mu (0.13 ha) of cropland, receive support to build biogas systems that include digesters (8 to 10m^3 in size), gas collectors, pipes, gas purifiers and stoves. (b) The technical extension and biogas service system component aims to strengthen and expand existing rural energy and agricultural extension services so as to provide technical support for the operation and maintenance of biogas systems. (c) The third component of the project has to do with management and M&E.

The expected direct benefits of biogas technology relate to: (i) energy production, as biogas can be used as a fuel alternative to wood and oil; (ii) agricultural productivity, as the sludge from the biogas reactor is transformed into ammonia nitrogen; and (iii) environmental protection, as there will be a reduction in greenhouse emissions and better sanitary conditions. The first two benefits generate immediate savings for farmers in terms of reduced expenditure on fuel and fertilizer. Achievement of the project's development objectives will be monitored through environmental indicators; measurements of household living conditions; changes in household expenditures and labour savings; and improved human and institutional capacity.

Source: World Bank, 2008c.

4.2.7. Environmental taxes

Environmental taxes, such as grazing or discharge taxes, translate the costs of environmental pollution/resource scarcity into appropriate monetary costs, thereby providing farmers (the polluters) with incentives (taxes) to contain the negative impacts of livestock produc-

tion systems on the environment. At the same time, they generate additional revenue for government, which may be used for environmental programmes or the supply of other public goods. There exist countless livestock-environment taxes, which differ in terms of objectives, target population and design. For instance, a tax aimed at reducing overgrazing in pastoral zones differs from one for reducing livestock manure emissions in industrial production systems (Fullerton *et al.*, 2008; Smith, 1992; Vermersch *et al.*, 1993). As a general rule, the design of livestock-environment taxes calls for the following:

- Identifying an unambiguous causality between livestock production systems and environmental externalities, acknowledging that a variety of known and unknown factors contribute to pollution and environment degradation.
- Analysing the production function of livestock farmers to identify if and where there are opportunities for taxes to have an impact on husbandry practices, thereby leading to reduced negative environmental externalities. In some cases, for instance, it may be appropriate to tax factor inputs (i.e. feed); in others, it might be best to tax livestock discharges (i.e. dung).
- Designing appropriate tax measures – including level and characteristics (e.g. progressive, regressive, and neutral) – that encourage farmers to change their animal husbandry practices. It is, however, important to assess the expected impact of such taxes, not only on the environment but also on farmer livelihoods, because excessively high taxes might render livestock production unprofitable and induce livestock farmers to avoid paying them.
- Establishing an institutional mechanism to charge and collect environmental taxes, as well an effective M&E framework to measure their impact both on the environment and on household livelihoods.

Effectively designing and imposing a livestock-environment tax is anything but straightforward:

- Setting an appropriate level for an environmental tax is a challenging task. This is particularly so in low per capita-income countries where the environment is not greatly valued by most of the population. The purpose would be to assess livestock's contribution to environmental degradation and weigh the cost to livestock farmers of changing their husbandry practices against expected public benefits.
- Environmental taxes must be flexible to adapt to exogenous circumstances, including market and natural crises (e.g. price shocks, droughts, floods) that have an impact on farmers' capacity to produce and sell livestock and livestock-related products.
- Limited administrative capacity at the central and local government levels constitutes a significant constraint to both designing and implementing an effective system of livestock-environmental taxes. In addition, in developing countries, taxes are typically charged per unit of input/output (e.g. VAT, poll tax), and are therefore regressive. In other words, they disproportionately affect the less well-off (for instance, a unitary tax per animal/hectare is likely to be regressive because well-off farmers keep bigger and healthier animals and have better-quality land than poor livestock operators).
- Livestock-environment taxes are effective only when they create incentives for integrated changes in livestock systems, which often require a set of complementary

investments/programmes. Should this not be the case, taxes may shift the adverse impacts of livestock pollution to different compartments of the ecological system (e.g. an environmental tax to avoid overgrazing may lead to livestock being moved to areas where the tax is not levied).

Box 57. GRAZING TAX IN SOUTHERN MALI

In the Sudano-Guinea region of Mali, livestock are both a major source of revenue and a savings asset, and animal traction is a key input for crop production. Settlement densities, however, have reached around 41 persons and 28 to 30 tropical livestock units (TLU = 250 kg live weight) per square kilometre, which creates acute pressure on both common pastures and cropping land. In particular, animal wastes left on open-access pastures are undermining soil fertility and degrading the grazing areas, with negative consequences for farmer livelihoods. In an attempt to reduce pasture degradation, in 1998, the Government introduced an experimental grazing tax in some areas in the order of FCFA 1 000 (approximately US$2) per TLU per month to reduce the pressure of livestock on the land. A preliminary assessment of the grazing tax indicates that while there has been no reduction in stocking density in some areas – owing to the lack of alternative feed sources and labour opportunities – in others, livestock farmers have confined their animals and improved their husbandry practices. This has led to increased livestock productivity, greater availability of organic fertilizer and higher crop yields. In particular, it has been shown that, over a 15-year period, free grazing on common land remained more attractive to farmers than labour- and capital-intensive confinement systems. However, in areas where feed is available, a relatively low pasture tax is a sufficient incentive for farmers to change their husbandry practices. This is because confinement raises the output of livestock and crops, with the result that the net cost of the tax is more than compensated for by increased output value.

Source: Mwangi, 2006.

References

A-AARNET (2005) *Strategic choices and programme priorities for the ASARECA Animal Agriculture Research Network (A-AARNET).* A-AARNET Coordination Office, Nairobi.

Adams D.W., Graham D.H. and Von Pischke J.D. (eds.) (1984) *Undermining Rural Development with Cheap Credit.* Westview Press, Boulder, Colorado, USA.

Adams M., Sibanda S. and Turner S. (1999) Land Tenure Reform and Rural Livelihoods in Southern Africa. *ODI Natural Resources Perspectives,* 39.

ADF (2006) *United Republic of Tanzania. Livestock Marketing Project Completion Report.* African Development Fund, African Development Bank, Tunis.

Adler M. (2001) Village Banks in Mali. *D+C Development and Cooperation,* 1: 18-20.

Ahuja V. and Redmond E. (2001) *Economic and Policy Issues in Livestock Service Delivery to the Poor.* Background paper for the FAO PPLPI Initiative. FAO, Rome.

Aklilu J., Irungu P. and Reda A. (2002) *An Audit of the Livestock Marketing Status in Kenya, Ethiopia and Sudan.* Pan African Programme for the Control of Epizootics (PACE), Study, Nairobi, Organization of Africa Unity/Interafrican Bureau for Animal Resources, Nairobi.

Aklilu J. and Wekesa M. (2001) *Livestock and Livelihoods in Emergencies: Lessons Learnt from the 1999-2001 Emergency Response in the Pastoral Sector in Kenya.* Working Paper No. 3. Feinstein International Famine Centre, Medford, Massachusetts, USA.

Alston J.M., Chan-Kang C., Marra M.C., Pardey P.G. and Wyatt T.J. (2000) *A meta-analysis of the rates of return to agricultural R&D: Ex pede Herculem.* IFPRI Research Report No. 113. IFPRI, Washington, DC.

Alston J.M., Freebairn J.W. and James J.S. (2003) Distributional Issues in Check-off Funded Programs. *Agribusiness: An International Journal,* 19 (3): 277-288.

Alston J.M., Freebairn J.W. and James J.S. (2004) Levy-funded research choices by producers and society. *Australian Journal of Agricultural and Resource Economcis,* 48(1): 33-64.

Anderson K. and Martin W. (eds.) (2006) *Agricultural Trade Reform and the Doha Development Agenda.* Palgrave Macmillan, New York and World Bank, Washington, DC.

ASARECA (2005) *ASARECA's Strategic Plan 2006-2015. Agricultural Research-for-Development in Eastern and Central Africa.* ASARECA (Association for Strengthening Agricultural Research in Eastern and Central Africa), Entebbe.

Asopa V.N. and Beye G. (1997) *Management of Agricultural Research: A Training Manual. Module 1: Institutional Agricultural Research: Organization and Management.* FAO, Rome.

Auisi R. (2007) *Mozambique: Agriculture Input Fairs – A Chance to 'Live in Dignity'.* Inter Press Service News Agency, 10 August, Maputo.

Azuba-Musoke R.C. (2001) *Challenges on Changes of the Delivery of Livestock Services in Africa Using Uganda as a Model.* Proceedings of the 10th Conference of the Association of Institutions for Tropical Veterinary Medicine, Livestock Community and Environment, Copenhagen.

Baishya M. (2009) Taking Information and Communication Technology to the rural masses. *The Assam Tribune,* 27 September.

Banerjee A.V., Gertler P.J. and Ghatak M. (2002) Empowerment and Efficiency: Tenancy Reform in West Bengal. *Journal of Political Economy,* 110(2): 239-280.

Banzhaf M., Drabo B. and Grell H. (2000) *From Conflict to Consensus: Towards Joint Management of Natural Resources by Pastoralists and Agro-Pastoralists in the Zone of Kishi-Beiga, Burkina Faso.* Securing the Commons No. 3. International Institute for Environment and Development, London.

Bardhan P. and Mookherjee D. (eds.) (2007) *Decentralization and Local Governance in Developing Countries: A Comparative Perspective.* Oxford University Press, Oxford, UK.

Barton D., Morton J. and Hendy C. (2001) *Drought Contingency Planning for Pastoral Livelihoods.* Policy Series No. 15, Natural Resource Institute (NRI), University of Greenwich, London.

BASIS (2003) *Credit Bureaus and the Rural Microfinance Sector: Peru, Guatemala, and Bolivia.* Collaborative Research Support Programme, FAO, Rome and University of California, Berkeley, USA.

Bayer W. and Aters-Bater A. (1995) Forage alternatives from range and field: pastoral forage management and improvement in the African drylands. *In* Scoones I. (ed.), *Living with Uncertainty: New Directions in Pastoral Development in Africa.* Intermediate Technology Publications, London.

Besley T. and Burgess R. (2000) Land Reform, Poverty Reduction and Growth. Evidence from India. *Quarterly Journal of Economics,* 115(2): 389-430.

Beye G. (2002) Impact of foreign assistance on institutional development of national agricultural research systems in Africa. FAO Research and Technology Paper No. 10, FAO, Rome.

Biggs T. (1999) *A microeconometric evaluation of the Mauritius Technology Diffusion Scheme (TDS).* RPED Paper No. 108, World Bank, Washington, DC.

Birner R. and Gunaweera H. (2001) *Between market failure, policy failure and 'community failure': property rights, crop-livestock conflicts and the adoption of sustainable land use.* CAPRi Working Paper No. 13, IFPRI, Washington, DC.

Blench R., Chapman R. and Slaymaker T. (2003) *A Study of the Role of Livestock in Poverty Reduction Strategy Papers.* PPLPI Working Paper No. 1, FAO, Rome.

Boken V.K., Carcknell A.P. and Heathcote R.L. (eds.) (2005) *Monitoring and Predicting Agricultural Drought: A Global Study.* Oxford University Press, New York.

Borras S.M. Jr. (2003) Questioning Market-Led Agrarian Reform: Experiences from Brazil, Colombia and South Africa. *Journal of Agrarian Change,* 3(3): 367-394.

Borras S.M. Jr., Kay C. and Lahiff E. (2008) *Marlet-Led Agrarian Reform.* Routledge, London.

Botswana, Government of (1998) *Botswana National Settlement Policy.* Government Paper No. 2, Government of Botswana, Gaborone.

Boyd C., Blench R., Bourn D., Drake L. and Stevenson P. (1999) Reconciling interests among wildlife, livestock and people in eastern Africa: a sustainable livelihoods approach. *Natural Resources Perspectives,* 45.

Buchanan-Smith M. (2000) Role of early warning systems in decision making processes. *In* Wilhite D.A., Sivakumar M.V.K. and Wood D.A. (eds.), *Early Warning Systems for Drought Preparedness and Drought Management,* WMO (World Meteorological Organization), Geneva.

Byron Nelson M. (2005) *International Rules, Food Safety and the Poor Developing Country Producer.* PPLPI Working Paper No. 25, FAO, Rome.

Campion A. and Valenzuela L. (2001) *Credit Bureaus: A Necessity for Microfinance?* Microenterprise Best Practices, Development Alternatives, Inc., Bethesda, Maryland, USA.

Canada, Government of (2002) Canadian Beef Cattle Research, Market Development and Promotion Agency. *Canada Gazette*, 3, 30 January.

Carew R. (2001) Institutional Arrangements and Public Agricultural Research in Canada. *Review of Agricultural Economics*, 23(1): 82-101.

Carney C., Gill G.J. and Pal S. (2000) *Improving competitive agricultural research funding in India*. Policy Brief No. 12, National Centre for Agricultural Economics and Policy Research, New Delhi.

Castañeda T. (1998) *The design, implementation and impact of food stamp programs in developing countries*. Unpublished paper, World Bank, Washington, DC.

Catelos M.A. and Costales A. C. (2008) *Contract farming and other market institutions as mechanisms for integrating smallholder livestock producers in the growth and development of the livestock sector in developing countries*. PPLPI Research Report No. 45, FAO, Rome.

CDC (1998) Rift Valley Fever – East Africa, 1997-1998. *Mortality and Morbidity Weekly Report,* 47(13): 261-264.

CEESP (2002) Sustainable Livelihoods and Co-management of Natural Resources. *Policy Matters* 10.

Chao-Béroff R., Cao TH., Vandenbroucke J-P., Musinga M., Tiaro E. and Mutesasira L. (2000) *A Comparative Analysis Of Member-Based Microfinance Institutions In East And West Africa*. MicroSave Research Paper. MicroSave, Nairobi.

Chapman R. and Tripp R. (2002) *Case Studies of Agricultural Extension Programmes Using Privatized Service Provision*. Agricultural Research and Extension Network, UK.

Chema S., Gilbert E. and Roseboom J. (2003) *A Critical Review of Key Issues and Recent Experiences in Reforming Agricultural Research in Africa*. ISNAR Research Report No. 24, The Hague.

Coetzee G., Kabbucho K. and Njema A. (2003) *Taking Banking Services to the People: Equity's Mobile Banking Unit*. MicroSave Research Paper. MicroSave, Nairobi.

Coffey E. (1998) *Agricultural Finance: Getting the Policies Right*. Agricultural Finance Revisited No. 2. FAO, Rome.

Colman D. and Young T. (1989) *Principles of Agricultural Economics. Markets and Prices in Less Developed Countries*. Cambridge University Press, Cambridge, UK.

COMESA (2008) *Commodity-based Trade in Livestock Products. New Opportunities for Livestock Trade in the COMESA Region*. Policy Brief No. 1, COMESA (Common Market for Eastern and Southern Africa), Lusaka.

Conforti P. (2004) *Price Transmission in Selected Agricultural Markets*. FAO Commodity and Trade Policy Research Working Paper No. 7. FAO, Rome.

Conroy C. (2005) *Participatory Livestock Research – a Guide*. Intermediate Technology Development Group, London.

Conroy C., Thakur Y. and Vadher M. (2002) The efficacy of participatory development of technologies: experiences with resource-poor goat-keepers in India. *Livestock Research in Rural Development,* 14(3).

Costales A.C., Son N.T., Lapar L.M. and Tiongco M. (2006) *Smallholder contract farming of swine in Northern Viet Nam: type and scale of production*. PPLPI Research Report 06-11, FAO, Rome.

Coulter J. and Onumah G. (2002) The role of warehouse receipt systems in enhanced commodity marketing and rural livelihoods in Africa. *Food Policy,* 27(4): 319-337.

Coulter J. and Shepherd A.W. (1995) *Inventory Credit – An Approach to developing agricultural markets*. Agricultural Services Bulletin No. 120, FAO, Rome.

CTA (2005) *Market Information Systems and Agricultural Commodity Exchanges: Strengthening Market Signals and Institutions*. CTA Expert Consultation, Synthesis Report, Technical Centre for Agricultural and Rural Cooperation, Wageningen, Netherlands.

Curran M.M. and MacLehose H.G. (2002) Community Animal Health Services for Improving Household Wealth Status of Low-Income Farmers. *Tropical Animal Health and Production*, 34(6): 449-470.

DAC (2007a) *Guidelines for administering subsidy under agri-clinics agri-business centres scheme (ACABCs)*. Department of Agriculture & Cooperation. Ministry of Agriculture, Government of India, New Delhi.

DAC (2007b) *Operational guidelines of SFAC scheme for agribusiness project development*. Department of Agriculture & Cooperation. Ministry of Agriculture, Government of India, New Delhi.

Dairy Mail Africa (2007a) Smallholder Development – Milk Report. *Dairy Mail Africa*, January.

Dairy Mail Africa (2007b) Focus on Uganda. *Dairy Mail Africa*, December.

David P.A. and Hall B.H. (2006) Introduction. Property and the pursuit of knowledge: IPR issues affecting scientific research. *Research Policy*, 35: 767-771.

Deardorff A.V. (2006) *Glossary of International Economics*. World Scientific Publishing, London.

Deininger K. (2001) Negotiated Land Reform as One Way of Land Access: Experiences from Colombia, Brazil and South Africa. *In* de Janvry A., Gordillo G., Platteau J.P. and Sadoulet E. (eds.) *Access to Land, Rural Poverty, and Public Action*. Oxford University Press, Oxford, UK.

Deininger K., Castagnini R. and Gonzáles M. (2004) *Comparing Land Reform and Land Markets in Colombia: Impacts on Equity and Efficiency*. World Bank Policy Research Working Paper No. 3258. Washington, DC.

Delgado C., Rosengrant M., Steinfeld H., Ehui S. and Courbois C. (1999) *Livestock to 2020: The Next Revolution*. Food, Agriculture, and the Environment Discussion Paper No. 28, IFPRI, Washington, DC.

de Haan C., van Veeb T.S., Brandenburg B., Gauthier G., Le Gall F., Mearns R. and Siméon M. (2001) *Livestock Development. Implications for Rural Poverty, the Environment, and Global Food Security*. World Bank, Washington, DC.

De Janvry A., Key N. and Sadoulet E. (1997) *Agricultural and rural development policy in Latin America. New directions and new challenges.* FAO Agricultural Policy and Economic Development Series No. 2, FAO, Rome.

de Soto H. (2000) *The Mystery of Capital. Why Capitalism Triumphs in the West and Fails Everywhere Else.* Basic Books, New York.

Dinar A. (1996) Extension commercialization: how much to charge for extension services? *American Journal of Agricultural Economics*, 78:1-12.

Donner J. and Tellez C.A. (2008) Mobile banking and economic development: linking adoption, impact, and use. *Asian Journal of Communication*, 18(4): 318-332.

Dorward A., Kydd J., Morrison J. and Urey I. (2004a) A Policy Agenda for Pro-poor Agricultural Growth. *World Development*, 32(1): 73-89.

Dorward A., Fan S., Kydd J., Lofgren H., Morrison J., Poulton C., Rao N., Smith L., Tchale

H., Thorat S., Urey I. and Wobst P. (2004b) Institutions and Policies for Pro-poor Agricultural Growth. *Development Policy Review*, 22(6): 611-622.

Dorward A., Kydd J. and Poulton C. (2006) *Traditional Domestic Marketing Systems for Agricultural Products*. Background Paper for the World Bank World Development Report 2008. Imperial College, London.

Drucker A.G. and Latacz-Lohmann U. (2003) Getting Incentives Right? A Comparative Analysis of Policy Instruments for Livestock Waste Pollution Abatement in Yucatán, Mexico. *Environment and Development Economics*, 8: 261-284.

Drummond D, Caranci B. and Tulk D. (2007) *Market-Based Solutions to Protect the Environment*. Economics: Special Report, TD Financial Group, Toronto, Canada.

Dufour B. and Hendrikx P. (2009) *Epidemiological surveillance in animal health.* CIRAD, Paris; FAO, Rome; OIE, Paris; AEEMA, Maisons-Alfort.

Duncan A. and Jones S. (1993) Agricultural marketing and pricing reform: A review of experience. *World Development*, 21(9): 1495-1514.

Eaton C. and Shepherd. A. (2001) *Contract Farming: Partnerships for Growth*. Agricultural Services Bulletin No. 145, FAO, Rome.

Echeverría R.G. (1998) *Will Competitive Funding Improve the Performance of Agricultural Research?* Discussion Paper 98-16, ISNAR, The Hague.

Ehui S.K., Ahmed M.M., Gebremedhin B., Benin S.E., Nin Pratt A. and Lapar Ma.L. (2003) *10 years of Livestock Policy Analysis. Policies for improving productivity, competitiveness and sustainable livelihoods of smallholder livestock producers*. ILRI, Nairobi.

Ellis F. (1992) *Agricultural Policies in Developing Countries*. Cambridge University Press, Cambridge, UK.

Ellis J. (2008) Kazakhstan: Grain export ban stokes inflation fears elsewhere in Central Asia. *www.Eurasianet.org*.

Engels J.E. and Sardaryan G. (2006) *Developing the Food Supply Chain in Armenia*. Paper presented at the 98th EAAE Seminar 'Marketing dynamics within the global trading system: new perspectives', Crete, June-July.

EU (2007) Commission Regulation (EC) No.1410/2007 fixing the export refunds on pigmeat. *Official Journal of the European Union*, L 312/21.

Eunjung Cha A. (2007) Pig Disease in China Worries the World. *The Washington Post*, 16 September.

FAO (1999) *Manual on the Preparation of National Animal Disease Emergency Preparedness Plans*. FAO, Rome.

FAO (2002a) *Gender and Access to Land*. FAO Land Tenure Studies No. 4. FAO, Rome.

FAO (2002b) *Land Tenure and Rural Development*. FAO Land Tenure Studies No. 3. FAO, Rome.

FAO (2004) *The Provision of Services to the Livestock Sector.* Background Paper for FAO Committee on Commodity Problems. Twentieth Session. Winnipeg, Canada.

FAO (2006) *Livestock Report 2006*. FAO, Rome.

FAO (2007a) *Management of transmissible spongiform encephalopathies in livestock feeds and feeding. Course Manual*. FAO, Rome.

FAO (2007b) *The State of Food and Agriculture 2007. Paying Farmers for Environmental Services*. FAO, Rome.

FAO (2008) *Livestock Policy and Poverty Reduction*. Livestock Policy Brief 04. Animal Production and Health Division, FAO, Rome.

FAO (2009) *Linking farmers to markets. Cooperative linkages.* www.fao.org/ag/ags/ subjects/en/agmarket/linkages/coops.html.

Fassi-Fehri M.M. and Bakkouri M. (1995) *Profile of Veterinary Services in Morocco*. FAO, Rome.

Feder G. and Nishio A. (1999) The Benefits of Land Registration and Titling: Economic and Social Perspective. *Land Use Policy,* 15(1): 143-169.

Fermet Quinet E. and Gautier J. (2002) Mali: Contracting for Livestock Production Extension with Private Veterinarians. *In* Rivera W. M., Zijp W. and Alex G. (eds.), *Contracting for Agricultural Extension: International Case Studies and Emerging Practices.* CABI Publishing, New York.

Firmin-Sellers K. and Sellers P. (1999) Expected Failures and Unexpected Successes of Land Titling in Africa. *World Development*, 27(7): 1115-1128.

Fitzpatrick D. (2005) 'Best Practice' Options for the Legal Recognition of Customary tenure. *Development and Change*, 36(3): 449-475.

Fleisig H. (1996) Secured Transactions. The Power of Collateral. *Finance & Development*, 33(2): 44-46.

Fleisig H., Safavian M. and de la Peña N. (2006) *Reforming Collateral Laws to Expand Access to Finance*. World Bank, Washington, DC.

Forero-Pineda C. (2006) The impact of stronger intellectual property rights on science and technology in developing countries. *Research Policy*, 35: 808-824.

Fullerton D., Leicester A. and Smith S. (2008) *Environmental taxes*. NBER Working Paper Series No. 14197, NBER (National Bureau of Economic Research), Cambridge, Massachusetts, USA.

Gabre-Madhin E. (2001) *Market Institutions, Transaction Costs, and Social Capital in the Ethiopian Grain Market*. Research Report No. 124, IFPRI, Washington, DC.

Gerber P. and Menzi H. (2006) Nitrogen losses from intensive livestock farming in Southeast Asia: A Review of current trends and mitigation options. *International Congress Series*, 1293: 253-261.

Ghose A.K. (1983) *Agrarian reform in contemporary developing countries*. ILO, Geneva.

Gogging I. (2007) *The development impacts of a commodity exchange.* Paper presented at the Expert Meeting on the Trade and Development Implications of Financial Services and Commodity Exchanges, UNCTAD, Geneva.

Gollehon N., Caswell M., Ribaudo M., Kellogg R., Lander C. and Letson D. (2001) *Confined Animal Production and Manure Nutrients*. Agriculture Information Bulletin No. 771, Economic Research Service, USDA, Washington, DC.

Grant W. and Coetzee G. (2005) *The role for membership based financial services in reaching the underbanked, primarily in rural areas.* Background Paper for the 2nd African Microfinance Conference, Cape Town, South Africa.

Gregory I. (2006) *The Role of Input Vouchers in Pro-Poor Growth*. Background Paper for the African Fertilizer Summit, Abuja, Nigeria, 9-13 June.

Hardin G. (1968) The Tragedy of the Commons. *Science*, 162: 1243-1248.

Hargreaves S.K. (2002) *Sustainability and Privatization: The Zimbabwe Experience*. Paper presented at the Primary Animal Health Care in the 21st Century International Conference, Mombasa, Kenya.

Haro G., Doyo G. and McPeak J. (2005) Linkages Between Community, Environmental, and Conflict Management: Experiences from Northern Kenya. *World Development*, 33(2): 285-299.

Hausmann R. and Rodrik R. (2003) Economic Development as Self-Discovery. *Journal of Development Economics*, 72(2): 603-633.

Hazell P. (1999) Public Policy and Drought Management in Agropastoral Systems. *In* McCarthy N., Swallow B., Kirk M. and Hazell P. (eds.), *Property rights, risk, and livestock development in Africa*, IFPRI, Washington, DC. and ILRI, Nairobi.

Hazell P. and Skees J.R. (2006) Insuring against bad weather. Recent thinking. *In* Radhakrishna R., Rao S. K., Mahendra Dev S. and Subbarao K. (eds.), *India in a Globalizing World: Some Aspects of Macroeconomy, Agriculture, and Poverty*. Academic Foundation, New Delhi and Centre for Economic and Social Studies (CESS) Hyderabad.

Heath B. (2001) *The Feasibility of Establishing Cow-calf Camps on Private Ranches as a Drought Mitigation Measures*. Report for the Natural Resources Institute, Greenwich, UK.

Heath S.E., Kenyon S.J. and Zepeda Sein C.A. (1999) Emergency Management of Disasters Involving Livestock In Developing Countries. *Rev. sci. tech. Off. int. Epiz.*, 18(1): 256-271.

Heffernan C. and Rushton J. (2000) Re-stocking: A Critical Evaluation. *Nomadic Peoples*, 4(1).

Heffernan C., Misturelli F. and Nielsen L. (2001) *Re-stocking and Poverty Alleviation – Perceptions and Realities of Livestock-Keeping Among Poor Pastoralists in Kenya*. Veterinary Epidemiology and Economics Research Unit, University of Reading, Reading, UK.

Hill P. (1966) Landlords and brokers: A West Africa Trading System (with a Note on Kumasi Butchers). *Cahiers d'études africaines*, 6(23): 349-366.

Hoff K. and Stiglitz J. (1990) Imperfect Information and Rural Credit Markets – Puzzles and Policy Perspectives. *World Bank Economic Review*, 4(2): 235-250.

Holloway G., Nicholson C. and Delgado C. (1999) *Agroindustrialization through institutional innovation: transaction costs, cooperatives and milk-market development in the Ethiopian highlands*. MSSD Discussion Paper No. 35. IFPRI, Washington, DC.

Hovhannisyan V., Urutyan V. and Dunn D. (2004) *The Role of Cooperatives in Milk Marketing: The Case of Armenia*. Paper presented at the 14th Annual IAMA World Food Forum and Agribusiness Symposium, Montreux, Switzerland, 12-15 June.

IDL (2003) *Community-based animal health workers: threat or opportunity?* The IDL Group, Crewkerne, UK.

IFAD (1997) *Federal Republic of Bosnia and Herzegovina - Farm Reconstruction Project - Re-stocking Activities (408-BA) - Interim Evaluation Executive Summary.* IFAD, Rome.

IFAD (1999) *IFAD's Re-stocking Projects*. IFAD, Rome.

IFCN (2004) *IFCN Dairy Report 2004*. International Farm Comparison Network, Brunswick, Germany.

ILRI (1995) *Livestock Policy Analysis*. ILRI Training Manual No. 2. International Livestock Research Institute (ILRI), Nairobi.

Ivatury G. and Mas I. (2008) *The Early Experience with Branchless Banking*. CGAP Focus Note No. 46. CGAP, Washington, DC.

Jabbar M., Benin S., Gabre-Madhin E. and Paulos Z. (2008) Market Institutions and Transaction Costs Influencing Trader Performance in Live Animals Marketing in Rural Ethiopian Markets. *Journal of African Economies*, 17(5): 747-764.

Jacoby H.G. and Minten B. (2007) Is Land Titling in sub-Saharan Africa Cost-Effective? Evidence from Madagascar. *World Bank Economic Review,* 21(3) 461-485.

James A.D. and Upton M. (1995) Cost Recovery of Veterinary Services. *Journal of International Farm Management*, 1: 125-133.

Janssen W. (1998) Alternative Funding Mechanisms: How Changes in the Public Sector Affect Agricultural Research. *In* Tabor S.R., Janssen, W. and Bruneau, H. (eds.), *Financing Agricultural Research: A Sourcebook*. ISNAR, The Hague.

Jarvis L. (1986) *Livestock Development in Latin America*. World Bank, Washington, DC.

Johansson R. C. and Kaplan J.D. (2004) A Carrot and Stick Approach to Environmental Improvement: Marrying Agri-Environmental Payments and Water Quality Regulations. *Agricultural and Resource Economics Review*, 33(1): 91-104.

Kawagoe T. (1999) *Agricultural Land Reform in Postwar Japan: Experiences and Issues*. World Bank Policy Research Working Paper No. 2111. World Bank, Washington, DC.

Key N., Sadoulet E. and de Janvry A. (2000) Transaction costs and agricultural household supply response. *American Journal of Agricultural Economics*, 82(2): 245-269.

Keynian G., Olin M. and Dinar A. (1997) Cofinanced Public Extension in Nicaragua. *World Bank Research Observer*, 12(2): 225-247.

Khanna R.M. (2007) 25 per cent subsidy for setting up Agriclinics. *The Tribune*, 12 March, Chandigarh, India.

Kherallah M., Delgado C., Gabre-Madhin E., Minot N. and Johnson M. (2000) *The Road Half Travelled: Agricultural Market Reform in Sub-Saharan Africa*. Food Policy Report. IFPRI, Washington, DC.

Kidani A.B. (2007) Livestock Trade in Darfur. *Sudan Vision*, 23 April.

Klein B., Meyer R., Hanning A., Burnett J. and Fiebig M. (1999) *Better Practices in Agricultural Lending*. Agricultural Finance Revisited No. 3. FAO, Rome.

Klerkx L. and Leeuwis C. (2008) Institutionalizing end-user demand steering in agricultural R&D: Farmer levy funding of R&D in the Netherlands. *Research Policy*, 37(3): 460-472.

Knips V. (2005) *Developing Countries and the Global Dairy Sector. Part I: Global Overview.* PPLPI Research Report No. 31, FAO, Rome.

Konaka S. (1997) The Samburu Livestock Market in NorthCentral Kenya. *African Study Monographs*, 18(3-4): 137-155.

Kremer M. and Zwane A.P. (2005) Encouraging Private Sector Research for Tropical Agriculture. *World Development*, 33(1): 87-105.

Kumar A., Nair A., Parsons A. and Urdapilleta E. (2006) *Expanding Bank Outreach through Retail Partnerships. Correspondent Banking in Brazil.* Working Paper No. 85, World Bank, Washington, DC.

Kurup M.P.G. (2002) Package of improved livestock services through cooperatives: a case study of the Mahsana District Milk Producers' Union Ltd., Gujarat, India. *In* Rangnekar D. and Thorpe W., *Smallholder dairy production and marketing – opportunities and constraints*. Proceedings of a South-South workshop held at the National Dairy Development Board (NDDB), 13-16 March 2001, Anand, India.

Lacroix R. and Varangis P. (1996) Using Warehouse Receipts in Developing and Transition Economies. *Finance & Development*, 33(3): 36-39.

Lai K.C. and Cistulli V. (2005) *Decentralized Development in Agriculture. An Overview.* Easypol Module 012 – Thematic Overview. FAO, Rome.

Landell-Mills N. and Porras I. (2002) *Silver Bullet or Fools' Gold? A Global Review of Markets for Forest Environmental Services and Their Impact on the Poor*. Instruments for Sustainable Private Sector Forestry Series, IEED (International Institute for Environment and Development), London.

Larson D.F., Anderson J.K. and Varangis P. (2004) Policies on Managing Risks in Agricultural Markets. *World Bank Research Observer*, 19(2): 199-230.

Leksmono C.S. and Young J. (2002) Community-based animal health workers and institutional change: the DELIVERI Project in Indonesia. *PLI Notes,* 45:13-16.

Lele U., Lesser W. and Horstkotte-Wesseler G. (eds.) (2000) *Intellectual Property Rights in Agriculture. The World Bank's Role in Assisting Borrower and Member Countries*. World Bank, Washington, DC.

LID (Livestock in Development) (1999). *Livestock in Poverty-Focused Development*. Livestock in Development, Crewkerne, UK.

Lyman T.R., Ivatury G. and Staschen S. (2006) *Use of agents in branchless banking for the poor: rewards, risks, and regulation*. CGAP Focus Note No. 38. CGAP, Washington, DC.

Lyon F. (2003) Trader Associations and Urban Food Systems in Ghana: Institutionalist Approaches to Understanding Urban Collective Action. *International Journal of Urban and Regional Research*, (27)1: 11-23.

Mallick M. (2007) Malawi's mobile banks reach rural communities. *African Review of Business and Technology*, 43(8).

Mapitse N. (2008) *Botswana's food-and-mouth disease and beef trade policy*. Trans-boundary animal disease and market access for Southern Africa, Working Paper No. 3, IDS, Brighton, UK.

McDonnell P.J. (2006) Argentina bans beef exports. *Los Angeles Times*, 11 March.

McLeod A. and Leslie J. (2001) *Socio-economic impacts of freedom from livestock disease and export promotion in developing countries*. Livestock Policy Discussion Paper No. 3, FAO, Rome.

Mearns, R. (1997) Livestock and environment: potential for complementarity. *World Animal Review*, 88: 2-14.

Miller M.J. (ed) (2003) *Credit Reporting Systems and the International Economy*. MIT Press, Cambridge, Massachusetts, USA.

Mitra S. and Josling T. (2009) *Agricultural Export Restrictions: Welfare Implications and Trade Disciplines*. IPC Position Paper – Agricultural and Rural Development Policy Series. International Food & Agricultural Trade Policy Council, Washington, DC.

Mondragon H. (2005) *Colombia: Agrarian Reform, fake and genuine*. Land Research Action Network, www.landaction.org.

Morduch J. (2000) The Microfinance Schism. *World Development,* 28(4): 617-629.

Morrison P.S., Murray W. E. and Ngidandang D. (2006) Promoting indigenous entrepreneurship through small-scale contract farming: the poultry sector in Sarawak, Malaysia. *Singapore Journal of Tropical Geography*, 27: 191-206.

Morrison J. and Sarris A. (eds.) (2007) *WTO rules for agriculture compatible with development*. FAO, Rome.

Morton J. and Barton D. (2002) De-stocking as a Drought-Mitigation Strategy: Clarifying Rationales and Answering Critiques. *Disasters*, 26(3): 213-228.

Morton J., Barton D., Collinson C. and Heath B. (2002a) *Comparing Drought Mitigation Interventions in the Pastoral Livestock Sector*. Unpublished paper, Natural Resources Institute, Chatham, UK.

Morton J., Adolph B., Ashley S. and Romney, D. (2002b) Conceptual, methodological and institutional issues in participatory livestock production research. *Livestock Research in Rural Development,* 14(4).

Mozambique, Government of (2003) *Promotion of Rural and Periodic Markets in Nampula and Zambézia Provinces*. Ministry of Industry and Trade, Maputo.

Mukerji A.B. (1988) Periodic Markets of India: Characteristics and Developmental Implications. *In* Shrivastava V.K. (ed.), *Activities and Rural Development in South Asia*. *A Geographical Study*. Concept Publishing, New Delhi.

Mulugeta E., Gebremedhin B., Hoekstra D. and Jabbar M. (2007) *Analysis of the Ethio-Sudan cross-border cattle trade: The case of Amhara Regional State*. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper No. 4. ILRI, Nairobi.

Munkh-Orgil T. (2003) *Comments on Paper 'Risk Management Challenges in Rural Financial Markets: Blending Risk Management Innovations with Rural Finance'* by J.R. Skees. Reaction paper presented at the Conference on Paving the Way Forward for Rural Finance. An International Conference on Best Practices, 2-4 June, Washington, DC.

Mwangi E. (2006) *Subdividing the Commons: The Politics of Property Rights Transformation in Kenya's Maasailand*. CAPRi Working Paper No. 46, IFPRI, Washington, DC.

Nordås H.K. and Piermartini R. (2004) *Infrastructure and Trade.* Staff Working Paper ERSD 2004-04. WTO, Geneva.

Norton R.D. (2004) *Agricultural Development Policy: Concepts and Experiences*. FAO, Rome; and John Wiley, Chichester, UK.

OECD (2000) *A forward-looking analysis of export subsidies in agriculture*. OECD, Paris.

OECD (2004) *Tradeable permits. Policy evaluation, design and reform*. OECD, Paris.

OED (2006) *Concise Oxford English Dictionary*. Clarendon Press, Oxford, UK.

Oenema O. and Berensten P.B.M. (2005) *Manure Policy and MINAS: Regulating Nitrogen and Phosphorous Surpluses in Agriculture of the Netherlands*. Report to the OECD Environment Directorate, OECD, Paris.

Okolla A.W. (2002) *The Kenya Agricultural Commodity Exchange*. Agricultural Market Information Services No. 9, Technical Centre for Agricultural and Rural Cooperation (CTA), Wageningen, Netherlands.

Omano S.W. and Naseem W. (2005) *Agricultural Science and Technology Policy for Growth and Poverty Reduction*. ISNAR Discussion Paper No. 3, IFPRI, Washington, DC.

Omore A., Staal S. and Thorpe W. (1997) *The role of membership organizations and the gap they fill in private veterinary service delivery*. FAO Electronic Conference on Principles for Rational Delivery of Public and Private Veterinary Services.

Opoku L. and Foy D. (2008) Pathways out of poverty: Innovating banking technologies to reach the rural poor. *Enterprise Development and Microfinance*, 19(1): 46-58.

Oram P. (1998) *The influence of government policies on livestock production and the environment in West Asia and North Africa (WANA)*. Paper delivered at the International Conference on Livestock and the Environment. 20 January: Wageningen, Netherlands.

Owango, M., Lukuyu B., Staal S.J., Kenyanjui M., Njubi D. and Thorpe W. (1998) Dairy cooperatives and policy reform in Kenya: effects of livestock service and milk market liberalization. *Food Policy,* 23(2): 173-185.

Paarlberg P.L., Seitzinger A.H. and Lee J.G. (2004) *Economically Determined Livestock Quarantine Zones*. Paper presented at the Western Agricultural Economics Association Annual Meeting, Honululu.

Pagiola S., Arcenas A. and Platais G. (2005) Can payments for environmental services help reduce poverty? An exploration of the issues and the evidence to date from Latin America. *World Development,* 33(2): 237-253.

Pagiola S., Ramírez E., Gobbi J., de Haan C., Ibrahim M., Murgueitio E. and Ruíza J.P. (2007) Paying for environmental services of silvopastoral practices in Nicaragua. *Ecological Economics*, 64(2): 374-385.

Paxton J. and Cuevas C.E. (2002) Outreach and financial sustainability of institutions. Outreach and sustainability of member-based rural financial intermediaries. *In* Zeller M. and Meyer R.L. (eds.), *The triangle of microfinance: financial sustainability, outreach, and impact*. Johns Hopkins University Press, Baltimore and London.

Pearce D., Reinsch M., Azevedo J.P. and Brar A. (2005) *Caja Los Andes (Bolivia) diversifies into rural lending.* CGAP Agricultural Microfinance Case Study No. 3. CGAP, Washington, DC.

Peeling D. and Holden S. (2004) The effectiveness of community-based animal health workers, for the poor, for communities and for public safety. *Rev. sci. tech. Off. int. Epiz.*, 23(1): 253-276.

Peters R. (2006) *Roadblock to reform: the persistence of agricultural export subsidies*. Policy Issues in International Trade and Commodities Study Series No. 32, UNCTAD, Geneva.

Peterson E.B. and Orden D. (2005) Effects of Tariffs and Sanitary Barriers on High- and Low-Value Poultry Trade. *Journal of Agricultural and Resource Economics*, 30(1): 109-127.

Pfaff, A., Kerr S., Hughes F., Liu S., Sanchez G., Schimel D., Tosi J. and Watson V. (2000) The Kyoto Protocol and payments for tropical forest: An interdisciplinary method for estimating carbon-offset supply and increasing the feasibility of a carbon market under the CDM. *Ecological Economics,* 35(2): 203-221.

Phiri G. (2006) Forex Shortage Compounds Cattle Disease Outbreak. *African News Dimension*, 29 January.

Pica G., Pica-Ciamarra U. and Otte J. (2008) *The Livestock Sector in the World Development Report 2008: Reassessing the Policy Priorities.* PPLPI Research Report 08-07, FAO, Rome.

Pica-Ciamarra U. (2004) Access to land through rental markets: a (counter-) evolution in the World Bank's policy? *Land Reform*, 2: 8-20.

Pica-Ciamarra U. (2005) *Livestock Policies for Poverty Alleviation: Theory and Practical Evidence from Africa, Asia and Latin America.* PPLPI Working Paper No. 27, FAO, Rome.

Pica-Ciamarra U. and Otte J. (2008) *Animal Health Policies in Developing Countries – A Review of Options*. PPLPI Research Report 08-08, FAO, Rome.

Platteau J.P. (2000a) Allocating and Enforcing Property Rights in Land: Informal versus Formal Mechanisms in Sub-Saharan Africa. *Nordic Journal of Political Economy*, 26(1): 55-81.

Platteau J.P. (2000b) *Community Imperfections*. Paper delivered at the Annual (World) Bank Conference on Development Economics. Paris.

Rademakers M.F.L. (2000) Agents of Trust: Business Associations in Agri-Food Supply Systems. *International Food and Agribusiness Management Review*, 3(2): 139-153.

Rathore M.S. (2005) *State Level Analysis of Drought Policies and Impacts in Rajasthan, India*. Working Paper No. 93; Drought Series Paper No. 6. IWMI (International Water Management Institute), Colombo.

Reardon T. and Timmer C.P. (2007) Transformation of Markets for Agricultural Output in Developing Countries since 1950: How has Thinking Changed? *In* Evenson R. and Pingali P. (eds.), *Handbook of Agricultural Economics*, Vol. 3. Elsevier, North Holland, Netherlands.

Rivera W.M., Zijp W. and Alex G. (2000) *Contracting for Extension. Review of Emerging Practices*. World Bank, Washington, DC.

Roseboom J. (2004) *Agricultural research and extension funding levels required to meet the anti-hunger programme objective*. Consultancy Report to FAO, FAO, Rome.

Roth F., Zinsstag J., Orkhon D., Chimed-Ochir G., Hutton G., Cosivi O., Carrin G. and Otte J. (2003) Human health benefits from livestock vaccination for brucellosis: case study. *Bulletin of the World Health Organization*, 81(12): 867-876.

Rozycki V. (2006) *Credit Information Systems for Microfinance. A Foundation for Further Innovation*. Working Paper, Centre for Microfinance, Chennai, India.

Sadoulet E., Murgai R. and de Janvry A. (1998) *Access to land via rental markets*. Paper presented at the FAO/WIDER Seminar on Access to Land, Rural Poverty and Public Action, April 1998. Santiago, Chile.

Safavian M., Fleising H. and Steinbuks J. (2006) *Unlocking Dead Capital*. Public Policy for the Private Sector, Note 307, World Bank, Washington, DC.

Samra J.S. (2004) *Review and Analysis of Drought Monitoring, Declaration and Management in India*. Working Paper No. 84; Drought Series Paper No. 2. International Water Management Institute (IWMI), Colombo.

Sandford S. (1985) *Better Livestock Policies for Africa*. International Livestock Centre for Africa (ILCA), Nairobi.

SA-PPLPP (2009) *Development of Village Institutions for Equitable and Sustainable Access to Natural Resources*. Good Practice Note SAGP18. South Asia Pro-poor Livestock Policy Programme, New Delhi.

Schelling E., Wyss K., Bechir M. Doumagoum Moto D. and Zinsstag J. (2005) Synergy between public health and veterinary services to deliver human and animal health interventions in rural low income settings. *British Medical Journal*, 331: 1263-1267.

Schelling E., Bechir M., Abdoulaye M.A., Wyss K., Randolph T.F. and Zinsstag J. (2007) Human and Animal Vaccination Delivery to Remote Nomadic Families, Chad. *Emerging Infectious Diseases*, 13(3): 373-378.

Shears P. (2000) Communicable disease surveillance with limited resources: the scope to link human and veterinary programmes. *Acta Tropica*, 76: 3-7.

Shekara P. (ed.) (2001) *Private Extension: Indian Experiences*. National Institute of Agricultural Extension Management, Hyderabad, India.

Shepherd A.W. (1998) *Market Information Services (MIS) – Theory and Practice*. AGS Bulletin No. 125, FAO, Rome.

Shepherd A.W. (2005) *Associations of market traders. Their roles and potential for further development*. Agricultural Management, Marketing and Finance Occasional Paper No. 7, FAO, Rome.

Shepherd A.W. (2007) *Approaches to linking producers to markets. A review of experiences to date.* Agricultural Management, Marketing and Finance Occasional Paper No. 13, FAO, Rome.

Sherwood R.M. (1997) Intellectual Property Rights in the Western Hemisphere. *Inter-American Law Review*, 28: 566-595.

Sidahmed A.E. (1998) *Re-stocking Destitute Nomads: Issues on Post-disaster Rehabilitation*. Staff Working Paper No. 27. IFAD, Rome.

Skees J.R. and Enkh-Amgalan A. (2002) *Examining the Feasibility of Livestock Insurance in Mongolia*. Policy Research Working Paper No. 2886. World Bank, Washington, DC.

Skoufias E. (2003) Economic Crises and Natural Disasters: Coping Strategies and Policy Implications. *World Development*, 31(7): 1087-1102.

Smith S. (1992) Taxation and the Environment: A Survey. *Fiscal Studies*, 13(4): 21-57.

Smith L.D. (2001) *Reform and Decentralization of Agricultural Services: A Policy Framework*. FAO Agricultural Policy and Economic Development Series No. 7, FAO, Rome.

Sommer F. (1998) *Pastoralism, drought, early warning and response*. Paper submitted at the FAO electronic conference Livestock – Coping with Drought.

Stads G-J. and Kouriba A. (2004) *Agricultural Science and Technology Indicators*, Country Brief No. 17, July, 2004. IFPRI and IER, Washington, DC, and Bamako.

Stavins R.N. (1998) *Market-Based Environmental Policies*. Discussion Paper 98-26. Resources for the Future, Washington, DC.

Steinfeld H. (1997) *Livestock-Environment Interactions in Industrial Production Systems*. Proceedings of the International Conference on Livestock and the Environment, 16-20 June 1997, Wageningen, Netherlands.

Steinfeld H., Gerber P., Wassenaar T., Castel V., Rosales M. and de Haan C. (2006) *Livestock's long shadow. Environmental issues and options*. FAO, Rome.

Stern N. (1991) Public Policy and the Economics of Development. *European Economic Review,* 35(2-3): 241-271.

Stiglitz J.E. (1989) *The economic role of the State*. Basil Blackwell, Oxford, UK.

Stringfellow R., Coulter J., Lucey T., McKone C. and Hussain A. (1997) Improving the access of smallholders to agricultural services in sub-Saharan Africa: farmer cooperation and the role of the donor community. *ODI Natural Resources Perspectives*, 6.

Suyanto S., Leimona B., Pemana R.P. and Chandler F.J.C. (2005) *Review of Development Environmental Services in Indonesia*. ICRAF (World Agroforestry Centre), Bogor, Indonesia.

Tanner C., De Wit P. and Norfolk S. (2009) *Participatory Land Delimination: An Innovative Development Model Based upon Securing Rights through Customary and other Forms of Occupation.* Land Tenure Working Paper No.13, FAO, Rome.

Taylor-Powell E. (1987) *Fodder Bank Testing among Fulani Agropastoralists in Central Nigeria: Feeding Decisions in the Use of Improved Forages*. Paper 24b. Overseas Development Institute (ODI), London.

Thebaud B., Grell H. and Miehe S. (1995) R*ecognizing the effectiveness of traditional pastoral practices: lessons from a controlled grazing experiment in Northern Senegal*. Drylands Issue Paper E55, IIED (International Institute for Environment and Development), London.

Thomson G.R., Leyland T.J. and Donaldson A.I. (2009) De-Boned Beef: An Example of a Commodity for which Specific Standards could be Developed to Ensure an Appropriate Level of Protection for International Trade. *Transboundary and Emerging Diseases*, 56: 9-17.

Toulmin C. (1995) Tracking through drought: options for de-stocking and re-stocking. *In Living with Uncertainty: New Directions in Pastoral Development in Africa*, Scoones I. (ed.), Intermediate Technology Publications, London.

Uganda, Government of (2001) *The National Policy for the Delivery of Veterinary Services*. Ministry of Agriculture, Animal Industry and Fisheries, Entebbe.

Umali D.L. and Schwartz L. (1994) *Public and Private Agricultural Extension. Beyond Traditional Frontiers*. World Bank Discussion Paper No. 236, World Bank, Washington, DC.

Umali D.L., Feder G. and de Haan C. (1994) Animal Health Services: Finding the Balance Between Public and Private Delivery. *World Bank Research Observer*, 9(1): 71-96.

Uotila M and Dhanapala S.B. (1994) Dairy development through cooperative structure. *World Animal Review*, 79(2).

Upton (2004) *The Role of Livestock in Economic Development and Poverty Reduction.* PPLPI Working Paper No. 10, FAO, Rome.

USAID (2007a) *Building a Warehouse Receipt System that Works for All Stakeholders.* Notes from the Field No.1, Business Growth Initiative, USAID, Washington, DC.

USAID (2007b) *Djibouti Livestock Export Facility Begins Animal Testing*. Press Release, USAID/EastAfrica, Nairobi.

USAID (2009) *Djibouti Food Security Update*. FEWS-NET, November, Nairobi.

USAID, CARE (Christian Action Research and Education) and OAU/IBAR (Organization of African Unity/Interafrican Bureau for Animal Resources) (2001) *Pastoral Early Warning and Early Response Systems in the Greater Horn of Africa*. Proceedings from a Workshop held at Mombasa, Kenya, 13-15 November.

USITC (United States International Trade Commission) (2008) *Global Beef Trade: Effects of Animal Health, Sanitary, Food Safety, and Other Measures on U.S. Beef Exports*. Investigation No. 332-488, USITC, Washington, DC.

Verburg G. (2009) *Agriculture and sustainable development in the Netherlands*. Keynote speech given at the Integrated Assessment of Agriculture and Sustainable Development (AgSAP) Conference, Egmond aan Zee, Netherlands.

Vermersch D., Bonnieux F. and Rainelli P. (1993) Abatement of agricultural pollution and economic incentives: the case of intensive livestock farming in France. *Environmental and Resource Economics*, 3(3): 285-296.

Vogelgesang U. (2001) *Investigating Microfinance: Caja Los Andes, Bolivia*, GK Working Paper 2001-01, University of Mannheim, Germany.

Vukina T. and Wossink A. (2000) Environmental Policies and Land Values: Evidence from the Dutch Nutrient Quota System. *Land Economics,* 76(3): 413–29.

Wella E.B. and Roeleveld A.C.W. (2000) Participatory Research on oxen-drawn weeders in Lake Zone, Tanzania. *In* Stakey P. and Simalenga T. (eds.), *Animal power for weed control.* A resource book of the Animal Traction Network for Eastern and Southern Africa (ATNESA). Technical Centre for Agricultural and Rural Cooperation (CTA), Wageningen, Netherlands.

Wenner M.D., Navajas S., Trivelli C. and Tarazona A. (2007) Managing the risk in rural financial institutions: what seems to work. *Enterprise Development and Microfinance,* 18(3): 158-174.

WIPO (1995) *Hungary. Law No. XXXIII of 1995 on the Protection of Inventions by Patents*. Collection of Laws for Electronic Access, WIPO (World Intellectual Property Organization), Geneva.

Wisconsin Department of Agriculture, Trade, and Consumer Protection (2007) *Annual Report - Livestock Facility Siting*. Department of Agriculture, Trade, and Consumer Protection, Division of Agricultural Resource Management, Land and Water Resource Bureau, Resource Planning Section, Madison, Wisconsin, USA.

World Bank (1999) *Competitive Research Grant Programs. Financing Agricultural Research within World Bank Loans.* Agricultural Technology Notes No. 24. World Bank, Washington, DC.

World Bank (2001) *World Development Report – Attacking Poverty*. World Bank, Washington, DC.

World Bank (2003) *Land policies for growth and poverty reduction*. World Bank Policy Research Report. World Bank, Washington, DC. and Oxford University Press, Oxford, UK.

World Bank (2005a) *MN Index-Based Livestock Insurance Project*. Project Information Document (PID) Concept Stage. World Bank, Washington, DC.

World Bank (2005b) *Rural Finance Innovations. Topics and Case Studies.* Report No. 32726-GLB. World Bank, Washington, DC.

World Bank (2005c) *Agricultural Investment Sourcebook*. World Bank, Washington, DC.

World Bank (2005d) *Managing the Livestock Revolution Policy and Technology to Address the Negative Impacts of a Fast-Growing Sector*. Report No. 32735-GBL. World Bank, Washington, DC.

World Bank (2006) *Pro-poor Public Spending Reform – Uganda's Virtual Poverty Fund*. PREM Notes No. 108, World Bank, Washington, DC.

World Bank (2008a) *World Development Report 2008: Agriculture for Development*. World Bank, Washington, DC.

World Bank (2008b) *Livestock Externalities: Public Policy and Investment Needs*. Report No. 44010-GLB, World Bank, Washington, DC.

World Bank (2008c) *Project Appraisal Document on Two Proposed Loans in the Amount of US$120.0 million to the People's Republic of China for an Eco-Farming Project.* Sustainable Development Department, World Bank, Washington, DC.

World Bank (2009) *Index-based Livestock Insurance Project – Report No.AB4518.* World Bank, Washington, DC.

Wossink A. (2003) *The Dutch nutrient quota system: past experience and lessons for the future*. Paper presented at the OECD workshop on The *Ex post* Evaluation of Tradeable Permit Regimes. 21-22 January, Paris.

WRI (2005) *World Resources 2005: The Wealth of the Poor – Managing Ecosystems to Fight Poverty*. World Resources Institute (WRI), Washington, DC.

WTO (2004) *World Trade Report 2004*. WTO, Geneva.

Yan Z., Richard C. and Waters-Bayer A. (2008) *Co-management of rangeland to avoid the tragedy of the commons: experiences from highland Asia*. Paper presented at the XXI International Grasslands Congress/VIII International Rangeland Congress, Hohhot, Inner Mongolia, China.

Zhao H. (2004) Disease-free export zones key to animal husbandry. *China Daily*, 28 July.

The livestock sector contributes to the livelihoods of an estimated 70 percent of the world's rural poor. The increasing demand for animal protein in low and middle income countries provides an opportunity for the poor to improve their livelihoods. However, the nature of livestock farming is determined by policy and institutional frameworks that rarely favour the poor.

Launched in 2001 by the Food and Agriculture Organization of the United Nations, the Pro-Poor Livestock Policy Initiative (PPLPI) facilitates and supports the formulation and implementation of livestock-related policies and institutional changes that have a positive impact on the world's poor. To achieve this, PPLPI combines stakeholder engagement with research and analysis, information dissemination and capacity strengthening.

Livestock Sector Policies and Programmes in Developing Countries – A Menu for Practitioners comprises a user-friendly, non technical compilation of livestock sector policies/programmes, including case studies, to assist policy makers and development practitioners in formulating and implementing plans for institutional reforms and livestock sector-related policies that will benefit livestock farmers in particular and, in general, all stakeholders along the value chain.

ISBN 978-92-5-106543-3

I1520E/1/04.10/1100

Pro-Poor Livestock Policy Initiative

A Living from Livestock