



Pro-Poor Livestock Policy Initiative

Livestock sector development for poverty reduction:
an economic and policy perspective

Livestock's many virtues

A Living from Livestock



Livestock sector development for poverty reduction: an economic and policy perspective

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Preface

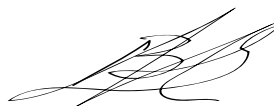
Increasing recognition that technology-oriented agricultural projects had largely failed to contribute significantly to broad-based poverty reduction led to a major shift in development thinking in the late 1990s. An alternative development paradigm began to emerge that placed much greater emphasis on pro-poor institutions and policies. It became widely accepted that an enabling institutional and policy environment is essential for creating the framework in which development can be steered to address the needs of the poor – and maybe also to deliver on the development community's bold collective promise to halve global poverty within the first 15 years of the new millennium.

One response to these developments was the launch in 2001 of the Pro-Poor Livestock Policy Initiative (PPLPI) by the Animal Production and Health Division (AGA) of the Food and Agriculture Organization of the United Nations (FAO), with financial support from the United Kingdom Government's Department for International Development (DFID). PPLPI's specific purpose was to "Strengthen capacity in FAO, Member Nations and international organizations to formulate livestock sector and related policies and implementation plans that reduce poverty, whilst managing environmental and public health risks".

Livestock farming tends to be shaped by national and international policy and institutional frameworks that are rarely pro-poor. One of the aims of PPLPI was to explore ways and means of facilitating and supporting the formulation and implementation of policies and institutional changes that would have a positive impact on the livelihoods of a large number of livestock-dependent poor people. The initiative's livestock focus reflected the fact that livestock contribute to the livelihoods of many of the world's rural poor, while the rapid increase in demand for livestock products in developing countries, in conjunction with the growing integration of global markets, provided both new opportunities and threats to the livelihoods of poor and small-scale livestock producers, traders and processors.

This book summarizes the lessons learned by PPLPI's multi-year, intensive global endeavour to advance livestock sector policy in ways that confer the greatest benefit to poor people. The experience gained by PPLPI has placed AGA at the forefront of policy and institutional innovation for equitable livestock sector development. It has also positioned PPLPI at the heart of a process of programmatic transformation. As a result of this transformation, FAO's corporate work in the livestock sector now focuses mainly on: i) pro-poor sector policy and management; ii) the implications of animal diseases for the poor, the economies of developing countries, and the global risks to both animal and human health; and iii) the livestock sector's impact on the environment.

Commenting on PPLPI's work on pro-poor policy and institutional change, the recent independent external evaluation of FAO noted that it had "influenced global thinking in these areas". So, although PPLPI came to an end in March 2010, its legacy is ensured within both FAO's Livestock Sector Strategy and Programme and the development community at large.



Berhe Tekola

Director, FAO Animal Production and Health Division

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The authors would also like to express their appreciation to the United Kingdom Government's Department for International Development (DFID), for its generous financial support and for giving PPLPI the freedom to experiment and try new, potentially risky approaches, to learn from set-backs and to try again and again. Flexible time frames and budgetary allocations linked to uncertain outcomes are uncommon features of development assistance.

Executive summary

An estimated 2.6 billion people in the developing world have to make a living on less than \$2 a day; of these people, about 1.4 billion are extremely poor, surviving on less than \$1.25 a day each. Poverty is intimately associated with undernutrition; FAO estimates that globally about 925 million humans were undernourished in 2010. Poverty and hunger have significant negative externalities affecting non-poor segments of society; thus, as well as ethical concerns, economic considerations and enlightened self-interest should also put poverty reduction high on the global agenda.

To achieve rapid advances in poverty reduction, interventions need to be well targeted so they spur economic growth to which the poor contribute and from which they benefit. Nearly three-quarters of the extremely poor – about 1 billion people – live in rural areas and, despite growing urbanization, more than half of the “dollar-poor” will reside in rural areas until about 2035. Most rural households depend on agriculture as part of their livelihoods, and about 90 percent of the world’s extremely poor are small-scale farmers.

Agricultural productivity gains and/or diversification into high-value agricultural products – leading to increased income through increased value of output per area of land and, more important, per unit of labour input – are an essential means of raising rural incomes and improving food security. Because a large share of the rural poor keep livestock, because livestock can make important contributions to sustainable rural development, and because the demand for livestock products is growing rapidly in developing countries, diversification into livestock, and increasing livestock productivity should form part of a strategy for poverty reduction and agricultural productivity growth.

This book reviews major aspects of the livestock-poverty interface with the objective of identifying the conditions under which livestock can be an effective tool for poverty reduction; the interventions that allow livestock’s poverty reduction potential to be unlocked, and the contexts in which they do so; and ways of facilitating sustainable implementation of these interventions.

POVERTY, FOOD SECURITY AND LIVESTOCK

Although the incidence of extreme poverty (< \$1.25/day) in developing countries has been significantly reduced over the past 15 years – from 42 percent in 1990 to 26 percent in 2005 – the absolute number of extremely poor still stands at an alarming 1.4 billion people (down from 1.8 billion in 1990). In South Asia and sub-Saharan Africa, the numbers of extremely poor have increased by 20 million and 100 million respectively. Diets in developing countries are deficient in not only quantitative terms, but even more so in terms of quality. The estimated disability-adjusted life years (DALYs) attributed to protein-energy malnutrition, iron-deficiency anaemia and vitamin A deficiency in the developing world are 17.4 million, 15.6 million and 0.6 million respectively. Given the high bioavailability of protein, iron and vitamin A in meat, eggs and milk, increasing the

availability of animal-source foods (ASFs) for poor populations in developing countries could significantly reduce the burden of disease attributable to protein and micronutrient deficiencies.

Livestock contribute to human food and nutrition security directly, by transforming vegetation from non-arable land, crop residues, by-products from food processing, and organic waste into human food of high nutrient density and nutritional quality. Livestock also contribute indirectly to food security by increasing crop output through providing manure. Livestock serve as a buffer to mitigate the impact of fluctuations in crop production on the availability of food for human consumption, and thereby stabilize food supply. Finally, livestock enhance total household labour productivity through smoothing the demand on family labour over seasons, genders and generations.

Smallholders, however defined, account for a large share of agricultural production throughout most of the developing world, particularly in South Asia and sub-Saharan Africa. In South Asia, more than 80 percent of farms are smaller than 2 ha, while in sub-Saharan Africa smallholders are responsible for an estimated 90 percent of agricultural production. In African and Asian countries included in FAO's Rural Income-Generating Activities (RIGA) dataset, farms with less than 2 ha of land or fewer than 2 tropical livestock units (TLU) are responsible for between half and three-quarters of total livestock production, and even more in some instances. With the exception of countries in Latin America and the Caribbean, mean landholding sizes are in the order of 1 ha or less. Livestock ownership is usually slightly more prevalent and equitable than landownership, but mean herd/flock size is small, normally between 1 and 2 TLU. Livestock are kept by households across all wealth groups, but households in the bottom expenditure quintile are more likely to have livestock in their asset portfolio than wealthier households are.

Livestock are also an important means of conferring income and status to women. Although women seldom hold property or usage rights to land they often independently own livestock. However, the promotion of animal production in which women are heavily involved does not automatically improve women's control over livestock-related income. Overall, it appears that within-household power dynamics, which are embedded in specific socio-economic contexts, are too complex and diverse to permit simple predictions about the gender-specific impacts of livestock promotion.

Globally, the number of poor livestock keepers (< \$2/day) has been increasing by about 1.4 percent per year. In absolute numbers, South Asia and sub-Saharan Africa dominate, with more than 45 and 25 percent of the world's estimated 752 million poor livestock keepers respectively. The depth of poverty among livestock keepers is particularly high in sub-Saharan Africa, where it is estimated that more than 85 percent of poor livestock keepers live in extreme poverty.

Growing populations and rising per capita incomes in developing countries will lead to major increases in the demand for ASFs in these regions. A large share of this growing demand stems from rapidly expanding urban populations. Increases in domestic livestock production – and the additional incomes generated – in response to (urban) demand growth add to gross domestic product (GDP) and national income. Knock-on effects include increases in rural employment and increased spending on productive inputs and consumer goods, generating additional trade with urban and/or local suppliers. As a result,

growth of the livestock sector in response to increased urban demand can launch a self-perpetuating process of economic growth and development.

Governments rarely appreciate the complex roles livestock play in rural household economies, and livestock development policies tend to focus singularly on marketed products. This perspective is obviously far too narrow, as livestock keepers are often willing to keep animals of low physical productivity in their herds, owing to the many collateral services they provide. This apparent divergence between the livestock assessment criteria used by policy-makers and those used by livestock keepers is a root cause of livestock sector development policies that contribute little to poverty alleviation.

In spite of the very many positive social outcomes that can be associated with livestock sector growth in developing country regions, there are also negative effects that need to be considered and managed. Two very significant effects are the emergence and subsequent spread of infectious diseases associated with livestock, and negative environmental impacts. The magnitude of negative environmental and public health externalities associated with livestock will be strongly influenced by the ways in which the livestock sector grows to meet the increasing demand.

LIVESTOCK SECTOR DEVELOPMENT, ECONOMIC GROWTH AND POVERTY REDUCTION

Economic growth is necessary for poverty reduction, but the magnitude and speed by which growth can reduce poverty are strengthened and accelerated when income distribution is equitable, and when the poor can participate in the economic activities that experience expansion. For rapid poverty reduction in developing countries, it is not enough simply to focus on rapid aggregate economic growth; attention must also be given to removing the types of inequalities that limit the poor's access to, and capacity to exploit, the opportunities for economic advancement. For growth to be pro-poor, it must achieve income gains for the poor in an inclusive growth process, promoting demand and market participation for activities that use resources (mainly labour) of the poor intensively.

In low-income agrarian developing countries, acceleration of the poverty reduction effects of economic growth requires the stimulation of economic activity in the place where most poor people are located – rural communities – and in the economic sector in which most of them pursue their livelihoods: agriculture. The strong poverty reduction impact of agriculture-led growth arises not only from the significance of agriculture in the overall economy but also from strong consumption and production linkages between agriculture and other sectors of the economy. Agriculture's pervasive expenditure and supply chains generate output, employment and income multipliers from the agriculture sector to rural non-farm economic activities and the economy as a whole.

In low-income agrarian economies, livestock form an integral part of predominantly smallholder diversified crop-livestock farming systems. Superseded only by larger-scale staple crops, the livestock sector is the second most important contributor to the agricultural economy. Despite its smaller output compared with that of staple crops, productivity and income growth in the livestock sector have strong income multiplier and poverty reduction impacts. This results from the demand side via direct and indirect income gains among rural households benefiting from income improvements, and from the supply side via linkages

with the staple crops sector as a generator of by-products for livestock feed. A combined strategy for livestock and staple crop productivity growth, exploiting the close linkage between these two sectors, would have the strongest income multipliers and poverty reduction benefits.

As developing countries undergo the transition from agrarian subsistence to more diversified market economies, growth in demand for livestock products and high-value crops will become stronger and the livestock sector will increase its share in agricultural value added, together with its potential for generating direct and indirect income and poverty reducing impacts. Marketing agrifood products with high income demand elasticities, such as livestock and their products, gives the rural poor a way of participating indirectly but actively in urban growth, propagating growth benefits without social dislocation and other adjustment costs. Although poverty is very common in sparsely populated (remote) areas, the majority of the rural poor live in reasonable proximity to (small and large) urban centres. This suggests a strategy for poverty reduction that promotes market access incrementally, radiating outwards from urban areas.

As modern supply systems expand, the technological, institutional and informational systems supporting agrifood production are becoming increasingly complex. Continuous investments are needed to comply with changing product, process, quality and safety standards. By implication, modern food systems in highly commercialized agricultural markets have introduced a new set of entry and transaction costs for producers to be competitive. However, the reality of agrifood supply chains in many developing countries is still far removed from the model of high-tech, highly integrated systems emanating from Organisation for Economic Co-operation and Development (OECD) economies. Demand for agricultural and livestock products of all kinds depends mainly on the income levels of the domestic population, and only the top income decile is a viable market for high-value processed cold chain products. Consumers in the lower three income quintiles normally purchase ASFs in live-animal and wet markets, to which the supply chains are mediated mainly by informal and customary networks.

The current expansion of markets for ASFs in developing countries, and their large degree of diversity represent enormous income potential for the rural poor, many of whom own livestock. However, which benefits of growing urban food demand go to rural smallholders and which to rapidly expanding agrifood industries will depend to a significant extent on policy decisions. Regrettably, livestock's potential for poverty reduction associated with appropriate sector development remains largely untapped. The reasons for this comprise market and institutional imperfections; prevailing policy paradigms in developing countries, with a systematic bias towards industrialization and concentration favouring large- over small-scale operators; and the underprovision of public goods and services, the consequences of which disproportionately affect the poor.

It must be recognized that the majority of agricultural and rural households in developing countries are unlikely to be recruited directly into agrifood industrialization; even intermediate stages of sector consolidation, such as contract farming, appear to be undertaken at a scale well beyond that of the average smallholder farmer. Nevertheless, urban demand growth currently represents an important opportunity for all domestic food producers, including smallholders, and should be appreciated for its inclusive development potential.

Unfortunately, their conditions make smallholders unlikely to compete with established commercial agrifood enterprises in urban markets. To be successful, smallholder producers need to emphasize their strengths – traditional product variety and low resource costs – while policies for inclusive development are needed to facilitate their market access. More inclusive national livestock markets will only arise from determined policy commitments to overcoming existing entry barriers, information and agency failures, and historic bias in favour of integrated agrifood enterprise development.

PRO-POOR POLICY AND INSTITUTIONAL CHANGE

In most instances, governments do not deliberately formulate policies that are anti-poor; rather they fail to realize that economic growth, although necessary, is not always sufficient for poverty reduction. Despite increasing international interdependencies, national governments still have more than sufficient space for policy reforms that can reduce poverty significantly.

Livestock sector policies should be consistent with the broader institutional and policy framework directing growth in agriculture and in the economy in general. Most attempts to implement wholesale reforms of the livestock sector have proved ineffective, and piecemeal implementation can create more harm than good. By contrast, small but tailored policy and institutional changes can generate remarkable returns in terms of enhancing livestock's contribution to economic growth and poverty reduction.

There is a rich menu of good policies and institutions that can support livestock sector development, but the peculiarities of each country setting mean that a copy-and-paste approach to policy and institutional reforms can rarely, if ever, work. Experimentation is an effective way of identifying the most appropriate institutional and policy reforms to support sector growth in different countries. However, experimentation requires a risk-taking approach, which is associated with both successes and failures.

Policy reforms in the livestock sector should preferably target the “not-so-poor” farmers if the objective is to spur growth that benefits the poor, particularly through the multiplier effects generated by sector development. The relationship between policy/institutional reforms and livestock sector development is two-way, as changed institutions influence the level and pace of the sector's growth pattern, while development of the sector may call for further institutional changes. In other words, the design and implementation of policies that sustain inclusive and pro-poor growth of the livestock sector is a never-ending process.

In conventional approaches policy advice is simply transferred to policy-makers, and practitioners are unlikely to have much impact; partnerships and knowledge exchange networks and mechanisms have to be established, rather than relying on an “authority” as a source of policy advice. However, such processes are typically drawn out, iterative and uncertain in their outcomes. Understanding and promoting policy and institutional change depend on the underlying capacities for change, which are largely a function of the linkages and the quality of associated relationships among actors in the sector.

CONCLUSIONS

For global reduction of poverty and associated food insecurity, development efforts need to focus on regions and countries at early stages of development – sub-Saharan Africa and poorer regions of South and Southeast Asia. In these regions, experience suggests that agriculture, partly by default, remains one of the most important sectors for rural poverty alleviation, but that increases in productivity, particularly labour productivity, are necessary for agriculture to realize its poverty-reducing potential. One important way of increasing labour productivity in smallholder agriculture is diversification into high(er)-value agricultural products (horticulture, aquaculture, livestock), but such diversification is constrained by a multitude of entry barriers that are substantial for most low-income households, including investment, technology and market access. Increased income from agriculture is effective in generating employment in local non-tradable goods and services, and a strong case can also be made for agriculture-induced poverty relief through secondary employment creation.

More rapid gains in poverty reduction through agricultural intensification may be obtained by focusing policy interventions on the most eligible “upper” smallholders in “favoured” areas (although not the poorest of the poor, these households are still predominantly poor), while less endowed households will benefit indirectly through spill-overs such as technology diffusion and increased demand for non-tradable local goods and services (especially labour). For the less favoured agricultural households, livestock do not provide many growth opportunities but act as important safety nets, and policy emphasis here should be directed to reducing vulnerability, for example, by protecting livestock assets.

Agriculture is heterogeneous and highly complex and affects a large set of stakeholders. Agricultural development therefore requires approaches that are carefully adapted to local conditions, and large-scale blueprint planning is likely to fail. Experimentation with modest but targeted interventions and continuous learning from the results are more likely to lead to the desired outcome of poverty eradication. Transaction costs and the risks of coordination failure are high in agriculture, and public leadership is needed to promote lower-income agrifood supply chains. For public agencies mandated to support agriculture the most important role concerns not public expenditure, but policy-making, coordination, regulation and the provision of services that the private sector will not provide.

Keywords

agriculture, animal production, economics, food insecurity, household, livestock, nutrition, poverty

Abbreviations and acronyms

ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AGA	Animal Production and Health Division (FAO)
ASF	animal-source food
DALY	disability-adjusted life year
DFID	Department for International Development (United Kingdom)
EAP	East Asia and the Pacific
EECA	Eastern Europe and Central Asia
FAO	Food and Agriculture Organization of the United Nations
FMD	foot-and-mouth disease
GDP	gross domestic product
GHG	greenhouse gas
GIC	growth incidence curve
GNI	gross national income
GREP	Global Rinderpest Eradication Programme
GTAP	Global Trade Analysis Project
GWP	global warming potential
HH	household
HPAI	highly pathogenic avian influenza
ICP	International Comparison Program (World Bank)
ILRI	International Livestock Research Institute
LAC	Latin America and the Caribbean
MDG	Millennium Development Goal
NENA	Near East and North Africa
NGO	non-governmental organization
OECD	Organisation for Co-operation and Development
OIE	World Organisation for Animal Health
PDR	(Lao) People's Democratic Republic
PPLPI	Pro-Poor Livestock Policy Initiative
PPP	purchasing power parity
RIGA	Rural Income-Generating Activities
RNFE	Rural non-farm economy
SPS	sanitary and phytosanitary
SSA	sub-Saharan Africa
TLU	tropical livestock unit
UN	United Nations
WHO	World Health Organization

*All too often livestock are seen as something prosperous people consume,
not something poor people produce.*

Philipp Mellor

1. Introduction

An estimated 2.6 billion people in the developing world have to make a living on less than \$2 a day (Chen and Ravallion, 2008). Of these, about 1.4 billion people are extremely poor, surviving on less than \$1.25/day. Asia harbours the majority of the extremely poor, with 933 million, while the incidence of extreme poverty is highest in sub-Saharan Africa, at one in two people (50 percent) (Chen and Ravallion, 2008; World Bank, 2007). Poverty is intimately associated with undernutrition; FAO estimates that globally about 925 million humans were undernourished in 2010 (FAO, 2010c).

As well as ethical concerns, economic considerations and enlightened self-interest should put the reduction of poverty high on the global agenda:

- The poor are as efficient as the non-poor at making use of their resources, as first argued by Nobel Laureate Theodor W. Schultz (1964) in his classic book *Transforming traditional agriculture*. For example, on average, smaller farms achieve higher land productivity than their larger-scale counterparts (Barrett, 1996; Heltberg, 1998; Pender *et al.*, 2004; Wiggins, 2009), a phenomenon referred to as the “inverse productivity relationship”, partly because farmers working on their own fields appropriate the full benefits of their efforts, whereas agricultural labourers obtain a fixed wage independent of output level (Hayami and Otsukam, 1993).
- It has been demonstrated that in today’s world, investments have higher returns in less-favoured areas, which are also home to the poorest segments of humanity, mainly because investment opportunities have begun to decline in more developed areas (Fan and Chan-Kang, 2004; Fan and Hazell, 2001).
- Societies with low and stagnant incomes are significantly more prone to violent conflict and civil unrest than their wealthier counterparts. Local conflicts often assume international dimensions, and the annual global cost of civil war has recently been estimated, conservatively, at USD 100 billion (Collier, 2007) – far more than total global aid.
- Public health systems in poor countries are normally weak, and the poor tend to be disproportionately more affected by diseases, many of which are contagious (Gwatkin, Guillot and Heuveline, 1999). Consequently, poverty is an important factor for disease emergence, maintenance and amplification, with potential repercussions at the global level, in both high- and low-income societies.

To achieve rapid advances in poverty reduction, interventions need to be well targeted so that they spur economic growth to which the poor contribute and from which they benefit. Nearly three-quarters of the extremely poor, about 1 billion people, live in rural areas (World Bank, 2008) and most of them – about 90 percent according to Lipton (2005) – are small-scale farmers depending directly on agriculture as part of their livelihoods. Despite growing urbanization, the majority of the world’s poor will continue to live in rural areas for some decades to come; it has been estimated that more than half of the “dollar-poor” will reside in rural areas until about 2035 (Ravallion, Chen and Sangraula, 2007; UN, 2007).

Given that rural agrarian populations in most developing countries will continue to grow for at least another ten to 15 years (up to 30 years in the least developed countries) (UN, 2007), and land for sustainable agriculture cannot expand at the same rate, agricultural production cannot easily be expanded “horizontally”. As a consequence, an essential means of raising rural incomes and improving food security is through productivity gains and/or diversification into high-value agricultural products, leading to enhanced income through increased value of output per area of land and, more important, per unit of labour input.

Diversification into livestock, and increasing livestock productivity should form part of strategies for poverty reduction and agricultural productivity growth in developing countries, because a large share of the rural poor keep livestock as contributors to their livelihoods (FAO, 2009b; LID, 1999; Thornton *et al.*, 2002) and because livestock have a variety of characteristics that make them important contributors to sustainable rural development. Livestock provide high-quality food and marketable products that can be produced by small-scale farmers and are generally of higher value and less vulnerable to climatic shocks and critical harvest timing than many crops. Livestock also increase crop production, by providing draught power and manure; enhance labour productivity, by reducing drudgery and dependency on hand-tools, thereby freeing time for other production activities; and smooth labour demand across agricultural seasons. One of their most important roles is converting organic material not suited for human nutrition into high-value food and non-food products. Finally, livestock – especially small stock such as poultry, pigs, sheep and goats – are particularly important assets for rural women, whose role in agriculture is often unappreciated. From livestock, women can earn income that remains under their control, with implications for the intra-household allocation of food and resources. However, the unregulated growth of livestock populations may generate negative externalities: increased production of greenhouse gases (GHGs); pollution of soils and water sources from animal wastes; increased human health risks; and deforestation and unsustainable use of land resources for feedgrain production.

Development of the livestock sector in ways that capitalize on its positive effects while controlling the negative impacts could thus contribute substantially “to rais[ing] levels of nutrition, improv[ing] agricultural productivity, better[ing] the lives of rural populations and contribut[ing] to the growth of the world economy” (FAO, 2010b) and to achieving Millennium Development Goal (MDG) 1 of eradicating extreme poverty and hunger. However, the track record of livestock sector development interventions in promoting sustained poverty reduction is weak (LID, 1999), and although the rural poor have a major stake in the livestock sector, only a small minority of them have so far been able to take advantage of the opportunities provided by livestock sector development. This failure has to a large extent been due to a combination of national, regional and global-level policies, regulations, norms and values. These define the societal “rules of the game”, which create a poverty trap for the livestock-dependent poor by influencing both the behaviour of livestock keepers and the policy-making process. On the one hand, inadequately functioning markets and institutions often prevent the poor from making full use of their scarce assets and skills to escape poverty; for instance, because of unsecured or unrecognized property rights over land, houses and other fixed and movable goods, the poor cannot use their assets as collateral to obtain credit and invest in growth-enhancing technologies and enterprises (de

Soto, 2000). On the other hand, the rural poor, who are often dispersed and have poor means of communication, face high opportunity costs of collective actions and cannot afford not to work in order to participate in lengthy and time-consuming policy processes whose outcomes are not immediate and are uncertain at best (Binswanger and Deininger, 1997). Policies are thus rarely designed with their benefit in mind, thereby constraining the poor from making full use of their assets and abilities. Institutional weaknesses prevent the poor from taking full advantage of the development potential offered by livestock and the livestock sector.

The multiple dimensions of the livestock-poverty interface, including technical, policy and political economy aspects, have been addressed and debated in disparate contexts and from different perspectives (e.g., Ahuja and Sen, 2006; FAO, 2009a; Perry and Grace, 2009; Thornton *et al.*, 2007), but poverty has rarely been the entry point of analysis, and issues have been looked at predominantly from either the technical or the policy perspective. This has created difficulties for appreciating the intricacies of livestock-poverty relations and, consequently, for formulating policies that stimulate unambiguously pro-poor investments in the livestock sector. This book reviews the major aspects of the livestock-poverty interface with the objective of identifying the conditions under which livestock can be an effective tool for poverty reduction; the interventions that allow livestock's poverty-reducing potential to be unlocked, and in what contexts; and how sustainable implementation of these interventions can be facilitated.

The following chapter provides a brief overview of the extent and distribution of poverty in developing country regions and of changes in these over the past 15 years, and reviews the extent to which poor people are engaged in agriculture and livestock keeping. Chapter 3 examines the multiple roles that different types of livestock can play within households, and how these contribute to reducing vulnerability and increasing income. Chapter 4 explores the direct and indirect contributions that livestock can make to overall economic development, with particular emphasis on the agriculture-based economies in which most of the poor are found. As markets form a vital link between households and the wider economy, and their functioning is critical for sustainable development, Chapter 5 looks at markets' role in poverty reduction, and the constraints to market access that poor livestock keepers regularly face. Chapter 6 is based on a review of livestock policies implemented in a variety of developing countries, identifies common elements of successful and pro-poor livestock sector policies and institutional reforms, describes the political dimensions of policy and institutional changes that favour poor livestock keepers, and outlines strategies for overcoming opposing interests. Chapter 7 summarizes what has been learned about how livestock sector policy can be advanced in ways that confer tangible benefits to poor people, and provides conclusions on how to capitalize on livestock sector development to accelerate global poverty reduction.

2. Poverty, food security and livestock – a global overview

This chapter provides an overview of the global extent of poverty and its distribution among the six main continental blocks of countries: East Asia and the Pacific, Eastern Europe and Central Asia, Latin America and the Caribbean, the Near East and North Africa, South Asia, and sub-Saharan Africa. For each of these regions, structural features of the whole economy and the agriculture sector are examined to illustrate how they are linked to the extent of poverty. Interregional differences in livestock population densities, numbers of livestock keepers, levels and dynamics of development are reviewed. Following this, the role of livestock in food security and nutrition, the changing patterns of food consumption, and their implications for future demand for animal-source foods (ASFs) are analysed. The chapter ends by reviewing the negative impacts of livestock sector growth and intensified livestock production.

GLOBAL EXTENT AND DISTRIBUTION OF POVERTY

According to recent estimates by the World Bank, using data from the 2005 International Comparison Program (ICP), the extent of poverty is still high in the developing world. Of the 5.5 billion people in developing countries, about 1.4 billion live below the international absolute poverty line of \$1.25 a day. Another 1.7 billion remain vulnerable to falling into poverty, which may be triggered by natural shocks, such as drought; economic shocks, such as food and fuel price rises; and financial shocks, such as unexpected health care expenditures. Tables 2.1 and 2.2 show the incidences of poverty and the absolute numbers of poor people in 1990 and 2005, using various poverty lines and based on the World Bank 2005 ICP.

Among the developing country regions, Eastern Europe and Central Asia (EECA), Latin America and the Caribbean (LAC) and the Near East and North Africa (NENA) had the lowest poverty incidences in both 1990 and 2005 (< 10 percent by 2005). All of the remaining regions had high poverty rates in 1990, and only East Asia and the Pacific (EAP) made significant advances in reducing these, from about 56 percent in 1990 (79 percent in 1981 [PovcalNet, 2010]), to just 18 percent by 2005. The number of extremely poor people declined from 893 million to 337 million over the same period. This decrease was largely influenced by the large improvement in China, from 60 percent poor in 1990 (84 percent in 1981) to 16 percent in 2005. East Asia and the Pacific is well on track to achieve MDG 1 of reducing poverty incidence by half by 2015.

In the sub-Saharan Africa (SSA) region, however, the incidence of poverty decreased only slightly, from 55 percent in 1990 to 50 percent in 2005, having worsened up to the mid-1990s before starting to improve. The absolute number of poor people increased from 284 million in 1990 (202 million in 1981) to 384 million by 2005. In South Asia, the number of poor declined, but progress was rather slow, with poverty incidence declining from about

Table 2.1
DEVELOPING COUNTRY POPULATIONS, BY REGION AND INCOME CATEGORY, 1990 (MILLIONS)

Region/country	<\$1.25 /day	(%)	\$1.25–< 2 /day	(%)	\$2–<13 /day	(%)	\$13+ /day	(%)	Total population
EAP	893.4	56.0	380.3	23.8	315.5	19.8	6.6	0.4	1 595.8
China	683.2	60.2	277.6	24.4	173.7	15.3	1.2	0.1	1 135.7
EECA	7.0	1.5	24.9	5.4	355.3	76.2	76.9	16.9	464.1
LAC	46.7	10.7	49.2	11.2	276.7	63.2	65.3	14.9	437.9
NENA	12.2	5.4	32.2	14.3	170.3	75.5	10.8	4.8	225.5
South Asia	574.4	51.3	351.6	31.4	192.6	17.2	1.1	0.1	1 119.7
India	435.5	51.3	266.1	31.3	146.7	17.3	1.0	0.1	849.3
SSA	283.7	54.9	109.2	21.2	117.7	22.7	5.9	1.2	516.5
All regions	1 817.5	41.7	947.4	21.7	1 428.1	32.7	169.1	3.9	4 362.1

< \$1.25 = extremely poor.

< \$2 = poor by developing country standards.

< \$13 = poor by United States standards.

Sources: Chen and Ravallion, 2008; Ravallion, 2009.

Table 2.2
DEVELOPING COUNTRY POPULATIONS, BY REGION AND INCOME CATEGORY, 2005 (MILLIONS)

Region/country	<\$1.25 /day	(%)	\$1.25–< 2 /day	(%)	\$2– <13 /day	(%)	\$13+ /day	(%)	Total population
EAP	336.9	17.9	391.8	20.8	1 117.1	59.3	37.4	2.0	1 883.2
China	207.7	15.9	266.0	20.4	806.0	61.8	25.0	1.9	1 304.7
EECA	23.9	5.0	18.0	3.9	347.8	73.4	82.4	17.7	472.1
LAC	45.1	8.2	49.2	8.9	362.2	65.8	94.6	17.1	551.1
NENA	14.0	4.6	37.5	12.3	240.1	78.6	13.4	4.5	305.0
South Asia	595.8	40.4	495.7	33.5	380.2	25.8	4.9	0.3	1 476.6
India	455.8	41.6	371.9	34.0	263.7	24.1	3.4	0.3	1 094.8
SSA	384.2	50.4	171.7	22.5	197.1	25.8	9.7	1.3	762.7
All regions	1 399.8	25.7	1 164.1	21.3	2 644.3	48.5	246.2	4.5	5 454.4

< \$1.25 = extremely poor.

< \$2 = poor by developing country standards.

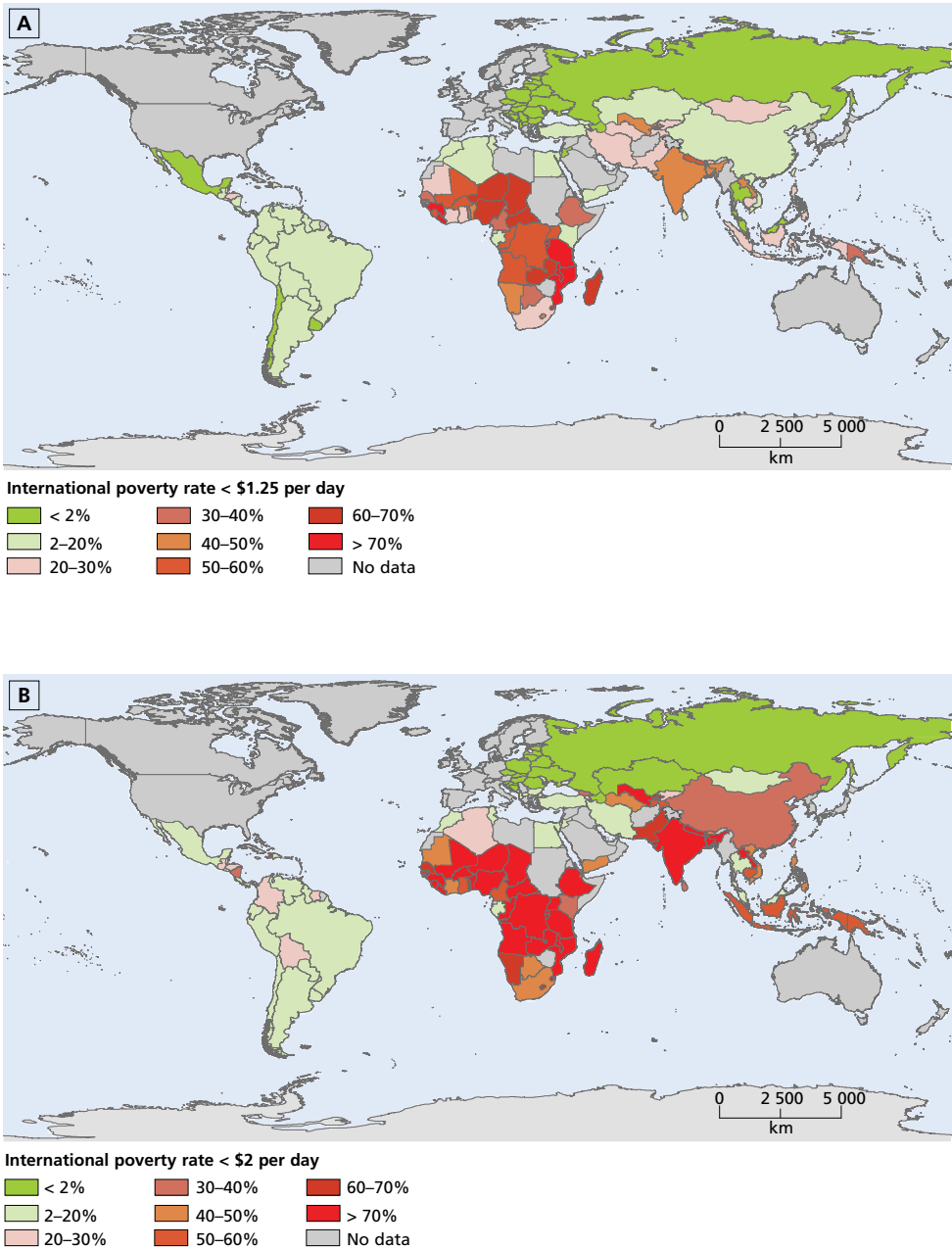
< \$13 = poor by United States standards.

Sources: Chen and Ravallion, 2008; Ravallion, 2009.

51 percent in 1990 to 40 percent in 2005. With this slow decrease, the absolute number of people living below the absolute poverty line in this region increased from 574 million in 1990 (548 million in 1981) to 595 million in 2005, of whom 456 million were in India.

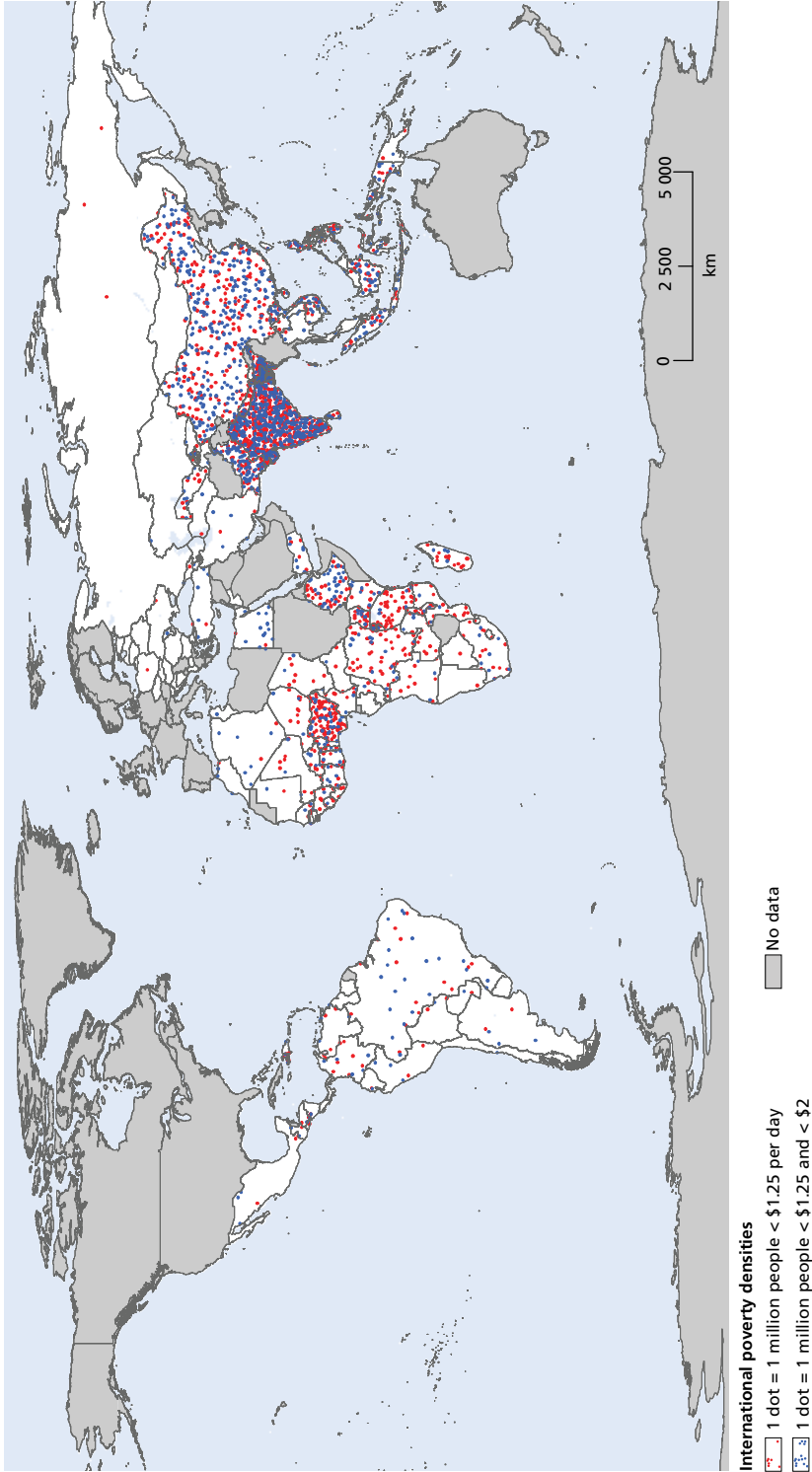
Most of the approximately 1 billion extremely poor people living in rural areas (World Bank, 2008) depend directly or indirectly on agriculture for their livelihoods. Figure 2.1 maps poverty rates across much of the world, based on data in the 2008 World Devel-

FIGURE 2.1
Poverty rates across the world based on (A) the revised international poverty line of \$1.25/day and (B) the \$2/day poverty line, estimated at 2005 purchasing power parity (PPP)



Source: Based on data from World Bank, 2008.

FIGURE 2.2
Poverty densities across the world based on two international poverty lines, \$1.25 and \$2 per day, applied to 2010 population estimates



Sources: Poverty rates from World Bank, 2008; population estimates for 2010 from FAOSTAT, 2010.

opment Report (World Bank, 2008). Figure 2.1A uses the revised absolute poverty line of \$1.25/day – the current equivalent of the well-known “dollar-a-day” estimate for extreme poverty. Figure 2.1B uses the \$2/day poverty line, which creates a far bleaker picture of global poverty, pushing a number of countries up into the “red zone” with more than 70 percent of their population classified as poor.

Figure 2.2 shows poverty densities for the same international poverty estimates, applied to 2010 population figures (FAOSTAT, 2010). Each red dot represents a million people living on less than \$1.25/day and each blue dot a million additional people living on between \$1.25 and \$2/day. Large countries with high densities of poor people include India, Bangladesh and Nigeria.

FOOD AND NUTRITION SECURITY IN THE DEVELOPING WORLD

A rough indication of poor diets in the developing world, and hence of the need to improve food and nutrition security, can be derived from the average daily food energy intake, measured in calories per person (Table 2.3). In all developing country regions calorie intake is lower than it is in high-income countries. Regional average intakes are between an eighth, in the Near East and North Africa, and a third, in sub-Saharan Africa, lower than in high-income countries. The calorie intakes of the poor in each region are much lower than those of more affluent groups.

While developing country diets are poorer in quantitative terms than those in high-income countries, the difference in terms of quality is even more marked. The poorer quality of diets in developing countries is reflected by the low average levels of supply (and consumption per head) of meat and dairy products. In all regions but Latin America and the Caribbean, the average intake per person of meat and dairy products is a small fraction of that in high-income countries. At the rural poor's low levels of ASF consumptions even small increases in ASF intake provide nutritional benefits, which far outweigh any acute or chronic disease risks associated with the high consumption of ASFs of high-income countries or high-income households in developing countries (Randolph *et al.*, 2007).

Low levels of consumption of livestock products such as meat, milk and eggs may be explained by the higher cost of production, and hence price per unit of food energy, than for staple crop products. To some extent, in providing food energy, higher levels of cereal consumption per person compensate for the low levels of meat, milk and egg consumption. However, many of the poor in developing countries suffer from not only low energy supply, but also micronutrient deficiencies, partly owing to their mainly cereal-based diets (Table 2.4).

The estimated disability-adjusted life years (DALYs)¹ that the World Health Organization (WHO) attributes to protein-energy malnutrition, vitamin A deficiency and iron-deficiency anaemia in the developing world are 17.4 million, 0.6 million and 15.6 million respectively (WHO, 2004), arising mostly from disability, while an estimated 460 000 people per year die from nutritional deficiencies. Given the high bioavailability of protein, iron and vitamin A in meat, eggs and milk, increasing the availability of ASFs for poor populations in developing countries could significantly reduce the burden of disease attributable to protein and micronutrient deficiencies.

¹ One DALY is equivalent to one year of healthy life lost to poor health or disability. DALYs are calculated as the sum of life years lost due to premature death, and years of disability.

Table 2.3
PER CAPITA CONSUMPTION OF CALORIES, PROTEIN, MEAT AND MILK, BY REGION, 2005

Region/country	Calories/ day	Calories from ASF/day (%)	Protein/day (g)	Protein from ASF/day (%)	Meat supply/day (g)	Milk ^a supply/day (g)
EAP	2 825	18.6	80	35.9	122	58
China	2 970	21.5	89	37.1	148	65
EECA	3 134	20.9	93	43.8	126	460
LAC	2 965	23.7	86	54.3	198	382
NENA	3 083	10.0	86	24.5	68	191
South Asia	2 337	9.0	55	21.0	16	190
India	2 348	8.3	55	19.0	14	179
SSA	2 068	6.9	52	19.9	40	78
All regions	2 634	14.5	71	31.3	86	169
High-income countries ^b	3 362	26.1	102	56.9	222	555

^a Excluding butter.

^b Based on 2010 World Bank classification (Annex 1).

Source: FAOSTAT, 2010.

Table 2.4
PREVALENCE OF PROTEIN-ENERGY MALNUTRITION, VITAMIN A DEFICIENCY AND IRON-DEFICIENCY ANAEMIA, BY REGION, 2004

Region	Protein-energy malnutrition		Vitamin A deficiency		Iron-deficiency anaemia	
	(%)	(thousands)	(%)	(thousands)	(%)	(thousands)
EAP	2.2	41 146	0.2	3 836	16.4	311 115
EECA	0.9	4 424	0.1	267	11.5	54 540
LAC	1.9	10 283	0.0	65	10.4	56 908
NENA	3.1	10 176	0.4	1 203	14.1	45 857
South Asia	6.9	102 496	0.6	9 245	29.3	437 824
SSA	9.2	68 669	0.9	6 613	26.6	199 373
All regions	4.3	237 194	0.4	21 229	20.2	1 105 617

Source: WHO, 2008.

THE ROLE OF LIVESTOCK IN FOOD SECURITY AND NUTRITION

Livestock directly contribute to human food security by transforming vegetation from non-arable drylands,² crop residues, by-products from food processing, and organic waste into human food that is of high nutrient density and nutritional quality. Livestock thus offer one of the most efficient means of utilizing resources that would otherwise go unexploited, in both rural and urban areas.

² Drylands comprise arid, semi-arid and dry sub-humid areas (other than polar and sub-polar regions) where the ratio of rainfall to mean annual potential evapotranspiration ranges from 0.05 to 0.65.

Livestock play a particularly important role in food security in dryland areas. A characteristic feature of drylands is low and highly variable rainfall, which makes much of them unsuitable for crop production. Drylands cover about 40 percent of the world's land surface and 54 percent of productive land,³ and their exploitation through livestock grazing constitutes the largest land-use system on earth. It is estimated that more than 180 million people in the developing world depend on these systems for their livelihoods (Thornton *et al.*, 2002), mainly through exploitation for grazing livestock. Drylands constitute a particularly large share of the land area of sub-Saharan Africa (60 to 70 percent); in East Africa an estimated 40 to 50 percent of ruminant meat is produced in drylands, while the equivalent figure for West Africa is between 30 and 40 percent (Rass, 2006). In addition, drylands complement and make possible other production systems, such as stratified beef production, which relies on a supply of calves for feeding by cow herds maintained on natural grasslands.

Livestock not only provide a means of exploiting drylands to support human livelihoods, they also add value to large amounts of plant materials associated with the production of food crops (e.g., straws, stovers) and to by-products of food and fibre processing (e.g., oilseed cakes, brewers' grains)⁴ that are not edible for humans but can be used as animal feed. It has been estimated that in 1993, crop residues of wheat, rice, maize and barley provided more than 650 million tonnes of animal feedstuff, equivalent to 27 million tonnes of crude protein and 4 194 billion megajoules (MJ) of energy, while the feed energy produced from the global supply of by-products (excluding crop residues) would support the production of more than 500 million tonnes of milk (CAST, 1999). These figures are underestimates as they take into account only the main crop residues and by-products. Other low-value feed transformed into human-edible material by livestock includes organic kitchen and other wastes, which low-income households often feed to their animals, and a range of other organic materials consumed by animals through scavenging. Where livestock are largely fed from crop residues and by-products or wasteland, little or no cultivated land is devoted to fodder production. Improving the utilization and quality of crop residues, such as the treatment of straw, extends the livestock carrying capacity without reducing the production of crops for sale or human consumption.

Livestock also contribute indirectly to food security by increasing crop output through providing manure, which is a valuable source of organic plant nutrients and reduces the need for chemical fertilizers. Livestock enhance the flexibility and thus the stability of food production (Bradford, 1999). Because they can be kept for variable lengths of time and be maintained on a variety of diets they serve as a buffer to mitigate the impact of fluctuations in crop production on the availability of food for human consumption.

ASFs alone are unsuited to providing basic subsistence needs. Meat is rarely a staple diet item, even in pastoral societies, where the main livestock products consumed are milk and blood, which are complemented by purchased cereals. However, ASFs are energy-dense, contain high-quality protein and are good sources of a number of micronutrients. Animal pro-

³ The world's productive lands include all areas except for hyper-arid lands with a ratio of mean annual precipitation to mean annual potential evapotranspiration of less than 0.05.

⁴ Fadel (1999) estimates that every 100 kg of food produced yields 37 kg of animal feed by-product. The waste disposal function of livestock in utilizing these by-products represents a valuable service in itself and reduces the price of food for humans.

Table 2.5
MICRONUTRIENTS PROVIDED BY ANIMAL-SOURCE FOODS

Nutrient	Source	Consequences of deficiency
Calcium	Dairy products	Nutritional rickets
Zinc	Meats	Dermatitis, diarrhoea, growth faltering and stunting, impaired immune function and increased risk of infections
Iron	Meats	Children: impaired growth and cognitive development and reduced immune function Adults: lowered work capacity
Vitamin A	Dairy products, liver, egg-yolk	Night blindness, corneal ulceration, loss of vision, growth faltering, increased risk of infectious disease, morbidity and mortality
Vitamin B12	ASFs are only source	Anaemia, disorders of central nervous system
Vitamin B2 (riboflavin)	Dairy products, meats, eggs, organs	Skin lesions, angular stomatitis, glossitis, cheilosis

teins have higher digestibility (96 to 98 percent) than most plant proteins (65 to 70 percent), and the amino acid composition of animal proteins is superior to that of plants. The biological values for animal proteins range from 90 to 100 relative to egg protein (the reference protein conventionally set at 100), while values for plant proteins range from 50 to 70. The bioavailabilities of important minerals (calcium, phosphorous, iron, zinc, magnesium and manganese) and vitamins – thiamine (B1), riboflavin (B2), niacin, pyridoxine (B6) and B12 – are much higher in animal than in most plant products. These characteristics make ASFs important for population groups with limited food intake capacity relative to their needs, such as young children, pregnant and lactating women, and people with HIV/AIDS. For example, studies of children in various countries have shown that both their physical and their mental development are strongly and positively associated with the amounts of ASFs in their diet (Calloway, Murphy and Beaton, 1988, cited by Bradford, 1999). The benefits of ASFs appeared to be related more to micronutrient than to protein content (Allen *et al.*, 1992; Murphy and Allen, 1996, cited by Bradford 1999).

THE ROLE OF AGRICULTURE IN POVERTY REDUCTION

Although the agriculture sector makes a relatively small contribution to gross national income (GNI) or gross domestic product (GDP), large proportions of national economically active labour forces are employed in agriculture (compare the fourth and fifth columns of Table 2.6).

The agricultural labour force's far smaller contribution to national income indicates that average incomes and productivities are lower in agriculture than in the rest of the economy, reinforcing the argument that poverty is more prevalent in the agriculture sector.

The second and third columns of Table 2.6 provide estimates of the average per capita incomes of each of the main continental blocks and two large individual countries, China and India (Annex 1 provides a list of the 2010 World Bank country groupings). Based on GNI per capita it is apparent that most developing regions and countries fall into the middle-income category, with average annual per capita incomes of between USD 976

Table 2.6
STRUCTURAL FEATURES OF DEVELOPING COUNTRY ECONOMIES AND THE RELATIVE IMPORTANCE
OF AGRICULTURE AND THE AGRICULTURAL LABOUR FORCE, 2008

Region/country	GNI/capita (USD)	GNI/capita PPP (international dollars)	Agricultural value added (% of GDP)	Agricultural labour force (% of total)	Agricultural land (% of total)*	Land/person in agriculture (ha)*
EAP	2 631	5 399	12	56.9	50.8	1.3
China	2 940	6 020	11	62.0	59.6	1.2
EECA	7 418	12 220	7	15.2	28.2	20.5
LAC	6 780	10 309	6	15.6	35.7	17.0
NENA	3 242	7 308	12	22.6	22.4	7.9
South Asia	986	2 733	18	53.6	54.7	0.9
India	1 070	2 960	18	55.4	60.6	0.8
SSA	1 082	1 991	14	59.4	44.0	5.8
All regions	2 789	5 330	11	47.6	38.2	3.0

* Last two columns based on 2005 estimates of area of agricultural land.

Sources: World Bank, 2010b; FAOSTAT, 2010.

and USD 11 906 (as defined in World Bank, 2010a). Eastern Europe and Central Asia, and Latin America and the Caribbean are upper-middle-income regions with average annual per capita incomes of more than USD 3 856.

The alternative estimates of per capita incomes in PPP provide a better indication of the purchasing power. They are generally higher than the United States dollar values, but are closely correlated to these. There is considerable variation in average per capita PPP income levels among regions. These figures illustrate a familiar phenomenon: as per capita incomes rise, the proportion of the national labour force engaged in agriculture, and the value added as a proportion of national income diminish. Thus, the two upper-middle-income regions, unlike the others, employ less than 40 percent of their labour forces in agriculture, which yields less than 10 percent of national income.

There is far more available agricultural land per person employed in agriculture in the upper-middle-income regions than in the rest of the developing world. South Asia and East Asia and the Pacific have relatively small areas (about 1 ha) of land available per agricultural worker. However, although the agricultural resource base per person in agriculture is low in many developing countries (particularly in highly populated East and South Asia), and despite the poor remuneration of agricultural labour, the number of people depending on agriculture as part of their livelihoods has, in absolute terms, grown over the past 15 years (Table 2.7).

In general, in spite of continuing human migration to urban centres, populations in most countries will remain predominantly rural until 2020. In the two poorest regions, although urban populations are growing faster than rural ones in absolute terms, rural populations will continue to expand: for sub-Saharan Africa until 2045, and for South Asia until 2025 (FAOSTAT, 2010). In Latin America and the Caribbean, and the Near East and North Africa the majority of the labour force is engaged in non-agricultural employment. The same is

Table 2.7
NUMBERS AND PROPORTIONS OF ECONOMICALLY ACTIVE POPULATION ENGAGED IN AGRICULTURE,
BY REGION, 1990 AND 2005 (MILLIONS)

Region/country	1990				2005			
	Agriculture		Non-agriculture		Agriculture		Non-agriculture	
	(no.)	(%)	(no.)	(%)	(no.)	(%)	(no.)	(%)
EAP	599.7	67.6	287.3	32.4	644.7	56.9	487.6	43.1
China	472.8	71.9	184.7	28.1	498.7	62.0	305.1	38.0
EECA	47.3	23.5	154.1	76.5	31.3	15.2	174.8	84.8
LAC	32.4	19.4	134.1	80.5	42.0	15.6	228.1	84.4
NENA	21.4	33.2	43.0	66.8	25.4	22.6	87.2	77.5
South Asia	269.9	62.8	159.8	37.2	342.9	53.6	297.4	46.5
India	207.4	63.4	119.2	36.5	261.6	55.4	210.8	44.6
SSA	132.8	67.9	62.6	32.0	194.5	59.4	133.2	40.6
All regions	1 103.5	56.8	840.8	43.2	1 280.8	47.6	1 408.1	52.4

Source: FAOSTAT, 2010.

true of Eastern Europe and Central Asia, but data for this region must be treated with caution, as the constituent countries changed dramatically between 1990 and 2005.

In most developing countries, the majority of the population continues to live in rural areas, poverty rates are higher among rural than urban households, and the rural poor constitute between 70 and 80 percent of the total number of poor. People employed in agriculture make up nearly half of the total labour force in all developing country regions and more than 60 percent in low-income countries (result not shown). This constitutes a large resource with potential for stimulating economic growth in agriculture and rural, non-farm economic activities.

There is consensus that to reduce poverty rapidly, interventions have to be directed to the rural areas of developing countries, where most of the population and most of the poor people live, and that they should target economic activities in rural areas, mainly agriculture, in which most of the poor are engaged (World Bank, 2008). The relative emphasis on interventions in agriculture will gradually decline as the structure of the economy transforms, moving towards other sectors (services and industry), but transformation of the economy has usually been driven by development of the agriculture sector (Tiffin and Irz, 2006). From a global perspective, the emphasis must remain on the rural population when poverty reduction is a main goal of economic development.

LIVESTOCK SECTOR TRENDS AND LIVESTOCK KEEPERS

Livestock's contribution to the total value of agricultural production can be estimated as the sum of price-weighted quantities of different agricultural commodities produced, after deducting the quantities used as seed and feed, weighted in a similar manner. Deduction of the agricultural inputs used gives a measure of the net production or output of each sector. Base prices are the average international commodity prices for the period 1999 to 2001.

Results obtained for the main regional groups of countries, China and India in 1990 and 2007 are presented in Table 2.8. Results for 2007 are the most recent figures available. The changing contribution of livestock to agricultural net output may be assessed either by comparing the percentage level in 2007 (seventh column) with that in 1990 (fourth column), or by comparing the growth rate of livestock net output with that of agriculture (last two columns).

In developing regions, it appears that livestock contribute about a third of total agricultural net output on average, but there is considerable variation, with sub-Saharan Africa having the lowest contribution in 2007. Between 1990 and 2007, the percentage contribution of livestock grew rapidly in East Asia and the Pacific, quite fast in South Asia, and moderately in the Near East and North Africa. However, the relative importance of net livestock output fell in Latin America and the Caribbean, sub-Saharan Africa, and developing countries as a whole. As there are substantial structural economic differences among these groups of countries, it is difficult to identify reasons for the decline in livestock's contribution to agricultural output. Again, changes over time recorded for Eastern Europe and Central Asia need to be treated with caution, as the constituent countries have changed.

Broad changes in the structure of regions' livestock sectors between 1990 and 2008 are shown in Table 2.9. The variation of tropical livestock units⁵ (TLU) per person in agriculture is wide, in both years. Livestock density measured in TLU per square kilometre of agricultural land also varies substantially among regions. South Asia's 92 TLU/km² is more than twice that in any other region. Density is very low in Eastern Europe and Central Asia, at 12 TLU/km², moderate in the Near East and North Africa, and sub-Saharan Africa, at 23 TLU/km², and a relatively high 41 TLU/km² in East Asia and the Pacific.

The TLU per person employed in agriculture may be linked to average consumer incomes. It is currently highest in Latin America and the Caribbean, with nearly 7 TLU/person employed in agriculture, and exceeds 1 TLU/person in Eastern Europe and Central Asia, the Near East and North Africa, and sub-Saharan Africa. TLU/person in agriculture in East Asia and the Pacific, and South Asia is much lower. In East Asia and the Pacific, the majority of the TLUs are non-ruminants (pigs and poultry), while elsewhere ruminants account for most TLUs.

Over the 18-year period, the TLU per person employed in agriculture rose only in East Asia and the Pacific, and the Near East and North Africa. Numbers fell in Latin America and the Caribbean, and South Asia, and remained stable in sub-Saharan Africa, just keeping pace with expansion of the agricultural labour force. Again care is needed in assessing changes over time for Eastern Europe and Central Asia.

In all regions, the proportion of ruminants in the total TLU value declined between 1990 and 2008, while the proportion of non-ruminant livestock (pigs and poultry) rose. The last two columns of Table 2.9 give the average annual growth rates of the numbers of ruminant and non-ruminant livestock, independent of the changing agricultural labour force. Growth rates of ruminant numbers are relatively small, at less than 1 percent in all but the Near East and North Africa, and sub-Saharan Africa, and are even negative in India and Eastern Europe and Central Asia. Growth rates for the non-ruminant (pig and poultry) sectors are

⁵ The TLU, equivalent to 250 kg live weight, standardizes live animals by species' mean live weight. The TLU conversion factors used are cattle 0.60, buffaloes 0.50, sheep and goats 0.10, pigs 0.25, and poultry 0.01. Livestock are aggregated into TLUs of 250 kg live weight, disregarding differences in breed, sex, age and health status.

Table 2.8
LIVESTOCK SECTOR'S CONTRIBUTION TO AGRICULTURAL GDP,* AND ANNUAL LIVESTOCK
SECTOR GROWTH, BY REGION, 1990 AND 2007

Region/ country	1990			2007			Annual growth rate	
	Agricultural (billion international dollars)	Livestock production (billion international dollars)	Livestock: agricultural GDP (%)	Agricultural production (billion international dollars)	Livestock production (billion international dollars)	Livestock: agricultural GDP (%)	Agriculture (%)	Livestock (%)
EAP	244	58	23.7	478	145	30.3	4.0	5.6
China	173	45	25.8	355	120	33.9	4.3	6.0
EECA	142	95	67.0	120	53	44.5	-1.0	-3.3
LAC	111	49	43.8	190	81	42.7	3.2	3.0
NENA	36	12	33.7	60	22	36.7	3.1	3.6
South Asia	149	43	29.1	241	82	33.9	2.9	3.8
India	106	29	27.2	170	54	31.9	2.8	3.8
SSA	61	17	28.1	97	26	26.6	2.8	2.4
All regions	742	274	36.9	1,185	408	34.5	2.8	2.4

* Livestock sector GDP is frequently underestimated owing to accounting methods that do not (fully) include products such as manure and services such as draught power, the benefits of which are allocated to other sectors (for an example see Behnke, 2010).

Source: FAOSTAT, 2010.

Table 2.9
STRUCTURE AND GROWTH OF THE LIVESTOCK SECTOR, 1990 TO 2008

Region/ country	1990			2008			Annual growth rate	
	TLU/1 000 people in agriculture (no.)	Ruminants (%)	Non- ruminants (%)	TLU/1 000 people in agriculture (no.)	Ruminants (%)	Non- ruminants (%)	Ruminants (%)	Non- ruminants (%)
EAP	(No.)	46	54	539	39	61	0.8	2.4
China	412	41	59	518	35	65	0.7	2.1
EECA	3 393	73	27	2 747	69	32	-3.7	-2.6
LAC	7 470	87	13	6 766	82	18	0.6	2.6
NENA	1 579	83	17	1 894	77	23	1.6	3.7
South Asia	885	96	4	777	94	6	0.5	3.6
India	888	97	3	700	95	6	-0.2	2.8
SSA	1 145	93	7	1 147	93	7	2.1	2.3
All regions	980	78	22	980	74	26	0.5	1.9

Source: FAOSTAT, 2010.

far higher, at more than 3.5 percent per year in Eastern Europe and Central Asia, and South Asia. Between 2005 and 2008, poultry numbers increased by 10 percent a year in Eastern Europe and Central Asia and by nearly 8.75 percent in South Asia, particularly in India with 8.93 percent (FAOSTAT, 2010).

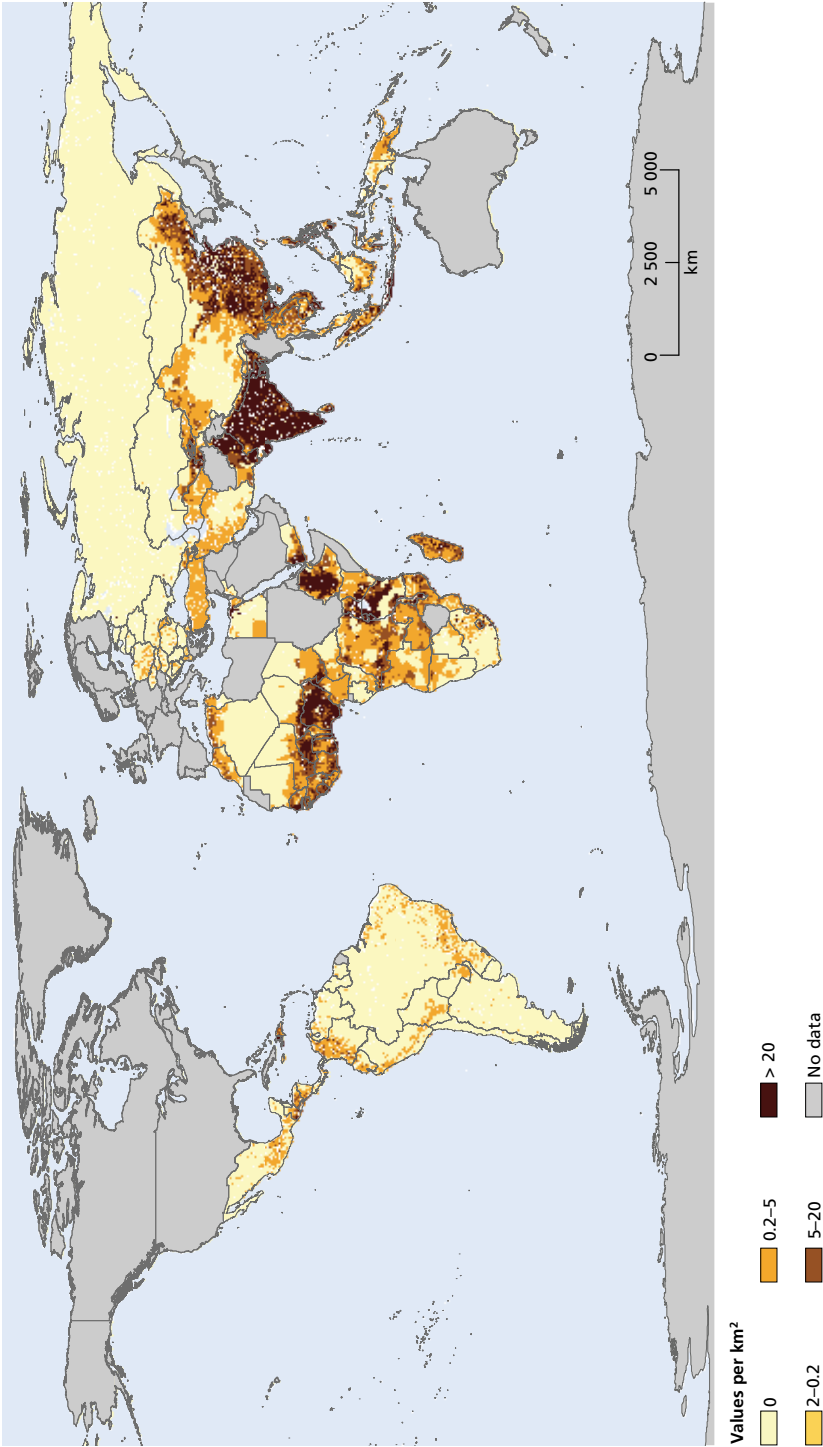
To locate poor livestock keepers for the targeting of research and development activities, the International Livestock Research Institute (ILRI) estimated the numbers of poor livestock keepers in the developing world (Thornton *et al.*, 2002; 2003). These data have recently been updated using 2010 estimates of rural populations (FAOSTAT, 2010) and the more recent Version 5 of the Thornton *et al.* (2002) livestock production system maps (Robinson *et al.*, 2011). The updated estimates of poor livestock keepers were based on national rural poverty lines⁶ from the 2008 *World Development Report* (World Bank, 2008), updated using data from the World Bank (2011). This resulted in a collage of estimates of rural headcount indices based on surveys conducted between 1990 and 2006 and covering most developing countries. As the international poverty lines used in this chapter do not distinguish urban from rural poverty they are not ideal for estimating poor livestock keepers, because poverty rates usually differ greatly between urban and rural areas. However, to bring these latest estimates into line with other figures in this chapter, Table 2.10 compares the estimates of poor livestock keepers based on national rural poverty lines with those based on the international poverty lines for the poor (< \$2.00/day) and the very poor (< \$1.25/day). Table 2.10 includes the compounded, annualized rates of change in poor livestock keepers from 2000 to 2010, estimated using national rural poverty lines.

Estimates based on national poverty lines tend to be closer to those based on the \$1.25/day line, but there are exceptions: national estimates for China are vastly lower than the international estimates; and those for Latin America and the Caribbean, and the Near East and North Africa are, respectively, about six and three times those based on the international \$1.25/day poverty line. A striking finding from Table 2.10 is that shifting the poverty line from \$1.25/day to \$2/day more or less doubles the number of poor livestock keepers – showing the large numbers of people who fall into this marginal ground.

In terms of absolute numbers of poor livestock keepers (< \$2/day), South Asia and sub-Saharan Africa dominate, with more than 45 and 25 percent of the world's estimated 752 million poor livestock keepers respectively. The depth of poverty among livestock keepers is particularly high in sub-Saharan Africa, where it is estimated that more than 85 percent of poor livestock keepers are extremely poor. Globally, the number of poor livestock keepers has been increasing by about 1.4 percent per year – reductions in the numbers in East Asia and the Pacific, and Latin America and the Caribbean being offset by considerable increases in all other regions. Numbers have been increasing particularly rapidly in Eastern Europe and Central Asia with 3.75 percent per year, the Near East and North Africa with 4.62 percent, and sub-Saharan Africa with 3.35 percent.

⁶ National poverty lines reflect local perceptions of the level of consumption or income needed to avoid poverty. The perceived boundary between poor and not poor rises with the average income of a country, so does not provide a uniform measure for comparing poverty rates across countries. National poverty estimates are the appropriate measure for setting national policies for poverty reduction and monitoring their results. International poverty measurements provide a uniform standard for comparing poverty rates and numbers of people living in poverty across countries (World Bank, 2008).

FIGURE 2.3
Distribution (density) of poor livestock keepers, based on the international \$2/day poverty line, 2010



Source: Data from Robinson et al., 2011.

Table 2.10
ESTIMATES OF POOR LIVESTOCK KEEPERS BASED ON NATIONAL RURAL POVERTY LINES AND
INTERNATIONAL POVERTY LINES, 2010, AND ANNUAL RATE OF CHANGE IN POOR LIVESTOCK
KEEPERS BASED ON NATIONAL RURAL POVERTY LINES, 2000 TO 2010

Region/country	Poor livestock keepers in 2010 (millions)			Annual change in poor livestock keepers, 2000–2010
	National rural poverty line	International poverty lines		
		< \$1.25/day	< \$2/day	
EAP	50	70	170	-2.05%
China	7	46	105	-1.42%
EECA	17	7	12	3.75%
LAC	28	5	10	-1.48%
NENA	23	7	13	4.62%
South Asia	150	178	328	0.89%
India	106	142	258	0.41%
SSA	160	154	219	3.35%
All regions	428	421	752	1.40%

Source: Adapted from Robinson *et al.*, 2011.

Figure 2.3 shows the distribution of poor livestock keepers based on the international \$2/day poverty line. The map shows that there are particularly high densities of poor livestock keepers throughout South Asia (India, Pakistan and Bangladesh) and in parts of sub-Saharan Africa (particularly Nigeria, Ethiopia, Uganda, Burundi, Rwanda, Malawi and areas of Kenya, South Africa and the Niger).

CURRENT AND FUTURE DEMAND FOR LIVESTOCK PRODUCTS

Comparison of regional average per capita incomes (Table 2.6) with average per capita supply or consumption of calories, protein and proportions derived from ASFs (Table 2.3) suggests there is a strong positive relationship between per capita income and consumption level. For instance, the relatively low-income regions of South Asia and sub-Saharan Africa have the lowest per capita consumptions of calories, protein and nutrients derived from ASFs, while the upper-middle-income regions of Eastern Europe and Central Asia, and Latin America and the Caribbean have the highest consumption levels. There is a case for further exploration of the association between total per capita expenditure level, determined by income, and the allocations to consumption of different food items (Table 2.11), by region.

These estimates show that in the poorer regions of East Asia and the Pacific, South Asia, and sub-Saharan Africa, more than 50 percent of total expenditure is allocated to food, with bread and cereals as the largest item. In contrast, the higher-income developing country regions of Eastern Europe and Central Asia, Latin America and the Caribbean, and the Near East and North Africa allocate between 26 and 42 percent of total expenditure to food, while the proportion in high-income countries is only about 13 percent. As the proportion of expenditure allocated to meat and dairy products increases, that allocated to bread and cereals decreases, among other dietary improvements.

Table 2.11
PROPORTIONS OF EXPENDITURE ALLOCATED TO DIFFERENT FOOD ITEMS, BY REGION (PERCENTAGES)

Region/country	Food expenditure as % of total	% of food expenditure					
		Bread and cereals	Meat	Dairy	Fish	Fruits and vegetables	Other food items
EAP	52.4	31.7	17.6	4.4	6.1	17.6	22.7
China	54.1	32.4	19.6	4.0	4.8	17.6	21.6
EECA	38.8	17.8	19.3	12.3	2.3	18.3	30.1
LAC	26.2	18.9	22.4	12.2	2.8	15.6	28.1
NENA	42.4	21.6	20.9	9.9	3.2	17.4	27.1
South Asia	52.5	32.1	8.2	16.9	5.1	14.1	23.6
India	52.5	30.8	9.0	17.8	5.2	14.0	23.2
SSA	60.9	31.4	12.8	5.6	9.3	18.8	22.1
All regions	48.9	28.8	15.1	10.1	5.2	16.5	24.3
High-income countries*	13.3	13.1	18.0	9.0	5.0	13.9	41.0

* Based on 2010 World Bank classification.

Sources: ICP 2005 dataset; data for India and China from Wu, 2005.

The impact of a change in per capita income on the quantity of a commodity demanded or consumed is measured by the income elasticity of demand.⁷ For most commodities, income elasticities of demand are positive, although for a few “inferior” goods the quantity demanded falls as incomes rise, resulting in negative income elasticity. For necessities such as food, income elasticities are generally below unity, and Engel’s Law states that as incomes rise, the income elasticity of demand for food falls (Norton, Alwang and Masters, 2006). However, while in high-income countries the income elasticity may be as low as 0.1, in very poor countries it may be as high as 0.8. There are also differences in income elasticities of demand for different food items. Higher-quality but more expensive items such as ASFs generally have higher income elasticities of demand than staple food crops. Table 2.12 translates income elasticities of demand into estimates of the additional expenditure on specific food items resulting from an additional \$1 of total household expenditure.⁸

The figures in Table 2.12 support Engel’s Law by showing a declining proportion of income spent on food as incomes rise. The proportion of the additional expenditure on food devoted to meat and dairy combined (ASFs) varies from 20 to 25 percent in the poorer regions of East Asia and the Pacific, South Asia, and sub-Saharan Africa. It is higher, at 30 to 35 percent, in the middle-income regions of Eastern Europe and Central Asia, Latin America and the Caribbean, and the Near East and North Africa, and reaches close to 40

⁷ Estimated as the percentage change in quantity demanded, divided by the percentage change in per capita income.

⁸ Estimates were obtained from the product of income elasticity of demand and current consumption level per \$1 of expenditure (Table 2.11).

Table 2.12
PREDICTED EXPENDITURE ALLOCATIONS OF ADDITIONAL INCOME, BY REGION (PERCENTAGES)

Region/country	% allocated to food	% of additional food expenditure					
		Bread and cereals	Meat	Dairy	Fish	Fruits and vegetables	Other food items
EAP	40.0	26.2	18.5	1.9	7.6	20.4	25.3
China	43.5	27.7	19.6	0.7	6.3	21.6	24.1
EECA	24.3	13.3	20.1	14.2	2.6	16.4	33.4
LAC	16.0	12.1	24.0	13.9	3.4	13.7	32.9
NENA	27.2	14.9	21.9	11.1	4.3	14.5	33.4
South Asia	39.5	27.1	9.3	14.2	6.1	17.5	25.7
India	40.9	26.8	10.2	13.6	5.9	18.7	24.9
SSA	47.4	24.9	13.3	6.4	13.2	16.2	26.0
All regions	36.1	24.6	15.3	8.2	7.0	18.2	26.7
High-income countries*	3.8	6.7	18.6	10.4	7.5	11.3	45.5

* Based on 2010 World Bank classification.

Sources: ICP 2005 dataset; data for India and China from Wu, 2005.

percent for high-income countries. These results emphasize the expected relative growth in per capita ASF consumption as incomes rise. (A similar trend is observable for fruits and vegetables.)

In 2003, FAO published the report *World agriculture: towards 2015/2030* (Bruinsma, 2003), which presented prospective developments in food demand and consumption and the possible implications for nutrition and undernourishment. Since publication of this study, estimates of population growth have been considerably revised and world energy markets have become increasingly tight, resulting in increased costs for inputs and for transporting agricultural products, along with less direct effects such as increasing demand for agricultural land for producing biofuels. For these and other reasons, FAO has revised and extended the 2015/2030 estimates to 2030/2050 (Alexandratos *et al.*, 2006). Regional estimates of demand growth for livestock commodities based on these revisions are presented in Table 2.13.

The results shown in Table 2.13 reflect trends in both population and consumption patterns. Growth in poultry consumption outstrips that in other ASFs in all regions, and by far the most dramatic change is the projected increase in demand for poultry meat in South Asia. This is driven by growth in demand in India, where a staggering 850 percent increase is projected over the 30-year period, accompanied by a nearly 300 percent increase in egg consumption. In terms of volumes, the growth in consumption of milk products is impressive: in South Asia consumption will more than double, to 213 tonnes in 2030, 70 percent of which (146 million tonnes) will be in India. Because of its large and rapidly growing population, East Asia also has large projected increases in consumption, particularly of pork and poultry meat, and milk, most of which will be in China. The largest absolute and relative projected

Table 2.13
GROWTH IN DEMAND FOR LIVESTOCK PRODUCTS, 2000 TO 2030

Region/country	Beef		Mutton		Pork		Poultry		Eggs		Milk	
	Absolute ('000 tonnes)	Proportion (%)	Absolute ('000 tonnes)	Proportion (%)	Absolute ('000 tonnes)	Proportion (%)	Absolute ('000 tonnes)	Proportion (%)	Absolute ('000 tonnes)	Proportion (%)	Absolute ('000 tonnes)	Proportion (%)
EAP	8 798	130	1 669	58	28 075	63	22 522	143	10 188	45	23 765	132
China	6 888	132	1 537	56	22 050	54	14 609	121	6 810	34	15 936	143
EECA	290	11	204	40	112	5	2 310	108	684	28	4 364	15
LAC	7 302	58	239	54	4 405	100	14 434	126	3 246	78	39 818	72
NENA	1 929	112	1 287	103	9	52	6 296	243	1 799	148	17 913	111
South Asia	3 367	84	1 722	115	950	160	11 491	725	5 947	294	118 942	126
India	1 338	51	588	85	921	160	8 865	844	4 251	280	79 330	119
SSA	3 768	113	1 883	137	1 106	155	3 235	170	1 727	155	20 939	107
All regions	25 454	81	7 004	88	34 656	66	60 287	170	23 590	70	225 741	97

Source: Robinson and Pozzi, 2011.

increases in mutton consumption are for sub-Saharan Africa. Beef consumption is projected to increase most in East Asia and the Pacific, again driven by consumption in China.

Although the projections do not account for differential affluence and ASF consumption rates between urban and rural areas, separate population projections for urban and rural areas can be derived from United Nations (UN) estimates of urbanization (UN, 2008). This enables the mapping of projections that differentiate between urban and rural growth in demand. Robinson and Pozzi (2011) used the Global Rural and Urban Mapping Project (GRUMP) (CIESIN *et al.*, 2004) population layer to map the UN estimates of rural and urban populations in 2000 and 2030 (UN, 2003; 2008) from which they mapped the growth in demand for ASFs (Figure 2.4).

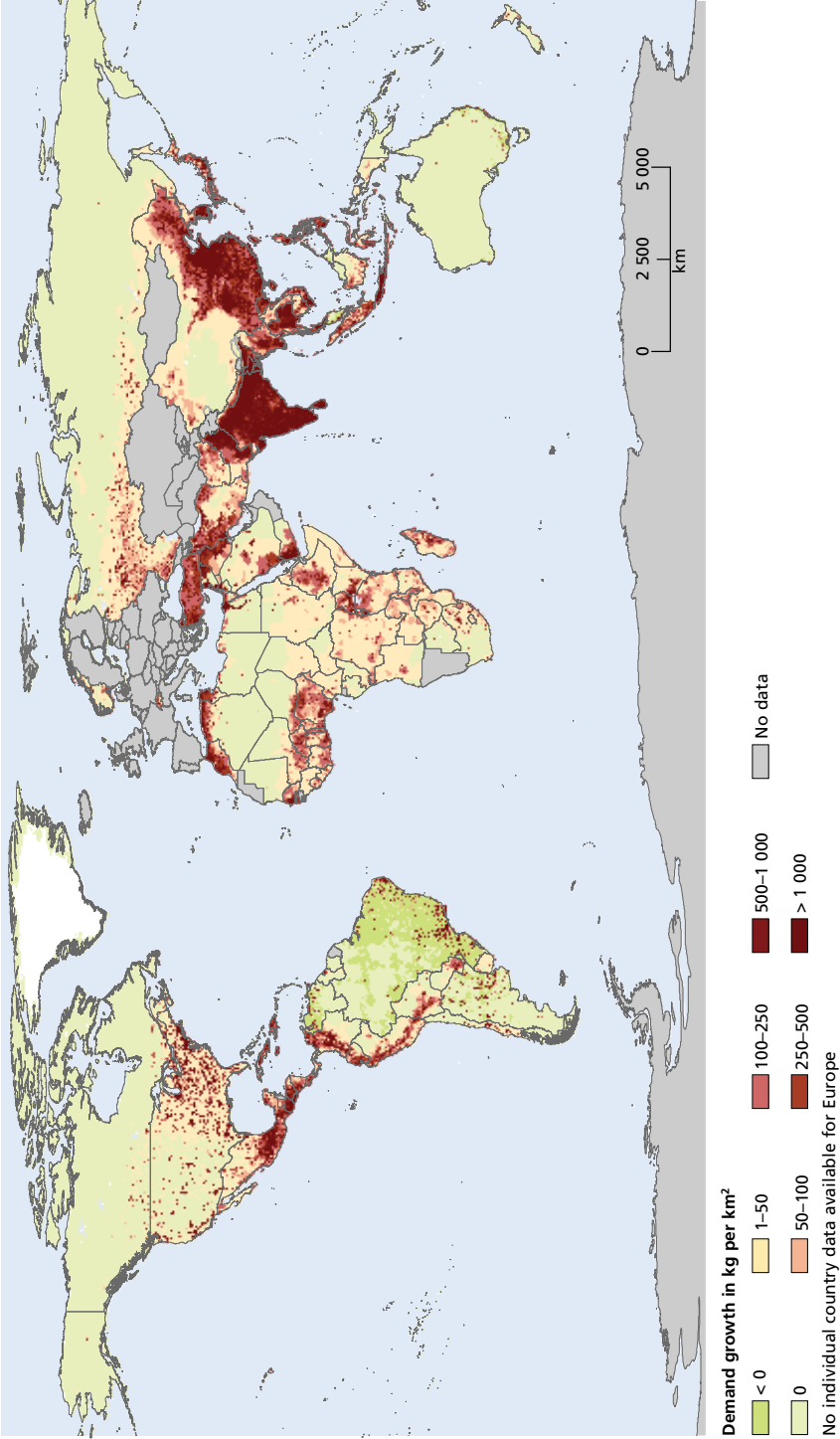
Figure 2.4 provides a global overview of projected demand for poultry meat, the ASF for which projected consumption increases are the greatest in all regions. Widespread increases are evident, particularly in South Asia, and East Asia and the Pacific. The apparent decline in Brazil reflects a net reduction of consumption in rural areas. Overall, the projected increase in annual poultry meat consumption is 3.8 million tonnes (77 percent), with a projected increase of 4.0 million tonnes (98 percent) in urban areas accompanied by a projected reduction of 200 000 tonnes (16.5 percent) in rural areas. This reflects high levels of urbanization leading to a reduction in the rural population.

The effect of urbanization on changing demand for ASFs is not clearly illustrated in Table 2.13, or in a map at the scale of Figure 2.4. For example, poultry meat consumption in India is projected to increase by about 8.8 million tonnes between 2000 and 2030, an 844 percent increase (Table 2.13). While most of this increase – 5.2 million tonnes – will occur in rural areas (compared with 3.7 million tonnes in urban areas), the relative increase in urban areas, at 1 288 percent, will be almost twice that in rural areas, at 676 percent. Similar patterns are seen in other commodities. For example, pork consumption in China is projected to increase by 22 million tonnes (54 percent) between 2000 and 2030 (Table 2.13). However, urban consumption is projected to increase by 23.5 million tonnes, or 160 percent, while rural consumption declines by 1.4 million tonnes, or 5 percent, again reflecting very high rates of urbanization.

This growth in demand for ASFs, particularly in the burgeoning urban areas of developing countries, presents potential opportunities for economic growth and poverty reduction. As long as daily per capita incomes remain below \$5, quantity has preference over quality (McDermott *et al.*, 2010) and most low-income consumers purchase their food in traditional live-animal or wet markets. Livestock producers who gain access to these urban markets benefit from the potential increased sales and higher prices that may be obtained. Many of these producers may be livestock-dependent poor, but even where production is in the hands of larger-scale commercial livestock owners, additional employment is generated for hired labour. The results represent an increase in the livestock sector's contribution to national GDP and the corresponding national income, while poor urban consumers derive the nutritional benefits associated with increased ASF dietary intake.

Expanded markets for ASFs have further benefits. Increases in livestock production are likely to necessitate increases in purchased inputs of young or breeding stock, genetic material, feeds and veterinary services. Some of these may be purchased from urban-based suppliers, resulting in financial flows from rural to urban locations. In addition, as shown in Table 2.12, less

FIGURE 2.4
Global growth in demand for poultry meat, 2000 to 2030



Sources: Robinson and Pozzi, 2011, based on data provided by J. Bruinsma.

than half of any additional income earned is likely to be spent on food, with the remainder being allocated to non-food consumer goods. It can be assumed that this applies to the income growth of livestock producers as much as to that of other members of society. The resultant growth in rural demand for non-food consumer goods might be met by purchases from urban suppliers. However, opportunities are also created for expanding local village-level manufacture and provision. In either case, growth of the livestock sector in response to increased urban demand can serve as the launch-pad for a self-generating process of economic growth and development (see Chapter 4).

NEGATIVE IMPACTS OF LIVESTOCK PRODUCTION

Although livestock sector growth in developing country regions can lead to a variety of positive social outcomes, there are also potential negative environmental and public health impacts, which need to be managed to minimize their consequences. The negative effects of livestock production include land degradation (e.g., from overgrazing), pollution from effluents, loss of biodiversity, emergence and spread of zoonotic pathogens, development of antimicrobial resistance, and GHG emissions, which drive climate change.

Recently there has been considerable debate about the contribution that livestock make to GHG emissions. GHGs comprise carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and gases with high global warming potential (GWP), mainly hydrofluorocarbons. In 2004, CO₂ from anthropogenic processes constituted about 77 percent of global GHG emissions, CH₄ constituted 14 percent, and N₂O 8 percent, the remainder being accounted for by GWP gases (IPCC, 2007). It has been estimated that agriculture generates about one-third of total global GHG emissions: 24 percent of CO₂, 52 percent of CH₄, and 84 percent of N₂O (USEPA, 2006). Agriculture's direct contributions to GHG emissions are dominated by N₂O from soils and CH₄ from enteric fermentation, which constituted 38 and 32 percent respectively of all agricultural non-CO₂ emissions in 2005 (USEPA, 2006).

Per capita GHG emissions and the contributions of different sources to total emissions vary significantly among regions (Table 2.14). Total per capita GHG emissions in high-income countries are about four times those of the rest of the world, and nearly ten times the amount estimated for low-income countries (result not reported). Regional estimates of per capita emissions of CO₂ – the main GHG – diverge even more, with a person in a high-income country emitting more than 50 times as much as one in a low-income country. For CH₄, with the exception of the two extremes, Latin America and the Caribbean (90 kg CO₂ equivalent) and the Near East and North Africa (18 kg CO₂ equivalent), per capita emissions from agriculture fall within a relatively narrow band of 40 to 55 kg CO₂ equivalent for all regions and for low- and high-income countries. Per capita emissions of N₂O from agriculture are lowest in South Asia, at less than 30 kg CO₂ equivalent, about 86 kg CO₂ equivalent in Latin America and the Caribbean and in high-income countries, and again between 40 and 55 kg CO₂ equivalent in all other regions.

Livestock account for an estimated 18 percent of global annual GHG emissions (FAO, 2006). These estimates include direct GHG emissions and, more important, the effect of deforestation and the GHG impacts of land-use change and feed crop production arising from increased livestock production (although these pose problems in attribution). Livestock's direct contributions to GHG emissions stem from enteric fermentation of

Table 2.14
ANNUAL PER CAPITA GHG EMISSIONS, BY GHG, SOURCE AND REGION,
2005 (KILOGRAMS OF CO₂ EQUIVALENT)

Region/country	Total GHGs	CO ₂	CH ₄	N ₂ O	CH ₄ from agriculture	N ₂ O from agriculture
EAP	499.9	368.9	84.1	43.8	42.4	39.2
China	551.0	431.2	76.4	43.5	38.2	40.3
EECA	977.0	726.7	197.7	48.9	31.0	37.3
LAC	496.2	232.8	156.9	106.0	90.6	86.5
NENA	477.7	353.7	68.9	50.0	17.8	46.0
South Asia	207.0	109.2	66.3	29.5	43.7	27.6
India	222.5	130.0	65.1	27.5	42.2	25.5
SSA	264.2	84.9	86.5	69.4	42.8	54.5
All regions	426.3	268.2	96.1	51.0	46.3	43.6
High-income countries*	1 588.5	1 289.3	84.1	113.6	44.4	85.9

* Based on 2010 World Bank classification.

Source: World Bank, 2010b.

Table 2.15
ANNUAL CH₄ AND N₂O EMISSIONS IN DEVELOPING COUNTRIES, BY SOURCE,
1990 TO 2010 (MILLION TONNES CO₂ EQUIVALENT)

Region/country	1990		2000		2010		Annual growth
		(%)		(%)		(%)	
Total CH ₄ and N ₂ O	6 060	100	6 741	100	7 986	100	1.4
Agriculture	3 877	64	4 447	66	5 162	65	1.4
Soils	1 357	22	1 524	23	1 833	23	1.5
Enteric fermentation	1 315	22	1 381	20	1 664	21	1.2
Rice	584	10	617	9	692	9	0.9
Manure	221	4	231	3	279	3	1.2
Other	401	7	694	10	694	9	2.8

Source: Authors' calculations based on USEPA, 2006.

ruminants (CH₄), and manure management (CH₄ and N₂O). Over the 20 years 1990 to 2010, emissions of both these non-CO₂ GHGs by livestock in developing regions grew by 1.2 percent per year (Table 2.15), which is half the annual livestock sector growth rate of 2.4 percent (Table 2.8), reflecting an increase in value generation per kilogram of non-CO₂ GHG emission. Livestock's share in direct contributions to non-CO₂ GHG emissions in developing countries has remained at 24 percent over the past two decades, despite

the sector's rapid growth, implying that emissions from other activities are growing at the same pace.

The emergence and spread of zoonotic pathogens and the development of antimicrobial resistance are other negative consequences of increasing livestock production that have received major public attention recently. Bovine spongiform encephalopathy, Nipah virus infection and highly pathogenic avian influenza (HPAI) are notable examples of pathogens causing infection in humans after massive propagation in livestock. Increasing livestock and human populations, coupled with changes in land use and agricultural practices have been identified as the main drivers for disease emergence (Woolhouse and Gowtage-Sequeria, 2005). Intensification – particularly the industrialization of livestock production, in which animals are often mass-reared under the prophylactic use of antibiotics⁹ – is one of the causes of the increasing prevalence of antibiotic resistance in animal and human pathogens. Increasing livestock densities and higher animal turn-over also alter evolutionary trajectories by conferring selective advantages to fast-growing, early-transmitted and hence probably more virulent parasites (Mennerat *et al.*, 2010). Increasing livestock production will augment human health risks from pathogens associated with livestock unless livestock sector expansion is accompanied by proper safeguards. In addition to standard hygiene and biosecurity practices, these measures should include strategic interventions that slow down the “race” between the livestock industry and pathogens (Palumbi, 2001).

DISCUSSION AND CONCLUSIONS

Since establishment of the MDGs in the 1990s, global numbers of poor people defined by the low income limit of \$1.25/day have declined. However, progress in poverty reduction has been very uneven among regions, with most gains being made in East Asia and the Pacific, where poverty incidence declined by 38 percentage points (from 56 to 18 percent), while in South Asia and sub-Saharan Africa it decreased by only 10 and 5 percent respectively.

It is worth noting that of the six main continental blocks of countries, three – Eastern Europe and Central Asia, Latin America and the Caribbean, and the Near East and North Africa – have low numbers and low proportions of the total population (at between 4.6 and 8.2 percent) with per capita daily incomes of less than \$1.25. Some 94 percent of the world's extremely poor live in East Asia and the Pacific, South Asia and sub-Saharan Africa.

Although the agriculture sector makes a relatively small contribution to national income or GDP, large proportions of national economically active labour forces are employed in agriculture. Nearly three-quarters of the extremely poor live in rural areas (World Bank, 2008) and most depend on agriculture for their livelihoods. Average incomes and productivities are lower in agriculture than in the rest of the economy, reinforcing the argument that poverty is more prevalent in the agriculture sector. Although the agricultural resource base per person in agriculture is low in many developing countries (particularly in highly populated East and South Asia), and despite the poor remuneration of agricultural labour, the number of people dependent on agriculture has grown from 1.1 billion to 1.3 billion over the past 15 years. Low-income countries have the highest shares of labour employment in, and contributions to national income from, agriculture, at about 60 and 25 per-

⁹ In the United States of America, 20 to 50 percent of antibiotic production goes into livestock feed for prophylactic purposes (Palumbi, 2001).

cent respectively. Rural populations will continue to expand in absolute numbers until 2045 in sub-Saharan Africa and until 2025 in South Asia.

In all regions, livestock make a substantial contribution to the total net output of agriculture. In the regions where most poor people live, livestock's contribution to net agricultural production rose from 23.7 to 30.3 percent in East Asia and the Pacific, and from 29.1 to 33.9 percent in South Asia. However, in sub-Saharan Africa, where there is more agricultural land per person, the equivalent figure fell from 28.1 to 26.6 percent in 2007. Also of interest is that the proportion of the livestock population (measured in TLUs) represented by non-ruminant poultry and pigs grew between 1990 and 2008, from 54 to 61 percent in East Asia and the Pacific, and from 4 to 7 percent in South Asia, while remaining constant in sub-Saharan Africa. The shift to increased relative reliance on poultry and pigs in East and South Asia may help to explain the growth in the relative net output of livestock in these regions.

Although ASFs alone are unsuitable for the provision of basic human subsistence needs, livestock contribute to food security by converting otherwise unusable plant material into human food. Arid and semi-arid rangelands, which are largely unsuited to arable cropping, account for 54 percent of the world's productive land, and an estimated 180 million people in the developing world depend on them for their livelihoods, mainly from grazing livestock. In sub-Saharan Africa, a third to a half of all ruminant meat is produced from rangelands: 40 to 50 percent in East Africa, and 30 to 40 percent in West Africa. Rangelands may also provide calves to be finished in more intensively managed production systems elsewhere.

Livestock also add value to crop residues such as straw and stovers, or processed by-products such as oilseed cakes or brewers' grains. It has been estimated that cereal crop residues provide more than 650 million tonnes of animal feed, while the global supply of by-products (excluding crop residues) would provide sufficient feed energy to produce more than 500 million tonnes of milk. In addition, many animals and poultry birds are fed from organic kitchen and other wastes through scavenging, at little or no feed cost. Increases in crop yields resulting from the application of animal manure contribute to food security. Livestock also provide a buffer against the risk of crop failure, thereby stabilizing food supply.

FAO forecasts of demand for livestock products in 2030 compared with demand in 2000 show the impacts of changes in population and consumption patterns. Growth in consumption of poultry meat is expected to outstrip that in all other ASFs in all regions, especially in India where a huge 850 percent increase is projected over the 30-year period; egg consumption in India is predicted to increase by nearly 300 percent over the same period. Expected growth in milk and dairy product consumption is impressive, with the quantity consumed in South Asia forecast to more than double by 2030. Large increases in consumption of ASFs, particularly pork, poultry meat, milk and beef, are also predicted for East Asia, mainly in China. The largest absolute and relative increases in mutton consumption are projected to occur in sub-Saharan Africa.

A major influence on the pattern of future demand for ASFs is the effect of urbanization. For instance, the predicted increase in poultry meat consumption in urban areas of India, at 1 288 percent, is more than 1.5 times that for rural areas, at 844 percent. A similar pattern emerges for pork consumption in China, which is projected to increase by 54 percent overall between 2000 and 2030. However, urban consumption is projected to

increase by 160 percent, while rural consumption declines by 5 percent, reflecting a very high rate of rural-urban migration.

Increased domestic livestock production can stimulate sustainable economic growth and development by increasing rural incomes and employment, which leads to higher spending on productive inputs and consumer goods, and greater trade for both urban and local rural suppliers.

The negative effects associated with livestock sector growth in developing country regions include the emergence and spread of infectious zoonotic and non-zoonotic diseases, and negative environmental impacts. The H5N1 avian influenza panzootic and the pandemic (H1N1) influenza A crisis demonstrate the potential magnitude of public health problems associated with rapidly expanding livestock production. Negative environmental effects include GHG emissions, land degradation (e.g., from overgrazing), loss of biodiversity, and pollution from effluents.

Most economic transformations have been driven by development of the agriculture sector (Tiffin and Irz, 2006), followed by a gradual shift in emphasis towards other sectors of the economy. However, for poverty reduction, the emphasis must remain on the rural population.

SUMMARY AND KEY POINTS

- Although the incidence of extreme poverty (< \$1.25/day) in developing countries declined significantly, from 42 percent in 1990 to 26 percent in 2005, the absolute number of extremely poor people is still an alarming 1.4 billion (down from 1.8 billion in 1990). In South Asia and sub-Saharan Africa the numbers of extremely poor increased by 20 million and 100 million respectively.
- Diets in developing countries are deficient not only in quantitative terms, but even more so in terms of quality. The estimated DALYs attributed to protein-energy malnutrition, iron-deficiency anaemia and vitamin A deficiency in the developing world are 17.4 million, 15.6 million and 0.6 million respectively (WHO, 2004). Given the high bioavailability of protein, iron and vitamin A in meat, eggs and milk, increasing the availability of ASFs for poor populations in developing countries could significantly reduce the burden of disease attributable to protein and micronutrient deficiencies.
- Livestock contribute directly to human food and nutrition security by transforming vegetation from non-arable land, crop residues, food processing by-products and organic waste into human food of high nutrient density and nutritional quality. Livestock also contribute indirectly to food security by increasing crop output through providing manure, and serve as a buffer to mitigate the impact of fluctuations in crop production on the availability of food for human consumption, thereby stabilizing food supply.
- In most developing countries, the majority of the population lives in rural areas, poverty rates are higher among rural than urban households, and the rural poor constitute between 70 and 80 percent of the total number of poor people. In the two poorest regions, sub-Saharan Africa and South Asia, although urban populations are growing faster in absolute terms, rural populations will continue to expand until 2045 and 2025 respectively.
- There is consensus that to reduce poverty rapidly, interventions must be directed to the rural areas of developing countries, where most of the population and most of

the poor people live, and should target rural economic activities, as most of the poor are engaged in these (World Bank, 2008). Most of the world's poor depend directly or indirectly on agriculture for their livelihoods; the number of people involved has grown from 1.1 billion to 1.3 billion over the past 15 years.

- In all developing regions, livestock make a substantial contribution to the total net output of agriculture, averaging about 35 percent. Over the last 15 years, livestock value added has grown most rapidly in the lower-middle income regions of East Asia and the Pacific, and South Asia, where many of the extremely poor live. The contribution of livestock to agricultural net output in sub-Saharan Africa fell from 28.1 percent in 1990 to 26.6 percent in 2007.
- Globally, the number of poor livestock keepers (< \$2/day) has been increasing by about 1.4 percent per year. In terms of absolute numbers, South Asia and sub-Saharan Africa dominate, with more than 45 and 25 percent of the world's estimated 752 million poor livestock keepers respectively. The depth of poverty among poor livestock keepers is particularly high in sub-Saharan Africa, where it is estimated that more than 85 percent of them are extremely poor.
- Growing populations and rising per capita incomes in developing countries will lead to major increases in the demand for ASFs in these regions. A large share of this growth will stem from rapidly expanding urban populations.
- Increases in domestic livestock production in response to urban demand growth, and the additional incomes generated, add to GDP and national income. Knock-on effects include increases in rural employment and in spending on productive inputs and consumer goods, generating additional trade with urban and/or local suppliers. As a result, growth of the livestock sector in response to increased urban demand can launch a self-perpetuating process of economic growth and development.
- In spite of the many positive social outcomes associated with livestock sector growth in developing country regions, there are also negative effects that need to be considered and managed. Two very significant effects are the emergence and subsequent spread of infectious diseases associated with livestock, and negative environmental impacts. The magnitude of negative environmental and public health externalities associated with livestock will be strongly influenced by the ways in which the livestock sector grows to meet the increasing demand.
- The relative emphasis on interventions in agriculture will gradually decline as the structure of the economy transforms, but economic transformations have usually been driven initially by development of the agriculture sector. From a global perspective, the emphasis must remain on the rural population if poverty reduction is a main goal of economic development.

3. Livestock and livelihoods

The preceding chapter provided an overview of poverty and livestock sector development trends in the six main continental blocks of countries since 1990, based to a large extent on information from global datasets that do not disaggregate below the national level. This chapter reviews the role of livestock in the economy of rural households, drawing on published and grey literature and nationally representative household surveys compiled from FAO's Rural Income-Generating Activities (RIGA) database (Davis *et al.*, 2007) for 12 countries: four in Latin America and the Caribbean – Ecuador, Guatemala, Nicaragua and Panama; four in sub-Saharan Africa – Ghana, Madagascar, Malawi and Nigeria; three in South Asia – Bangladesh, Nepal and Pakistan; and one in East Asia and the Pacific – Viet Nam. The chapter begins by providing an overview of the characteristics of rural households in developing countries, highlighting facets related to livestock. It then reviews the multiple, often intertwined roles livestock play in rural households, and how livestock support particularly the livelihoods of lower-income groups through non-monetized or indirect services. To conclude, the chapter presents results of analyses of gender aspects of livestock keeping and production using information contained in the FAO-RIGA database.

CHARACTERISTICS OF RURAL HOUSEHOLDS

Agriculture remains the single largest source of income and livelihoods for rural households in the developing world, normally providing more than 50 percent of household income (DFID/ODI/NMFA, 2002; Jayne *et al.*, 2003; Otte and Chilonda, 2002). Smallholder farms (< 2 ha) account for significant and often growing shares of agricultural production. In Africa, for instance, it has been estimated that 90 percent of all agricultural production is derived from small farms (Spencer, 2002). In India, smallholders own the majority of livestock and dominate the dairy sector (Narayanan and Gulati, 2002). According to Nagayets (2005) historical trends in farm size suggest that in Africa and Asia small farms will continue to dominate the agricultural landscape for at least the next two to three decades.

The magnitude of small-scale producers' contributions to total livestock production in the countries included in the FAO-RIGA database is shown in Table 3.1. In all African and Asian countries, farms with less than 2 ha of land or fewer than 2 TLU are responsible for between half and three-quarters of total livestock production, and sometimes even more. However, it should be borne in mind that the RIGA surveys do not include corporate agricultural enterprises, so for some of the countries in the sample the figures may represent slight overestimates.

Salient characteristics of rural households derived from the 12 nationally representative surveys are displayed in Table 3.2. Mean household size ranges from 4.0 to 6.7 members, of whom in most cases nearly half are dependants (< 15 or > 60 years of age), while the household head has fewer than five years of formal education in almost all countries, attesting to the low human capital base of rural households. The proportion of households owning land varies markedly among countries, with low levels in Pakistan and Ghana,

Table 3.1
PROPORTIONS OF THE TOTAL VALUE OF LIVESTOCK PRODUCTION, BY
LANDHOLDING AND HERD/FLOCK SIZE CLASSES

Country	% of value of total household livestock production									
	Landholding size class (ha)					Herd/flock size class (TLU)				
	< 0.5	0.5–1	1–2	2–5	> 5	< 0.5	0.5–1	1–2	2–5	> 5
Ghana	79	3	4	12	2	47	16	16	12	9
Madagascar	42	14	21	19	4	32	10	19	21	18
Malawi	21	22	29	21	7	64	14	10	9	3
Nigeria	41	5	13	22	19	26	20	23	21	10
Bangladesh	64	17	12	7	1	31	19	25	25	0
Nepal	57	21	14	7	1	4	7	31	51	6
Pakistan	54	9	13	16	8	n/a	n/a	n/a	n/a	n/a
Viet Nam	87	10	3	1	0	17	23	30	28	3
Ecuador	24	5	7	17	46	7	8	11	30	44
Guatemala	55	11	11	10	13	34	17	20	16	13
Nicaragua	34	2	5	13	45	27	8	8	16	40
Panama	14	0	2	5	79	11	6	4	10	69

Source: FAO-RIGA database.

where about one-third of households own land, standing in strong contrast to Viet Nam and Malawi, where about 90 percent of rural households do. With the exception of countries in Latin America and the Caribbean, mean landholding sizes are in the order of 1 ha or less. Livestock ownership is usually slightly more prevalent than landownership, but again, mean herd/flock size normally lies between 1 and 2 TLU. Endowment with human and physical capital is even more precarious in households falling into the lowest wealth quintile measured by household expenditure. Average household size in this group tends to be between six and seven members, the majority (about 55 percent) of whom are classified as dependants. Average formal education of the household head rarely exceeds three years, while mean landholding and herd/flock size tend to be some 10 to 50 percent lower than the overall rural average, confirming that lack of access to land is associated with low incomes and rural poverty (IFAD, 2001).

To survive under these generally unfavourable conditions, rural households tend to diversify their income sources between farm and non-farm activities, and between family-owned enterprises and wage labour. The extent to which this diversification occurs varies among countries (Table 3.3). Income from own farm or own non-farm activities accounts for the largest income share in most countries included in the FAO-RIGA database, the exceptions being Bangladesh, Guatemala and Panama, where wage labour is the dominant source of income. Other sources, mainly transfers from relatives, typically account for 10 to 20 percent of the income of rural households. Agriculture, either through the small household farm or through provision of low-wage employment as an agricultural labourer, remains the sector providing most income to rural households in the majority of countries analysed.

Table 3.2
CHARACTERISTICS OF RURAL HOUSEHOLDS IN SELECTED COUNTRIES

Country	HH size (no.)	Dependants (%)	Formal education HH head (years)	Landownership (%)	Mean landholding (ha)	Livestock ownership (%)	Mean herd/ flock size (TLU)
Ghana	4.1	49	3.0	35	1.1	50	1.3
Madagascar	4.5	47	2.8	75	1.1	77	2.0
Malawi	4.1	49	4.2	91	1.5	63	0.5
Nigeria	4.7	39	4.0	68	6.4	46	1.5
Bangladesh	5.0	46	2.6	49	0.4	62	0.9
Nepal	5.5	47	1.9	79	0.6	88	2.0
Pakistan	6.7	49	3.0	33	0.9	47	n/a
Viet Nam	4.7	45	4.7	90	0.2	82	1.3
Ecuador	4.8	48	4.3	58	5.7	84	3.3
Guatemala	5.3	51	2.3	52	1.9	70	1.3
Nicaragua	5.5	48	2.5	42	5.8	55	4.0
Panama	4.4	45	5.8	51	6.3	61	3.3

Source: FAO-RIGA database.

Table 3.3
CONTRIBUTIONS OF DIFFERENT INCOME SOURCES TO TOTAL INCOME OF RURAL HOUSEHOLDS IN SELECTED COUNTRIES (PERCENTAGES)

Country	Farm	Non-farm enterprise	Wage labour	Other	Agriculture	Non-agriculture
Ghana	60	21	11	9	61	39
Madagascar	63	11	17	9	68	32
Malawi	44	15	30	12	64	36
Nigeria	78	11	9	2	80	20
Bangladesh	17	16	40	27	37	63
Nepal	n/a	n/a	n/a	n/a	n/a	n/a
Pakistan	33	11	38	19	41	59
Viet Nam	56	21	15	7	62	38
Ecuador	33	18	38	10	54	46
Guatemala	20	15	47	18	42	58
Nicaragua	35	11	43	11	57	43
Panama	18	22	44	16	35	65

Source: FAO-RIGA database.

Constraints specific to smallholder farmers include high transaction and marketing costs, lack of market power for both inputs and outputs, limited access to information and technology, and exposure and vulnerability to climatic and disease risks. In addition, smallholders often operate in areas where markets for food, insurance, financial and other services are not well developed. This makes it necessary for households to maintain a high degree of self-reliance and to cultivate informal social networks. On the other hand smallholders incur low supervision and opportunity costs for (family) labour, which confers some competitive advantage over large-scale farming in the production of labour-intensive, high(er)-value agricultural produce, such as milk. As a consequence of these determining conditions, smallholders make efficient use of scarce natural resources, tend to diversify their portfolios of farming activities to balance risks, and seek to optimize the returns from (heterogeneous) family labour. Livestock are an important means towards all these aims.

LIVESTOCK OWNERSHIP AMONG RURAL HOUSEHOLDS

As mentioned earlier, the majority of rural households own some livestock. The distribution of livestock ownership among households in different expenditure quintiles in selected countries is illustrated in Figures 3.1 and 3.2.

Livestock are kept by households across all five wealth groups, but in most of the countries analysed, households in the bottom expenditure quintile are more likely to have livestock in their asset portfolios than wealthier households, albeit only slightly in some countries.

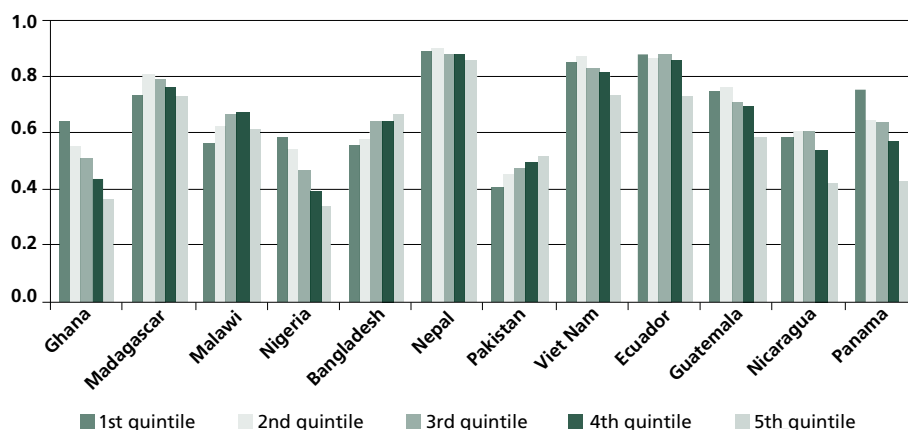
The average herd/flock size expressed in TLUs is relatively small for households in all quintiles in all regions except in the Latin American countries included in the sample. In general, these results correspond to published findings (Bebe *et al.*, 2003; Maltoglou and Rapsomanikis, 2005; Maltoglou and Taniguchi, 2004; Nanyeenya *et al.*, 2008), albeit ones that are representative of only mixed crop-livestock production systems. Households in pastoral areas tend to keep larger herds: in pastoral areas of East Africa the minimum herd size estimated as necessary for a household to make a living above the poverty threshold is 15 to 20 cattle if the household relies exclusively on livestock (Lybbert *et al.*, 2004). In the highlands of Peru, 2 000 head of alpaca are considered the minimum herd size for alpaca rearing to be commercially viable (ECLAC, 2004).

Figure 3.2 shows that a consistently positive association between the number of TLUs owned and household wealth exists only in the Latin American countries of Nicaragua, Panama and Ecuador (among the countries examined). The results are quite varied for the other countries in the database, and there is no unambiguous relationship between herd/flock size and household wealth. The number of TLUs does not provide information on the quality of the animals owned, for example no difference is made between a local cow and a cross-bred dairy cow when aggregating livestock into TLUs.

Lorenz curves¹⁰ of livestock ownership for the same sample of countries (Figure 3.3) deviate significantly from the line of absolute equality among expenditure groups in only

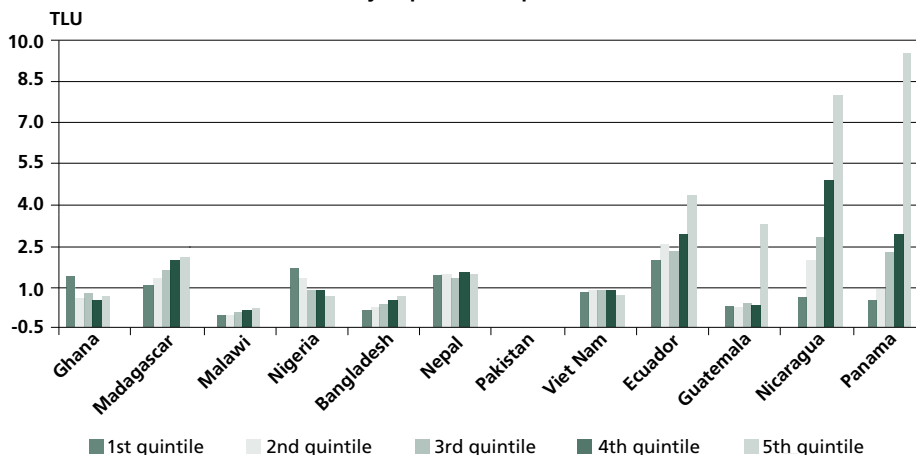
¹⁰ Lorenz curves map the cumulative distribution of rural livestock-keeping households ordered by average herd size on to the corresponding cumulative proportion of livestock kept. If livestock stock were equally distributed, with every household keeping the same number of TLUs, the Lorenz curve would be a 45-degree line; in case of complete inequality, with the largest holder holding all the livestock, the Lorenz curve would run along the x-axis with a right angle at (1,0) to terminate at (1,1).

FIGURE 3.1
Livestock ownership of rural households (%), by expenditure quintile



Source: FAO-RIGA database.

FIGURE 3.2
Size of livestock holding, expressed in TLUs, of rural livestock-keeping households, by expenditure quintile

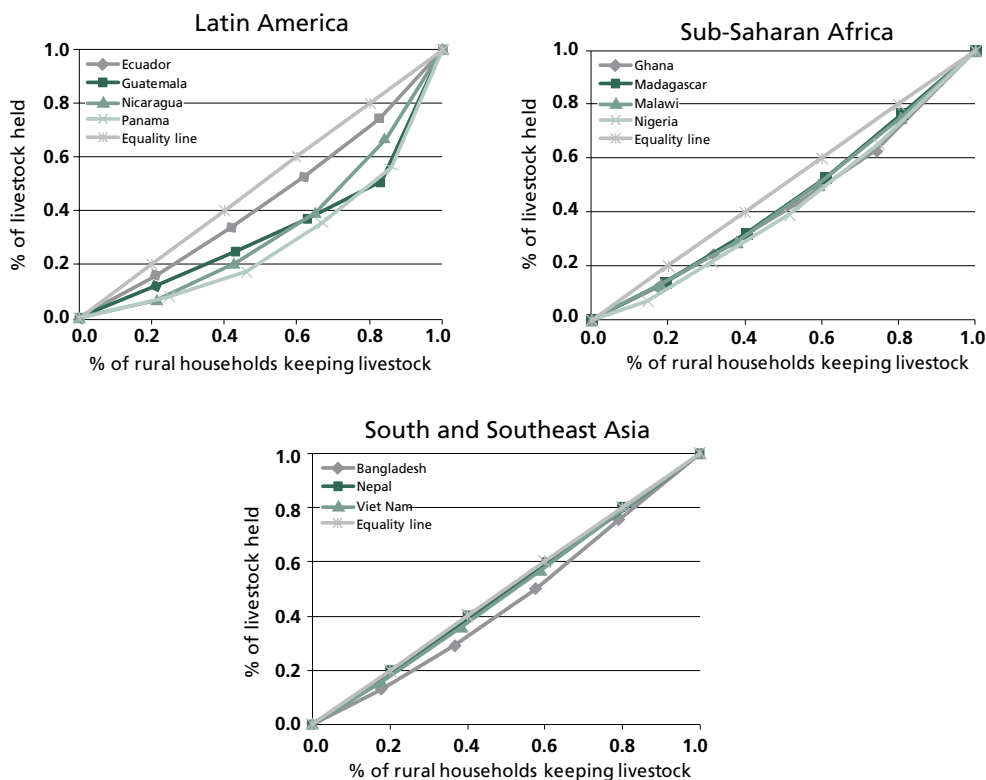


Source: FAO-RIGA database.

Latin America, where households in the two top quintiles keep more than 60 percent of the livestock population.

These findings corroborate reports that in developing countries livestock are often more equally distributed across wealth groups than land (Delgado, Narrod and Tiongco, 2008; McKinley, 1995; Mellor 2003; Zezza *et al.*, 2007). A suggested reason for this pattern is that the very poor and the landless can keep a few animals in spite of their poor access to land. This situation implies that broad-based increases in livestock productivity are likely to

FIGURE 3.3
Lorenz curves of livestock holdings to rural households keeping livestock



Source: FAO-RIGA database.

have a larger positive direct impact on the livelihoods of the poor than are corresponding increases in land productivity.

Rural households rarely specialize in one particular crop or livestock species, preferring to diversify to take advantage of the different, often complementary, roles each species can play, and to spread risks, including of animal diseases. This rationale appears to apply across wealth categories, as no consistent differences in livestock species owned can be identified among wealth categories within any country. Within a given agro-ecological setting, poorer and richer households tend to build herds of similar composition, with households with smaller landholdings being less likely to own cattle and more likely to own poultry (Pica-Ciamarra *et al.*, 2010). The poor's ability to acquire livestock is constrained by the capital and maintenance costs of different species, which are typically higher for large ruminants (IFAD, 2001; Kitalyi *et al.*, 2005). Large ruminants also require higher maintenance costs, as they need daily fodder equal to about 10 percent of their body weight – i.e., 30 to 40 kg of fodder per day – while chickens can survive on 30 to 50 g of feed per day by scavenging and from kitchen residues. Poor households need to balance herd/flock composition and

size carefully to make best use of the available resources, an important element of which is family labour, and to maximize livestock production and services while containing risk.

THE MULTIPLE ROLES OF LIVESTOCK

As shown in the preceding section, a large proportion of rural (and urban) households in developing countries keep some form of livestock, usually in small numbers, either as their main agricultural enterprise or, more frequently, in conjunction with crop production. The many roles livestock play in these households include the provision of services (e.g., draught/hauling power, insurance and savings), food (e.g., meat, milk and eggs) and non-food products (e.g., wool, hides and skins), and less tangible benefits such as status and inclusion in social networks. The relative importance of each of these different roles varies by livestock species, agro-ecological zone, production system and socio-cultural context, and livestock often assume several roles simultaneously.

Household food security

Undernutrition remains widespread in the developing world (see Chapter 2). The short-term impact of undernutrition includes poor growth and development of children, and increased risk of morbidity and mortality resulting from infectious diseases. Over the long term, it impairs children's cognitive development and school performance, and in adults it reduces work performance and productivity. This lowers human capital development and constrains the potential for economic growth.

Within the household, livestock can contribute to improved nutrition, particularly of children, in three ways (Tangka, Jabbar and Shapiro, 2000; Neumann, 2000; Shapiro *et al.*, 2000). Diets may be improved by:

- occasional direct consumption of milk, eggs or meat;
- use of the income earned from sales of livestock products to buy food;
- increases in crop production resulting from mixed farming.

Low-income households often keep small stock, such as poultry, pigs and small ruminants (sheep and goats), mainly scavenging for food and requiring very few resource inputs. These small livestock species are more convenient as a source of household meat than cattle and other large ruminants (e.g., buffaloes), whose meat may spoil before it can all be consumed within a single household (Upton, 1985). In Bangladesh, for example, it was seen that improving semi-scavenging smallholder poultry production directly increased the number of eggs households consumed, from two to five per week, while the household consumption of poultry meat increased from 62 to 105 g/week (Nielsen, 1998). In addition to increasing consumption of eggs and poultry meat, improved poultry production also increased household consumption of fish, milk and vegetables (Nielsen, 1998). In Ecuador, children from farm households owning livestock were less likely to be growth-retarded than children from non-livestock-owning households (Leonard *et al.*, 1994). An assessment of the impact of adopting dairy technology in coastal Kenya showed that children from households with improved dairy cattle were taller than those from households without improved breeds (Nicholson *et al.*, 1998). Similarly, in rural Rwanda, Grosse (1998, cited in Tangka, Jabbar and Shapiro, 2000) found that children between the ages of two and five years from households with dairy cattle or dairy goats were significantly taller than

children from households without dairy animals. More of the difference in child growth could be attributed to ownership of dairy animals than to household wealth, access to land or mother's education. Dairy animals are particularly important for pastoralists, for whom – during a normal wet season – milk from goats and camels provides about 66 and 100 percent of the mean energy and protein requirements, respectively, of a one-year-old child (Sadler *et al.*, 2009).

For mixed farming systems, the main benefits of livestock – manure production and animal draught power – are derived by the household farm. Crop yields are increased by the use of manure as fertilizer,¹¹ while cropped areas or cropping intensity may be increased by using animal draught power (see subsection on “Farm/household production and productivity”). Increases in crop production can in turn contribute to improved livelihoods and better nutrition. Additional income derived from sales of crops or livestock and livestock products can be used to purchase food items to supplement the farm-derived diet. However, additional income does not necessarily result in improved nutrition, because of competing expenditure needs such as payment of school fees, purchase of clothing and other domestic goods, and reinvestment in livestock.

Resilience to shocks: insurance, risk spreading and savings

Two challenges for rural smallholders are risk and vulnerability. In response to these, smallholders have developed multiple strategies for (*ex-ante*) risk management and (*ex-post*) coping with shocks. The former involves diversification into livestock, which appears to be a common strategy among a wide spectrum of rural households. The latter involves reducing variability in food consumption regardless of fluctuations in crop yields and income. Livestock offer many advantages as they are generally more adaptable to environmental shocks than crops are. Native animal breeds are adapted to local environmental risks and use available natural resources efficiently. They are mobile, which increases survivability, and may also be able to digest a wide variety of feedstuffs, thereby having the capacity to survive dramatic reductions in specific feed resources. Food such as milk and eggs from livestock provides nutritional insurance that can be used to smooth household food consumption levels. The potential food represented by animals “on the hoof” is also an important aspect of food security. When excess supplies of fodder and/or grains are available, they can be temporarily “stored” in livestock for “liquidation” in times of food shortage. In addition, realization of asset value can be timed more flexibly for livestock than for many other agricultural products, providing a further buffer against climatic and market risks.

Poor people thus increase their survivability through livestock by transferring risks to their animals. As agricultural risks increase, the insurance value of livestock increases. For example, Ayalew (2000, cited in Moll, 2005) estimated the insurance benefits of goats in the Ethiopian highlands to be about 8 percent of their value, while Moll (2005) suggests a value of up to 20 percent for situations where risks are severe.

Livestock also complement labour and capital, thereby offsetting variations in the availability of either. This is important when seasonal demands draw workers to higher-value

¹¹ In some areas manure is one of the most valuable outputs of livestock (e.g., Ayalew *et al.*, 2001; Haileselassie *et al.*, 2009).



Credit: ©FAO/Ami Vitale

temporary activities and when circumstances lead family members to leave the household for extended periods, such as owing to illness or for longer-term urban employment. In the absence of well-functioning markets for finance and insurance, livestock embody savings and provide a reserve against emergencies. If an urgent need for funding arises, whether for a special occasion or to cope with a disaster, animals may be sold to raise the money needed. Evidence of this savings function is that households purchase livestock when income exceeds consumption expenditure requirements, and sell them only in times of cash need (e.g., Moll and Dietvorst, 1999). Livestock can also function as a form of savings for urban populations, as shown in a study by Ossiya *et al.* (2003) in Kampala, where increases in urban livestock ownership were correlated with periods of political and economic upheaval. Poultry serve as *current* savings to meet households' small cash needs, such as for the purchase of medicines when a family member falls ill; small ruminants and pigs provide *medium-term* savings to meet slightly larger expenses, such as school fees and books; and large animals serve as *long-term* savings ("banks on hooves") to cover major investment needs, such as extending the house (Davendra and Chantalakhana, 2002).

Increasing the herd size on a fixed land area will at some stage reduce the biological productivity of individual animals, although as long as the stocking rate does not become excessive, this will be outweighed by the benefits of insurance and savings. Through flexible uses of livestock and diversification of income sources, small farms' incomes are much less variable from year to year if they produce crops and livestock than if they produce crops alone (Sandford, 1988, cited in Bradford, 1999). Both as a store of savings and as a risk reserve, small stock (sheep, goats, pigs and poultry) have advantages over larger animals (cattle, buffaloes and camels) owing to greater convenience.

Livestock are valuable capital assets that not only produce future income but also increase numerically through reproduction. Once a flock or herd is established, it can be expanded by raising larger numbers of replacements, reinvesting in the herd. Livestock are often considered to offer better rates of return than the interest paid by banks or savings institutions. In the trade-off between consuming young animals and rearing them to join the breeding herd households frequently forego consumption in the short term in favour of

asset building. This special characteristic of livestock as self-generating capital makes them a particularly valuable form of investment for the poor. However, the cost of establishing the foundation stock for a new livestock enterprise may be beyond the means of the poor, and credit or external aid may be required.

Farm/household production and productivity

By definition, smallholders have ownership or use rights to only small areas of agricultural land, pastoralists have (often eroding) user rights to non-privately owned rangelands, and landless livestock keepers do not possess land titles or user rights. For these households investment in livestock raises production and productivity by:

- mediating access to common property (grazing and scavenging) resources;
- converting low-quality organic material (rangeland grasses and shrubs, crop residues, organic wastes, scavengable protein) into high(er)-value products;
- extending the land area they can cultivate, through the use of draught power;
- facilitating diversification into more demanding crops, through the use of organic fertilizer and draught power;
- smoothing demand on family labour over seasons, genders and generations.

As mentioned in Chapter 2, livestock offer one of the most efficient means of utilizing resources that would otherwise go unexploited, such as dryland vegetation, crop residues and organic wastes, in both rural and urban areas. As well as adding value to material not suitable for human consumption, livestock enable low-income households to convert common property resources into private assets.

Smallholder farms in developing countries are rarely mechanized (fewer than 20 percent in most countries in the FAO-RIGA database) (Zezza *et al.*, 2007), and a recent estimate suggests that about half of the total cropped area in developing countries – at least 320 million ha – is cultivated using animal draught power provided by cattle, buffaloes, horses, donkeys and mules (Bruinsma, 2003). In China alone, according to the National Bureau of Statistics, in 2007 farmers kept 50 million draught cattle/buffaloes and about 10 million working equines. An earlier estimate suggested that motorized machines would have required 20 million tonnes of petrol to do the work performed by draught animals in a year (Ramaswamy, 1994). Cultivation with animal power or tractors often produces little or no improvement in crop yields compared with hand cultivation, but it allows a larger area to be cultivated per household or unit of labour. Draught power is therefore a labour-saving and land-using technology. The sometimes substantial labour saved by using animal power is valuable when growing crops that require intensive soil preparation. In central Nigeria, for example, draught animals decreased the time needed to prepare land for rice production from 315 to 94 hours/ha (Lawrence, Dijkman and Jansen, 1997). Animal draught is also used for cultivation in intensively cultivated and irrigated land in Asia and other regions, with buffaloes replacing cattle, camels or donkeys in wet rice zones. In these cases, the motive power requirements per hectare are very high, so benefits are derived from saving labour, despite Asia's high population density.

Livestock also free household labour by carrying water and fuel for household use (e.g., donkeys) and by serving as pack animals or pulling carts to take agricultural produce to markets or bring agricultural inputs back to farms. For landless nomadic households, livestock allow migration of all or parts of the family.



Credit: ©FAO/A. Wolstad

Many soils contain insufficient nutrients to sustain efficient crop production, and complementary relationships between crops and livestock can be exploited through nutrient recycling, with animals feeding on crop residues and returning manure¹² to the soil. This results in increased production from both crops and livestock. In areas where livestock are grazed on range or pasture, they transfer plant nutrients from non-arable to arable land. Manure has been shown to increase yields to similar levels as chemical fertilizers do, adding to livestock's role in increasing human food supply. In Uganda, for example, Pender *et al.* (2004) found that households with fewer livestock had lower crop production. The impact of manure on crop yields depends on many factors: crop type, soil type, quality of manure, prevailing agro-ecological conditions, etc. McIntire, Bourzat and Pingali (1992) estimated yield increases ranging from 15 to 86 kg of grain per tonne of manure. In addition to providing nutrients to the soil, the organic material contained in manure also improves soil texture. The economic value of manure is well recognized by farmers. In high-potential areas of Kenya, for example, the market value of manure has been found to be about five times the value of the equivalent nutrients in fertilizer (Lekasi *et al.*, 1998), and even in smallholder dairy farms the output of manure can represent 28 percent of the value of the milk produced (Lekasi and Tanner, 1998). In densely populated areas of Kenya, only farms with cattle were found to have positive soil-nutrient balances (Shephard and Soule, 1998). de Haan, Steinfeld and Blackburn (1997) estimated the fertilizer value of manures used in tropical irrigated areas alone to amount to USD 800 million/year.

Integrated duck-rice farming is a prime example of mutual benefits conferred by the combination of crops and livestock. Ducks not only enrich the soil but also effectively control weeds and arthropod pests, reducing labour and pesticide requirements. In Bangladesh, rice yields are an average of 20 percent higher in the rice-duck system than in the traditional rice-only system. The net returns to the farming household are also 50 percent higher in the crop-livestock system, as the ducks provide an additional source of income (Hossain *et al.*, 2009). In Indonesia, combining rice with ducks and fish improved farm income by 117 percent (Suriapermana *et al.*, 1998, cited in Davendra and Chantalakhana, 2002).

¹² In many areas manure is also used as a source of fuel, saving fuelwood and oil, and lowering dependency on external fuel supplies; however, the adoption of biogas by resource-poor households has been rather limited.

Table 3.4
AVERAGE SIZES AND COMPOSITIONS OF RURAL LIVESTOCK-KEEPING AND NON-LIVESTOCK-KEEPING HOUSEHOLDS IN SELECTED COUNTRIES

Country	Livestock-keeping households				Non-livestock-keeping households)			
	Total HH size	Working-age males	Working-age females	Dependants	Total HH size	Working-age males	Working-age females	Dependants
Ghana	5.2	1.2	1.3	2.7	3.8	0.9	1.0	1.8
Madagascar	5.2	1.3	1.3	2.7	4.2	1.0	1.2	1.9
Malawi	4.9	1.1	1.2	2.6	3.9	1.0	1.0	1.9
Nigeria	5.6	1.5	1.6	2.4	4.4	1.4	1.4	1.7
Bangladesh	5.5	1.5	1.4	2.6	4.8	1.3	1.3	2.2
Nepal	5.9	1.4	1.6	2.9	4.7	1.2	1.3	2.2
Pakistan	7.4	1.8	1.9	3.8	6.5	1.7	1.7	3.1
Viet Nam	4.8	1.3	1.4	2.1	4.3	1.2	1.4	1.6
Ecuador	5.1	1.4	1.4	2.4	4.2	1.1	1.3	1.8
Guatemala	5.8	1.3	1.4	3.0	4.7	1.1	1.3	2.3
Nicaragua	5.7	1.5	1.5	2.7	4.8	1.3	1.5	2.1
Panama	4.8	1.3	1.3	2.2	3.7	1.1	1.2	1.5

Source: FAO-RIGA database.

Livestock-keeping households tend to be larger than non-livestock-keeping households, particularly in terms of dependants and working-age males (Table 3.4). As livestock-related activities are generally less seasonally circumscribed than those related to crops – which often have high labour demands at critical times in the crop life cycle, such as field preparation, planting or harvesting – livestock serve as a means of spreading the requirements for household labour more evenly across genders, ages and times of year. In many societies, children do much of the herding (up to 90 percent in pastoral systems), while women are often responsible for milking dairy animals and milk processing (Tangka, Jabbar and Shapiro, 2000). Pica-Ciamarra *et al.* (2010) found that having a higher proportion of female members in a household is significantly correlated with having a higher proportion of small animals, such as poultry and small ruminants, in the household herd/flock. This is plausible because small stock can be kept close to the household to be looked after by family members at the homestead, and small stock do not require major physical efforts for their handling.

A disadvantage of livestock keeping or its intensification is that it can increase total household labour demand, which may have a particularly strong impact on women, thereby also reducing the time and quality of care they can dedicate to young children or to income-earning activities other than livestock. For example, women in a dairy project in Kenya reported that the project benefits came at the cost of a higher workload (Mullins *et al.*, 1996). A similar outcome is reported by Thomas-Slayter and Bhatt (1994) from a dairy intensification project in Nepal.

Table 3.5 presents estimates of annual, purchasing power-adjusted incomes per TLU and per adult animal (adult equivalent) for livestock-keeping households, grouped into three

Table 3.5
ANNUAL LIVESTOCK-DERIVED INCOME PER TLU AND ADULT EQUIVALENT IN LIVESTOCK-KEEPING HOUSEHOLDS, BY HERD/FLOCK SIZE CLASS

Country	Average herd size (TLU)			Income per TLU (PPP dollars)			Income per adult equivalent (PPP dollars)		
	< 1 TLU	1–2 TLU	> 2 TLU	< 1 TLU	1–2 TLU	> 2 TLU	< 1 TLU	1–2 TLU	> 2 TLU
Ghana	0.3	1.4	5.0	205	94	25	22	35	31
Madagascar	0.3	1.4	6.1	1 812	765	223	145	295	356
Malawi	0.2	1.3	4.0	424	203	64	29	77	61
Nigeria	0.4	1.4	5.5	120	68	26	15	24	32
Bangladesh	0.3	1.3	2.6	188	57	39	15	19	23
Nepal	0.5	1.3	3.2	284	175	104	40	66	77
Pakistan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Viet Nam	0.4	1.4	3.3	65	31	18	10	13	16
Ecuador	0.4	1.5	7.7	170	163	81	19	73	170
Guatemala	0.3	1.4	7.7	238	104	63	19	37	117
Nicaragua	0.4	1.4	9.9	923	485	154	83	164	380
Panama	0.2	1.4	15.1	19	23	35	1	8	176

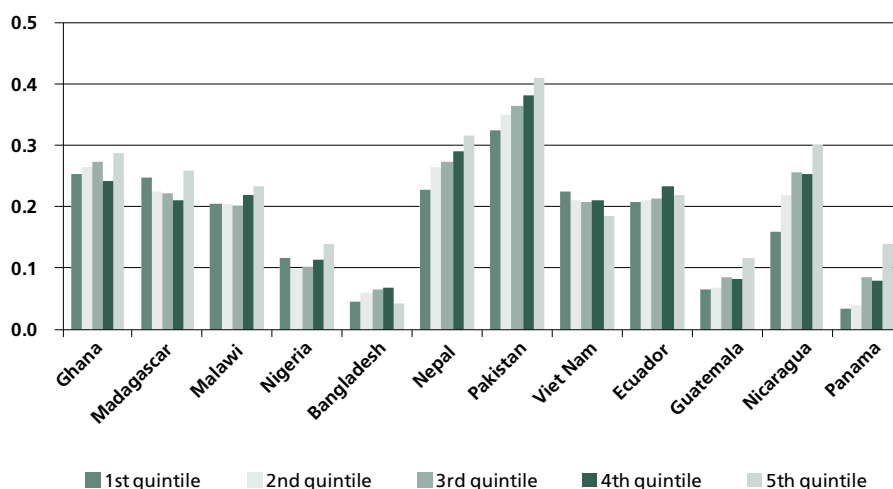
Source: FAO-RIGA database.

flock size classes for countries in the FAO-RIGA database. Although between-country variation in livestock-derived incomes is immense, with the exception of Panama, trends are remarkably similar: i) income per TLU tends to decrease as flock size increases (as a result, variation in livestock-derived income is much smaller than variation in herd/flock size); and ii) livestock-derived income per adult equivalent tends to increase as herd/flock size increases. The first observation can be explained, at least in part, by the species of livestock in the different flock size categories. Flocks with fewer than 1 TLU will consist of small stock such as chickens, pigs and small ruminants (by definition they cannot include large ruminants). These species have shorter generation intervals, more offspring, and lower maintenance requirements than large stock, thereby enabling very efficient transformation of low-cost feed resources into valuable livestock products. As total household herd size grows, feed requirements increase, often to a level where at least some feed has to be purchased, and herd composition tends to shift towards a greater proportion of large ruminants, which can have very long unproductive intervals, resulting in lower income per TLU. Households compensate for these diminishing returns on livestock assets by increasing returns on family labour, which becomes the limiting production factor as endowment with livestock and land increases.

Income generation: linking to the cash economy and value addition

Escape from poverty requires the production of a marketed surplus over basic subsistence needs, to pay for productive inputs and consumer goods and to meet immediate cash requirements. Although herd or flock expansion may be based on the natural processes

FIGURE 3.4
Livestock's contribution to the total income (%) of livestock-keeping households,
by expenditure quintile



Source: FAO-RIGA database.

of reproduction and growth, the initial investment in a new enterprise and other forms of asset accumulation require cash savings or credit supplies. Purely subsistence households are relatively rare and the vast majority of rural households are engaged to some extent in market activities, although they also aim to produce food for the family. Table 3.6 shows the participation in agricultural output markets of rural households in the FAO-RIGA countries, which clearly indicates that most households sell part of their agricultural production and that households in the bottom expenditure quintile are not significantly less likely to sell agricultural products than the average rural household; bottom-quintile households sell approximately the same share of their livestock products as other households do.

Given livestock's multiple roles in the household economy, it is difficult to measure precisely their contribution to total household income. The last two columns of Table 3.6 show livestock's average proportional contributions to household income, disregarding any changes that may occur in the value of the herd/flock. Livestock's average contribution in all expenditure quintiles ranges from a low 7 percent in Panama to a high 37 percent in Pakistan, and usually falls between 20 and 30 percent. Although this contribution may not be very high, livestock's contribution to cash income is often higher (e.g., Maltoglou and Taniguchi, 2004). Small streams of recurrent cash income derived from "flow" products such as milk and eggs are particularly useful for meeting minor everyday cash outlays.

The literature on livestock's relative contributions to the incomes of poorer compared with wealthier households does not provide a clear picture. Some studies have found that livestock contribute more to the income of better-off than of poor households (Wouterse

Table 3.6
RURAL HOUSEHOLDS' MARKET PARTICIPATION AND LIVESTOCK'S CONTRIBUTION TO
TOTAL HOUSEHOLD INCOME, FOR THE TOTAL RURAL SAMPLE AND FOR THE BOTTOM
EXPENDITURE QUINTILE, IN SELECTED COUNTRIES

Country	Proportion of HHs selling agricultural products (%)		Proportion of livestock production sold (%)		Livestock's contribution to total HH income (%)	
	Total sample	Bottom quintile	Total sample	Bottom quintile	Total sample	Bottom quintile
Ghana	71	81	45	71	81	45
Madagascar	94	96	60	94	96	60
Malawi	70	64	13	70	64	13
Nigeria	70	74	n/a	70	74	n/a
Bangladesh	76	65	30	76	65	30
Nepal	69	59	47	69	59	47
Pakistan	52	46	n/a	52	46	n/a
Viet Nam	91	93	68	91	93	68
Ecuador	62	62	35	62	62	35
Guatemala	57	59	28	57	59	28
Nicaragua	80	80	38	80	80	38
Panama	49	58	29	49	58	29

Source: FAO-RIGA database.

and Taylor, 2008), some have found no clear pattern (Adams, 2002), and some report a larger contribution for poor households than for households with higher income levels (Delgado *et al.*, 1999; Ifft, 2005). During the process of economic development, households tend to specialize, and wealthier households specializing in livestock farming are expected to derive a larger share of income from their farm animals than poorer households do (Deininger and Olinto, 2001; Holmann *et al.*, 2005; Homewood *et al.*, 2006; SA-PPLPP, 2009). Figure 3.4 shows livestock's contribution to household income, measured as the gross value of sold and self-consumed products for livestock-keeping households, by expenditure quintile in countries in the FAO-RIGA database.

In most sample countries, including Bangladesh, Ecuador, Ghana, Guatemala, Malawi, Nicaragua, Nigeria, Pakistan and Panama, households in the upper expenditure quintiles derive larger shares of their income from livestock than households in lower quintiles do.

Several studies have evaluated the impact of promoting animal production on household income and expenditure (Alderman, 1987; Ahmed, Jabbar and Ehui, 2000; Mullins *et al.* 1996; Nielsen, 1996). The general findings were that the incomes of households adopting animal production increased and that higher incomes resulted in increased food and non-food expenditures. Non-food expenditure may include purchase of inputs (concentrate feeds, labour, drugs and animal health services) and investment in genetic material, housing and equipment to increase future production.

Given the rapid growth in demand for livestock products, especially dairy and poultry products, currently occurring in many developing countries, the market potential exists to

Table 3.7
CONCENTRATION OF VALUE OF TOTAL AND MARKETED LIVESTOCK PRODUCTION,
BY EXPENDITURE QUINTILE

Country	% of value of total livestock production					% of value of marketed livestock production				
	Expenditure quintile					Expenditure quintile				
	1	2	3	4	5	1	2	3	4	5
Ghana	22	42	17	16	3	31	22	19	14	13
Madagascar	20	13	14	12	41	21	23	21	18	16
Malawi	18	19	20	23	20	18	22	22	20	17
Nigeria	25	25	19	15	16	22	24	23	17	13
Bangladesh	14	20	27	26	14	19	20	22	20	19
Nepal	16	19	20	22	24	20	21	19	20	19
Pakistan	20	21	21	20	19	n/a	n/a	n/a	n/a	n/a
Viet Nam	21	19	21	20	18	20	20	21	20	19
Ecuador	17	16	18	22	26	19	22	21	20	18
Guatemala	17	17	19	19	28	19	20	22	20	19
Nicaragua	10	18	21	21	30	21	20	22	19	18
Panama	9	10	23	28	31	16	17	23	22	21

Source: FAO-RIGA database.

absorb domestic outputs. With their relatively high income elasticity of demand, livestock are particularly attractive as a means for rural households to participate in urban-based economic growth. As shown in Table 3.7, poor rural households currently make considerable contributions to total and marketed livestock production: in most countries in the FAO-RIGA database, households in the bottom two expenditure quintiles provide about 40 percent of marketed livestock production (in value terms), which in many countries is more than the contribution of the households in the top two quintiles.

In addition to direct sales of livestock and/or their primary products (meat, milk, eggs, wool, etc.), some products can be processed at the household level, by either the livestock-keeping households themselves or other rural households, thereby contributing to wealth generation and poverty reduction (see Chapter 4 for livestock-related economic multiplier effects). Given the mobility restrictions faced by women and the elderly in many rural societies, value addition within the household provides an important avenue for these population groups to increase and diversify household income. In most parts of the world, women are essential participants in the value-adding processing of milk, hides, skins and fibres of livestock origin. For example, in Andhra Pradesh (India), the traditional processing of wool from Deccani sheep (by women) and its weaving into carpets (by men) increase the value of the wool by 400 to 500 percent (Svita and Rao, 2007). The returns on labour from household processing of a primary agricultural product may exceed the returns on its original production. In Thane, India, for example, the production of silkworm cocoons yields returns on labour of about 50 rupees (INR) per day, while the returns on processing the cocoons into Tasar silk amount to nearly INR 110/day (Patil *et al.*, 2009).



Credit: ©FAO/Asim Hafeez

Social and cultural functions

In many societies, livestock serve social and cultural functions. They may have special roles in religious ceremonies and other social institutions, and provide a tangible measure of personal or family status. Important social occasions are often marked by the consumption of livestock products; for example, goats are used in Moslem religious ceremonies, while pigs and chickens are required for Chinese ancestral worship and traditional ceremonies. Weddings or the births of children are also often commemorated with gifts of livestock, and in some areas dowries or bride-prices are paid in animals. The ability to participate in these activities may be essential for establishing and maintaining the social networks through which risk is managed.

Status should not be considered an intangible benefit because it may translate into influence and a subsequent increase in access to resources (Moll, 2005). The value of livestock as a means of conferring status is determined by the presence of alternative forms of displaying wealth, such as through housing or consumer goods, and is therefore highly context-specific and difficult to quantify. In most Southeast Asian countries, a well-tested fighting cock can be worth more than 1 000 regular broiler chickens (Davendra and Chantakhana, 2002). Apart from the intangible benefits of conferring status, it appears that in several countries livestock ownership facilitates access to formal credit. In six of the eight countries they analysed, Pica-Ciamarra *et al.* (2010) found a positive relationship between livestock ownership and receipt of formal loans (which was statistically significant in four countries, even after controlling for ownership of other assets), although livestock were rarely accepted formally as collateral. In-kind loans of livestock themselves are a popular way for poor households to improve their access to other goods and services. As livestock loans are normally repaid with the loaned livestock's offspring, short-cycle species such as chickens, goats and pigs are generally more suitable than cattle for this form of credit.

In smallholder households, livestock are also an important means of conferring income and status to women. In both traditional inheritance systems and many land reform and set-

tlement schemes, land rights are generally transferred to men as the heads of households. Female-headed households, resulting from death or extended migration of men or from divorce, generally control less land than male-headed households (IFAD, 2001). Although women seldom hold property or usage rights to land they often independently own small livestock, such as goats in West Africa (Okali and Sumberg, 1986), and backyard poultry in many developing countries. These animals normally scavenge or are fed on household waste, and represent an important asset and income source for women, who can control and allocate the income according to their needs. This proposition is explored in more detail in the next section.

Gender aspects of livestock keeping and production

Livestock are often considered an entry point for promoting gender balance in rural areas of developing countries, because there is evidence that women play a major role in livestock farming (Guèye, 2005; Niamir-Fuller, 1994; Sinn, Ketzis and Chen, 1999; Tangka, Jabbar and Shapiro, 2000; Tipilda and Kristjanson, 2009). Table 3.8 provides an overview of the prevalence and main characteristics of female-headed¹³ households in countries in the FAO-RIGA database.

In the countries analysed, 10 to 25 percent of households are headed by women, with the lowest prevalences of female-headed households in the two predominantly Muslim countries, Bangladesh and Pakistan, and the highest, of nearly one in three, in Ghana. Contrary to expectations, in general female-headed households are under-rather than over-represented in the bottom expenditure quintile, suggesting that gender of household head may not be the main determinant of household income. In all countries in the analysis, the average size of female-headed households is smaller than the overall country average, usually by 0.5 to 1.0 members, or 10 to 20 percent. Regarding the dependency ratio, there is no clear trend in differences between female- and male-headed households. In the Latin American countries for which data are available, dependency ratios are slightly below average for female-headed households, while in Ghana, Malawi, Nepal and Bangladesh they are slightly above average. The same is true for formal education of household head, which is above average among female-headed households in the four Latin American countries, while female household heads in other countries have fewer years of formal education than their male counterparts, particularly in Nepal and Viet Nam. In all countries, female-headed households are less likely to own land than male-headed households, and average landholding is usually considerably smaller than the global average (compare Tables 3.2 and 3.8).

In all countries in the FAO-RIGA database, female-headed households are less likely to keep livestock, in some cases considerably so (Ghana, Nigeria and Bangladesh). Furthermore, the average herd/flock size of female-headed livestock-keeping households is generally smaller than that of their male-headed counterparts in the same country. With two exceptions – small ruminants in Nigeria and poultry in Panama – female-headed households on average own fewer livestock of all species, the discrepancy with male-headed households being particularly marked for cattle (Viet Nam being the exception) and pigs in the

¹³ The definition of “female-headed household” applied in the various surveys underlying the FAO-RIGA database is not unambiguous, as the absence of a male household head may be due to death, separation or temporary migration, leading to different socio-economic outcomes for the female-headed household.

Table 3.8
PREVALENCE AND CHARACTERISTICS OF FEMALE-HEADED RURAL HOUSEHOLDS IN
SELECTED COUNTRIES

Country	Female-headed HHs as % of total		HH size (no.)	Dependants (%)	Formal education HH head (years)	Landownership (%)	Mean landholding (ha)
	Total sample	Bottom quintile					
Ghana	31	24	3.7	55	3.5	24	0.6
Madagascar	18	21	3.7	47	2.4	39	0.5
Malawi	24	26	3.7	57	2.6	89	1.1
Nigeria	13	8	3.1	37	3.5	28	4.4
Bangladesh	9	8	3.7	48	1.3	21	0.1
Nepal	13	11	3.7	53	0.6	61	0.3
Pakistan	8	5	5.3	53	1.8	15	0.2
Viet Nam	22	18	3.8	39	0.5	58	0.1
Ecuador	14	13	3.7	43	7.5	22	4.3
Guatemala	14	10	4.2	50	3.1	25	0.5
Nicaragua	18	19	5.1	44	4.5	11	1.0
Panama	18	17	3.5	43	9.0	16	0.9

Source: FAO-RIGA database.

two West African countries (Ghana and Nigeria). Given the higher prevalence of livestock and the larger herd/flock sizes in male-headed households, it is not surprising that within individual expenditure quintiles, the proportion of income derived from livestock is generally higher in male- than female-headed households (Pica-Ciamarra *et al.*, 2010).

The data in Table 3.9 do not support the widely held notion of the feminization of poverty and, more important, they cast doubt on the proposition that livestock are a prime tool for supporting female-headed households, which instead seem to have different livelihood avenues from their male-headed counterparts.

Within households, livestock ownership varies by region and is often complex. Contrary to common belief, even in pastoral societies, women (and male children) can own livestock. Among the agropastoral Fulani, for example, women own 27 percent of all cattle, while small ruminants are more usually the property of women than men (Waters-Bayer, 1988). By contrast, in mixed crop-livestock farming systems in northern Ghana, tradition prevents women from owning cattle, which may explain the very small ratio of cattle in female- relative to male-headed households in Table 3.9. Decisions on the disposal of livestock (sale, slaughter, transfer) are commonly taken in consultation between male and female household members, irrespective of ownership (Tangka, Jabbar and Shapiro, 2000).

Within livestock-keeping households, the roles of men, women, children and the elderly in livestock husbandry vary from region to region and are determined by tradition, farming system and an array of socio-economic variables (Tangka, Jabbar and Shapiro, 2000). It is rare for a particular livestock-related activity to be carried out exclusively by men, women

Table 3.9
LIVESTOCK OWNERSHIP, BY GENDER OF HOUSEHOLD HEAD IN SELECTED COUNTRIES

Country	HHs with livestock (%)		Mean TLU/HH		TLU ratio female:male-headed HHs			
	Female-headed	Male-headed	Female-headed	Male-headed	Cattle	SRs*	Pigs	Poultry
Ghana	32	60	0.16	0.89	0.04	0.71	0.14	0.31
Madagascar	65	81	0.61	1.77	0.24	0.31	0.56	0.76
Malawi	58	69	0.20	0.35	0.45	0.85	0.46	0.58
Nigeria	27	41	0.23	0.79	0.01	2.81	0.01	0.45
Bangladesh	35	62	0.13	0.57	0.21	0.50	n/a	0.43
Nepal	83	91	1.21	1.81	0.70	0.79	0.63	0.98
Pakistan	74	90	0.25	0.49	n/a	n/a	n/a	n/a
Viet Nam	62	70	0.75	1.19	0.95	0.53	0.95	0.95
Ecuador	73	76	1.83	2.98	0.53	0.45	0.67	0.88
Guatemala	61	67	0.64	0.97	0.35	0.72	0.69	0.36
Nicaragua	70	76	1.39	2.30	0.47	n/a	0.70	0.62
Panama	55	68	1.43	2.07	0.59	0.84	0.70	1.99

* SR = small ruminants, i.e., sheep and goats.

Source: FAO-RIGA database.

or dependants. Niamir-Fuller (1994) identifies three livestock production systems in which female labour input is critical: i) those where women are responsible for processing and marketing livestock products, such as the Fulani in Nigeria, where women are usually responsible for milk collection, processing and marketing (Osotimehin, Tijani and Olukomogbon, 2006); ii) those where women have overall responsibility for small stock, including goats, sheep and poultry, such as backyard poultry systems in Bangladesh (Paul and Saadullah, 1991); and iii) those where women are responsible for managing large stock and other livestock species, such as in parts of Latin America (Bravo-Baumann 2000). However, even within these broad categories, there is considerable variation in labour allocation from region to region, among households within a region, and within households over time (Tangka, Jabbar and Shapiro, 2000). Generalizations about livestock's role in promoting within-household gender equity are therefore complicated, if not impossible (Tangka, Jabbar and Shapiro, 2000; Tipilda and Kristjanson 2009).

Neither formal livestock ownership nor labour allocation to livestock-related tasks guarantees control over the products. For example, women may own (dairy) cattle and/or be responsible for milking, while men remain the decision-makers on milk sales (Valdivia, 2001; Tipilda and Kristjanson, 2009). Even *de facto* control over livestock or livestock-derived income is restricted by a household member's responsibility for meeting family welfare objectives according to the household's resources and needs (Tangka, Jabbar and Shapiro, 2000). It is therefore not surprising that many studies have found that women, with their traditional responsibility for child rearing and food preparation, tend to spend more of the income under their control on food than men do (e.g., Guyer, 1988; Tangka, Emerson

and Jabbar, 2002). As a consequence, increasing women's control over household assets and income results in a larger proportion of these being devoted to nutrition (and education) than when income is controlled by men (Valdivia, 2001). However, as the income from household farming activities often accrues to both men and women, even if the benefits are not shared equitably, increasing the income from a male-dominated activity may still confer substantial benefits to women. For example, Tangka, Emerson and Jabbar (2002) found that in the Ethiopian highlands, intensified dairying using cross-bred cattle significantly increased household incomes. Although much of this additional income accrued to men, who traditionally did not take part in household dairy activities, the women in households with cross-bred dairy cattle had far more income at their disposal than did women in households with local cattle, although the latter retained virtually all the dairy income.

Overall it appears that within-household power dynamics, which are embedded in specific socio-economic contexts, are too complex and diverse to permit simple predictions about the gender-specific impacts of livestock promotion.

DISCUSSION AND CONCLUSIONS

Smallholders, however defined, account for a large share of agricultural production throughout most of the developing world, particularly in South Asia and sub-Saharan Africa. In South Asia, more than 80 percent of farms are smaller than 2 ha (Nagayets, 2005), and in sub-Saharan Africa smallholders are responsible for an estimated 90 percent of agricultural production (Dunsten, 2001). In the majority of countries included in the FAO-RIGA database, households in the bottom two expenditure quintiles provide about 40 percent of marketed livestock production (in value terms), which in many countries is a larger contribution than that of households in the top two quintiles. Thus, the welfare of smallholders has important implications for overall agricultural production, and thereby food security (Narayanan and Gulati, 2002).

The majority of the world's livestock-dependent poor are engaged in mixed and integrated farming systems (Thornton *et al.*, 2003). From an environmental perspective, mixed farming is the most benign form of livestock production, as many nutrients are recycled within the farming system, and crop and livestock production play complementary roles in food production and the household economy. In these cases, livestock provide services beyond the direct provision of food.

Smallholder farmers tend to keep a mix of different livestock species, trading off specialization for better protection against risks, and foregoing livestock consumption to maintain or build assets. The importance of livestock can thus be considered in terms of *ex-ante* risk management. Instruments for risk management are varied in their characteristics and relevance to different situations. The more universal ones include income diversification (e.g., crop/livestock portfolios, on- and off-/non-farm work, migration) and choice of low-risk technologies at the cost of lower expected income (e.g., traditional seeds instead of high-yielding varieties).

Livestock can contribute to risk management in several ways. They are generally more adaptable to environmental shocks than crops, and often more so than their keepers themselves. They are mobile, which can increase survivability through moving across diverse natural landscapes. They may be relatively omnivorous, and thereby able to survive the



Credit: ©FAO/Marzio Marzot

dramatic effects on feed supplies that natural or induced environmental change can cause. Native animal breeds are particularly well-adapted to local environmental risks and use natural resources efficiently. For all these reasons, the superior survivability of livestock can significantly increase the survivability of livestock keepers and poor people keeping livestock, who are able to transfer environmental risk to their animals.

Another important and related strategic necessity of the poor is coping with risk, i.e., dealing with shocks *ex-post*, such as by reducing variability in consumption regardless of income fluctuations (consumption smoothing). Characteristics of risk coping include adaptability, dis-savings of liquid assets, credit, and insurance (individual or mutual) – all roles to which livestock in rural households contribute.

Livestock can be factors of production that complement labour (e.g., when animals are used for traction) and capital. This is an extremely important characteristic for managing risks in labour markets, where seasonal demand may draw workers to higher-value temporary activities, and in migration, when family members may leave the household production system for extended periods. Small stock have the additional advantage of having high rates of reproduction, so they can be useful in hastening recovery from stock losses. Their intrinsic value in nutrition and marketability make livestock a valuable class of assets. As livestock reproduce, this asset can appreciate even when prices are stable, and the realization of livestock's asset value can be timed more flexibly than that for many other agricultural products.¹⁴ This wide spectrum of livestock functions within household economies explains why livestock are a preferred investment in micro-credit schemes (e.g., Rubin, Tezera and Caldwell, 2010; Baumann and Hancock, 2011).

Frequently, the relative prices of feed and livestock products provide insufficient incentives for using purchased feed inputs, and low-/medium-input livestock production models

¹⁴ However, the financial resources embodied in livestock pose an exposure risk in terms of price dynamics and other determinants of asset value, such as health status. The financial dimension of risk coping must take this exposure into account.

prevail in many parts of the world. However, there is remarkable variation in livestock productivity within these systems, even in the same country and agro-ecological zone (e.g., Otte and Chilonda, 2002; Maltsoglou and Rapsomanikis, 2005; Teufel *et al.*, 2010; Hemme and Otte, 2010), suggesting that there is ample scope for enhancing general livestock production efficiency by propagating locally tested production models. However, these tend to require up-front investments, which may be out of reach for many smallholders, involve risk and, most important, lead only to substantial increments in total household income if livestock constitute a significant source of income to begin with (Garcia *et al.*, 2006). It is thus not surprising that while most smallholders are willing to invest in interventions that enhance the survival of their stock, few are willing to do so for yield-increasing measures.

Analysis of the FAO-RIGA data does not support the assertion that 70 percent of the world's rural poor are women for whom livestock represent one of the few potential sources of income (DFID, 2000). Irrespective of the share of women and girls among the poor, the promotion of animal production – in which women are undeniably heavily involved – does not automatically improve women's control over livestock-related income; a review of studies examining the impact of livestock projects on women's income reported mixed results (Leroy and Frongillo, 2007). On the other hand, women can benefit significantly from livestock interventions even if these primarily benefit men, as shown by Tangka, Emerson and Jabbar (2002).

No available studies have systematically assessed the impact that promoting animal production has on the incidence of zoonotic infections in humans (Leroy and Frongillo, 2007). Livestock – often asymptotically – harbour and shed a wide range of microorganisms known to have the capacity to infect humans, at times causing serious disease and even death. Several studies provide evidence of the health risks associated with livestock keeping. In Indonesia, for example, the housing of small ruminants close to the family quarters resulted in very high levels of faecal bacteria contamination of drinking-water sources (Budisatria *et al.*, 2007). In the Gambia, Pickering *et al.* (1986) found that children in compounds where animals were kept were at higher risk of animal-borne diarrhoeal diseases than other children, and households keeping chickens and goats were more likely to experience child death than households without chickens or goats. Similarly, in Kenya a greater risk of child mortality was associated with the presence of ruminants in living areas (Gemert *et al.*, 1984, cited in Tangka, Jabbar and Shapiro, 2000). The HPAI virus H5N1 is currently the most notable zoonotic pathogen, and a large share of human cases are attributable to handling sick or dead poultry. Given the risks to human health, the promotion of livestock production for poverty reduction should be accompanied by education in general hygiene and waste management.

Governments often do not appreciate the complex roles that livestock play in rural household economies, and livestock development policies tend to focus on the physical outputs of livestock production, often with an emphasis on marketed products (Behnke, 1985). This perspective is far too narrow: livestock keepers have often been shown to be prepared to keep animals of low physical productivity in their herds because of the many collateral services that livestock provide. This apparent divergence between the assessment criteria of policy-makers and those of livestock keepers is a root cause of livestock sector development policies that contribute little to poverty alleviation.

Pro-poor livestock sector development should not be primarily concerned with maintaining the status quo and preserving smallholder livestock keeping, but with capitalizing on current development trends and maximizing their contribution to poverty reduction. Although only a minority of poor livestock keepers will be able to benefit directly from the expected growth in demand for ASFs, and although growth tends to by-pass the very poor and destitute, pro-poor growth reaches the poor through indirect economic benefits (see Chapter 4) and increases the fiscal space for governments to provide safety nets for those who cannot otherwise benefit from rural development.

SUMMARY AND KEY POINTS

Smallholder farms (< 2 ha) account for a significant often growing share of agricultural production. In African and Asian countries included in the FAO-RIGA database, farms with less than 2 ha of land or fewer than 2 TLU are responsible for between half and three-quarters of total livestock production, and sometimes even more.

The mean size of rural households ranges from 4.0 to 6.7 members, of whom – in most cases – nearly half are dependants. Household heads generally have fewer than five years of formal education, attesting to the low human capital base of rural households. The proportion of households owning land varies markedly among countries. Apart from in Latin America and the Caribbean, mean landholdings are in the order of 1 ha or less. Livestock ownership is usually slightly more prevalent and equitable than landownership, but again mean herd/flock size is small and normally lies between 1 and 2 TLU.

Despite this slim base, in most of the countries in the FAO-RIGA database, agriculture is the sector that provides the most income to rural households, through either household farms or the provision of low-wage employment as agricultural labourers. Livestock are kept by households across all wealth groups, but households in the bottom expenditure quintile are usually more likely to have livestock in their asset portfolios than wealthier households are.

In agricultural households, livestock *reduce vulnerability* by being less reliant on weather conditions than crops, being mobile, and not having a specific harvest season, thereby acting as a store of nutrients and wealth that can be used for smoothing of consumption and expenditure. Livestock also perform social functions and contribute to the building and maintenance of social networks that act as safety nets in times of crisis.

Livestock also enhance the *productivity and income* of farming households by contributing to increased crop output through animal traction and improved soil fertility, using agricultural waste (land), converting lower-value agricultural products into higher-value ones, and providing access to common property resources (often non-arable land), thereby broadening the income-base of resource-poor households. Livestock enhance total household labour productivity through smoothing demand on family labour over seasons, genders and generations, and by providing essential, easily absorbable micronutrients and high-quality proteins for human nutrition, which are particularly important for young children and pregnant and lactating women.

Livestock are an important means of conferring income and status to women. Although women seldom hold property or usage rights to land they often independently own livestock. However, promotion of animal production does not automatically improve women's control over livestock-related income. Overall, it appears that within-household power dynamics,

which are embedded in specific socio-economic contexts, are too complex and diverse to permit simple predictions about the gender-specific impacts of livestock promotion.

While governments tend to focus livestock development policies on marketed products, many livestock keepers attach greater importance to the other services that livestock provide, such as manure, draught power and insurance against risk. This divergence in the priorities of policy-makers and livestock keepers often leads to livestock sector development policies that contribute little to poverty alleviation.

4. Livestock sector development, economic growth and poverty reduction

Chapter 2 presented an overview of the distribution of poverty across the six main regions of the developing world; trends in the livestock sector's contribution to agricultural value added in these regions; and projections suggesting strong emergent demand for ASFs, particularly in low-income countries, due to growing populations and rising per capita incomes. Meeting this growing demand through expansion of the rural livestock sector could help launch a self-sustaining process of economic growth and more balanced development. Chapter 3 analysed livestock's role in the rural economy, linking increased incomes from poor households' livestock-related economic activities to increased food and non-food expenditures. As ASFs have relatively high income elasticities of demand, livestock are particularly attractive as a means for rural households to participate in urban-based and overall economic growth. This chapter pursues this link between livestock sector development and economic growth by reviewing the concept of pro-poor growth and how the rural and agriculture sector in general, and the livestock sector in particular can be a catalyst for pro-poor growth in developing countries.

The chapter first surveys the theoretical and empirical literature linking economic growth and poverty reduction. This is followed by a more detailed examination of the role of agriculture in general and livestock in particular, tracing their linkages from low-income rural populations to the rest of the economy via agrifood supply chains. The chapter finishes by presenting empirical estimates of the multiplier effects of agrifood and livestock demand and productivity growth. These results reveal how promotion of the agrifood and livestock sectors can be a potent catalyst for growth and poverty reduction.

ECONOMIC GROWTH AND POVERTY REDUCTION

Much recent economic literature has focused on the relationships between economic growth and poverty reduction in developing countries, and most economists and policy-makers would agree that economic growth reduces poverty. The strongest assertion on this relationship was made by Dollar and Kraay (2002), whose controversial study suggested that the average incomes of the poorest quintile of a country, on average, rise or fall at the same rate as the overall average income. This conclusion arises from the strong empirical regularity of this phenomenon (the elasticity of the mean income of the lowest quintile to the national average income being 1) in a large sample of 92 countries over the past four decades. The same study also examined a number of policy-related factors thought to have direct effects on the incomes of the poor through their effect on income distribution (e.g., years of primary education, social spending, agricultural productivity, and formal democratic institutions), but found little evidence of such effects. The

controversies generated by the study revolved around the questions of whether or not economic growth was a sufficient condition for poverty reduction; income (re)distribution was important; and changes in income distribution would naturally follow the inverted U-shaped behaviour suggested by the Kuznets Hypothesis¹⁵ as economic growth in developing countries progressed.

Since the 1980s, more advanced and detailed econometric studies have been made possible by the proliferation of Living Standard Measurement Survey datasets for developing countries, allowing the observation and monitoring of changes in household incomes, poverty indices and income distribution. Adams (2004), for example, analysed two sets of relationships: that between economic growth (increasing per capita income) and poverty reduction (measured by the headcount index of \$1.08/person/day); and that between economic growth and income distribution (changes in the Gini coefficient), using the 2001 World Bank Global Poverty Monitoring database of 60 developing countries and 126 data intervals spanning the 1980s and 1990s. The first analysis confirmed that, on average, there is a significant inverse relationship between economic growth and poverty incidence. However, estimation of the second relationship did not confirm the Kuznets Hypothesis of an inverted U-curve behaviour of income inequality. With respect to the first result, the significance of the “on average” qualification can be seen from the summary of findings on growth and poverty reduction in the sample used, shown in Figure 4.1.

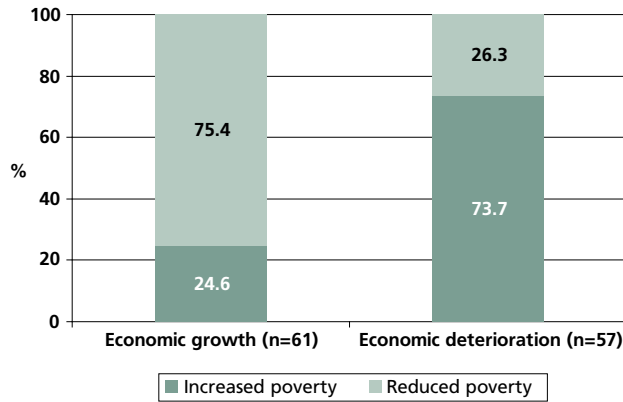
In general, poverty declined with economic growth (in 75 percent of cases) and rose with economic deterioration (in 74 percent). However, in 15 of the 61 instances (25 percent) where economic growth occurred, the features of that growth were such that poverty incidence was not reduced, i.e., economic growth was not a sufficient condition for poverty reduction. Conversely, poverty fell in 15 out of 57 observed time periods, despite overall economic deterioration.

Ravallion (2007) investigated the relationships among economic growth, changes in income distribution and poverty reduction further, using data from the World Bank's PovcalNet and World Development Indicators, representing 80 countries and 290 observations between two successive household surveys for each country, and spanning the period from about 1980 to the early 2000s. Over this period, the investigation found little or no correlation between changes in the distribution of income and rates of economic growth. As growth occurred, the proportion of cases in which inequality fell was about the same as the proportion of cases in which it rose. In general, across countries, it appeared that growth tended on average to be roughly distribution-neutral. However, the author cautions against drawing hasty policy conclusions from this finding, which merely revealed that *on average*, during the process of growth over the observed period, there was very little effective redistribution in favour of either the poor or the non-poor. This should not be interpreted as suggesting that distribution outcomes are unimportant for the poor, or that policy-makers in developing countries should focus on economic growth alone.

In most cases, the distribution-neutral feature of growth over the last two decades

¹⁵ This hypothesis refers to the claim from pioneering work by Simon Kuznets, who – using cross-section data of different countries – concluded that as the economy grows, income distribution initially tends to worsen (the Gini coefficient increases) but, beyond an intermediate level of income, it improves with further economic growth.

FIGURE 4.1
Economic growth and poverty reduction in developing countries, 1980s to 1990s (n=118)



Source: Adams, 2004.

provides insight into the findings of many empirical studies that poverty indices tend to fall with growth. As variation in initial inequality among countries is accounted for, the different rates of poverty reduction for the same rate of growth can be more clearly understood. While inequality does not generally disturb the inverse relationship between growth and absolute poverty measures, it affects the strength with which a given rate of growth reduces poverty. Intuitively, growth without effective redistribution policies tends to be distribution-neutral, and the greater the inequality at the outset, the less the poor will gain from the growth, largely because they initially own a smaller share of the initial “pie”. Ravallion (2007) posits the following conceptual relationship between growth and poverty reduction:

$$(1) \text{Rate of change in poverty } (\dot{r}) = \text{Growth elasticity of poverty } (\varepsilon) \times \text{Growth rate } (\hat{g})$$

where *growth elasticity of poverty* (ε) is the proportionate change in the measure of poverty arising from a given rate of economic growth, and in general has a negative sign.

Ravallion further asserts that the rate of poverty reduction is directly proportional to the “distribution-corrected rate of growth”. He then refines the basic model (equation 1) to try to capture the impact of income inequality on the responsiveness of poverty rates to aggregate income growth. A simple empirical model that fits well with the relevant developing country data is given by:

$$(2) \dot{r} = [k \times (1 - \text{Gini})^\theta] \times \hat{g}$$

where $k < 0$ is a constant of proportionality, *Gini* is a standard index of (initial) income inequality, and $\theta \geq 1$ is a parameter that captures the strength of inequality's influence on the relationship between growth and poverty. As the Gini ratio increases towards unity (rising inequality), the entire term in brackets (the growth elasticity of poverty), ε , becomes

smaller (approaching zero), thereby attenuating the effect of growth on poverty reduction.

Calculating the growth elasticities of poverty across 90 developing countries, and relating these to their initial Gini ratios, Ravallion (2007) obtained quite clear results for changes in the poverty headcount index (using the \$1/day poverty line) achieved in different situations. The correlation coefficient was 0.26, significant at the 1 percent level. The line of best fit traces a path where growth elasticity reaches its highest average absolute value ($\varepsilon = -4$) at low levels of inequality ($\text{Gini} \leq 0.20$), and passes through zero at a Gini index of 0.60. Proceeding further, Ravallion estimated values for the two parameters of the empirical model (equation 2) and obtained $k = -6.07$, and $\theta = 2$. Table 4.1 shows the impact that the initial inequality and poverty conditions have on the poverty headcount index's responsiveness to growth. Demonstrating how the initial level of inequality influences the poverty reduction's responsiveness to growth, he focused on two country cases, starting with the same poverty headcount of 40 percent and growing at the same rate of 2 percent per annum. The only difference between the two cases was their initial degree of inequality.

Differences in the initial level of inequality result in quite disparate outcomes. In the low-inequality country, poverty reduction is three times more responsive to the same rate of growth ($\varepsilon = -2.97$) than it is in the high-inequality country ($\varepsilon = -0.97$). At an average annual growth rate of 2 percent, poverty falls by nearly 6 percent per year in the low-inequality country and by less than 2 percent in the high-inequality country. At these rates of poverty reduction, it would take 35 years to halve the poverty headcount to 20 percent in the high-inequality country and only 11 years in the low-inequality country. Thus, in low-inequality countries, even modest rates of growth would result in relatively rapid poverty reduction.

This work reveals that while growth may contribute to poverty reduction, initial conditions of inequality strongly influence the pace of improvements in living standards of the poor. For this reason, a purely macroeconomic focus is likely to miss many opportunities that might arise from closer attention to the detailed determinants of livelihoods and income inequality. Simply put, aggregate growth is too blunt a policy instrument for effective poverty reduction. Instead, growth needs to be targeted and coupled with improvements in the distribution of incomes, so that the poor benefit disproportionately from the growth.

Table 4.1
RESPONSIVENESS OF THE POVERTY HEADCOUNT INDEX TO GROWTH, BY INITIAL INEQUALITY AND POVERTY CONDITIONS

Initial state	Gini ratio	Annual growth rate (%)	Initial poverty headcount (%)	Total growth elasticity	Annual rate of poverty reduction (%)	Time to halve headcount index (years)
Low inequality	0.3	2	40	-2.97	-5.95	11
High inequality	0.6	2	40	-0.97	-1.94	35

Source: Adapted from Ravallion, 2007.



Credit: ©FAO/Giulio Napolitano

AGRICULTURE, RURAL DEVELOPMENT AND PRO-POOR GROWTH

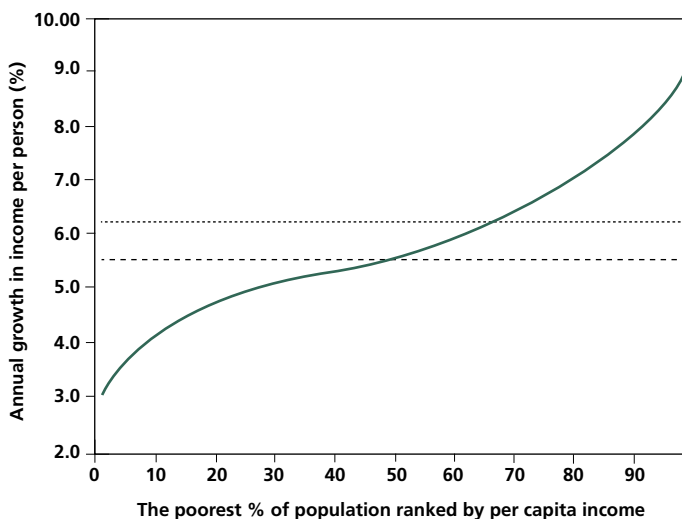
Given the need for focused development policies that propagate the benefits of economic growth more widely, it is necessary to take the circumstances of the poor into greater account, particularly those of the rural poor majorities in developing countries. For some authors, any growth that leads to poverty reduction is pro-poor. For others, growth is pro-poor only if it results in a disproportionate increase in incomes for the poor, i.e., it leads to declining inequality. Klasen (2007) goes beyond theoretical conceptualizations and argues that from a policy perspective, it is useful to define *pro-poor growth* as growth that maximizes income gains for the poor and thus accelerates progress towards meeting MDG 1. Although high overall economic growth can also bring about high income growth for the poor, such income growth will be even higher if the overall economic growth is accompanied by a reduction in inequality, allowing the poor a greater share in growth.

Ravallion and Chen (2003) construct *growth incidence curves* (GICs)¹⁶ across income strata in various developing countries, using the example of China in the 1990s. Here, although rapid overall economic growth was accompanied by increasing real incomes for the poor, the incomes of higher-income groups rose at a much faster rate, widening the income disparities. The resulting GIC for China is shown in Figure 4.2. While the economy was growing at about 6.2 percent per year, the mean income of the poorest 20 percent was increasing at only about 4 percent, while that of the richest 10 percent grew more rapidly than the average growth rate.

This inequitable (inequality-increasing) growth in China from 1990 to 1999 did not represent a natural phase of inequality rising with growth, in accordance with the Kuznets Hypothesis. For the sub-period 1993 to 1996, China experienced income growth averaging 8.2 percent per annum, while income inequality decreased. The income growth of the poorest

¹⁶ The GIC gives the rate of income growth in each percentile of the income distribution, ranked by income per person.

FIGURE 4.2
Growth incidence curve for China, 1990 to 1999



Source: Ravallion and Chen, 2003.

decile averaged 10 percent per annum, which was higher than the overall mean, indicating a pro-poor distributional shift. This distributional shift can be traced to a sharp reduction in the taxation of farmers in the mid-1990s. In China since 1980, periods of more rapid growth saw declining inequality, the fastest growth periods for agriculture did not coincide with periods of slower growth in the primary and tertiary sectors, and the provinces with more rapid rural income growth experienced steeper reductions in inequality (Ravallion, 2007).

A recurring theme in the literature of pro-poor growth is the significance of expansion in the agriculture and rural sector for achieving not only increased aggregate growth but also a growth process that is more inclusive of the poor. As mentioned earlier, even with the slowly changing profile of rural and urban poverty in the world, in 2002 – using the \$1/day poverty line – the rural share of the poor remained 75.8 percent of the total, and the rural poverty headcount index (29.3 percent) was more than double its urban counterpart (12.8 percent) (Chen and Ravallion, 2007).

The majority of the rural poor in developing countries rely primarily on agriculture for their livelihoods; although the degree of this reliance varies among and within countries, agriculture remains the most important economic activity for the poor in both developing and emerging agrarian economies (World Bank, 2008). For economic growth to result in significant poverty reduction it must reach the poor, either by changing their economic activities or by linking existing activities to the growth process. Table 4.2 presents selected socio-demographic characteristics of developing countries, categorized into three groups according to the dominant structure of their economies: i) agrarian; ii) emerging; or iii) urbanized.

Table 4.2
SELECTED SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THREE CATEGORIES OF
DEVELOPING COUNTRIES (PERCENTAGES)

Indicator	Agrarian economy	Emerging economy	Urbanized economy
Share of agricultural value added in GDP	29	13	6
Share of rural population	68	63	26
Share of agricultural workers in the labour force	65	57	18
Total poverty rate	49	22	8
Rural poverty rate	51	28	13
Urban poverty rate	45	11	6
Share of rural poor in total poor	70	80	46
Total population (millions)	615	3 510	965

Source: World Bank, 2008.

Focusing on only the share of agricultural value added in national GDP masks the magnitude of the potential contribution of agriculture-led growth to poverty reduction. While the share of agriculture in GDP tends to decline as economic development proceeds, this does not imply that faster economic growth and poverty reduction will be achieved by stimulating growth in the industrial and service sectors at the expense of agriculture. Several country studies in Asia and Africa have shown that GDP growth generated by growth in agriculture has stronger poverty reduction impacts than the same growth in non-agricultural activities, particularly in lower-income countries that are starting the process of economic growth and development. In India, for example, studies by the World Bank, based on analysis of a virtually unique set of data on poverty numbers across states and over time, show clearly that agricultural and rural growth reduce poverty drastically, while industrial and urban growth reduce it slightly or not at all (Ravallion and Datt, 1999). Examining longitudinal data from four middle-income Asian economies (Thailand, Indonesia, Malaysia and the Philippines), Warr (2002) found that while agricultural development reduced the incidence of poverty, industrial growth had the opposite effect. This observation also applied to Bangladesh (Woden, 1999) and was confirmed for Indonesia (Thorbecke and Jung, 1996). Cross-country analyses by Timmer (1997) and Bourguignon and Morrison (1998) yielded similar findings.

The underlying source of differential impacts between agricultural growth and non-agriculture-led growth is the large multiplier effect that growth in agriculture generates through its pervasive linkages to the rest of the economy, which are much stronger than those in most industrial and service sectors. On average, the inclusion of growth linkages nearly doubles the national income growth following an initial investment in agriculture, and agricultural investments are also found to generate the largest impact on the poor. For example, a comparison of eight African economies shows that agriculture-led growth strategies typically increase the incomes of the poor more than manufacturing-led growth does (Haggblade, Hazell and Reardon, 2005).

Such multiplier effects come from horizontal (consumption-oriented) and vertical (production or supply chain) linkages. The consumption linkages occur when agricultural

Table 4.3
AGRICULTURAL GROWTH LINKAGES IN ASIA, AFRICA AND LATIN AMERICA

Region	Initial agricultural income increment	Magnitude of additional income growth			Share of source of linkages (%)	
		Total	Rural non-farm	Other agriculture	Consumption (horizontal)	Production (vertical)
Asia	1.00	0.64	0.58	0.06	81	19
Africa	1.00	0.47	0.30	0.17	87	13
Latin America	1.00	0.26	0.21	0.05	42	58

Source: Haggblade, Hazell and Reardon, 2005.

households, which gain income from the initial growth in farm output, spend that additional income on mainly local goods and services. As illustrated in Chapter 2 (Table 2.12), in the less developed regions of sub-Saharan Africa, South Asia, and East and Southeast Asia, of an additional \$1 of income (or expenditure), between 40 and 47 percent is spent on food (staples, ASFs, fish, fruits and vegetables, and other food items), with the rest going to (largely domestic) non-food goods and services. Economic activities respond to this increase in demand.

The production linkages that arise from the agriculture sector are amplified by downstream value creation, as distribution, processing and marketing activities refine the agricultural products and pass them on to consumers. By generating employment and income from additional economic activity, growth of the livestock sector stimulates forward and backward linkages, comprising demand for agricultural inputs and services. For Asia, Africa and Latin America, Haggblade, Hazell and Reardon (2005) generated estimates of the direct and indirect effects of agricultural growth on other sectors of the economy and on the economy as a whole, assigning the source of these impacts to consumption and production linkages respectively (Table 4.3).

The differences in the total additional income impacts of the initial agricultural income increment indicate how strongly other sectors of the economy are linked to agriculture. In Table 4.3, the linkages are strongest in Asia, and rather weak in Latin America. In Asia, \$1 of initial agricultural income growth stimulates another \$0.64 of income growth through its multiplier effects. In Africa, the equivalent figure is \$0.47, and in Latin America it is a comparatively low \$0.26, reflecting the high urbanization of most Latin American countries, with agriculture contributing a relatively small 6 percent of total GDP, while high inequalities exist in the agriculture sector. In all regions, the positive income impacts occur mainly in the rural non-farm sector, as opposed to in other agricultural activities, implying that rural services and other non-farm enterprises respond positively to the initial increase in agricultural income. This is because farm consumption in developing countries is primarily from own production, and cash expenditures are concentrated on local non-food goods and services. In both Asia and Africa, consumption expenditure linkages overwhelmingly dominate, but in Latin America, production linkages are slightly stronger.

The size of the poverty reduction impacts of agriculture-led growth in a developing economy is influenced by: i) the size of agriculture relative to the overall economy; ii) the

strength of the linkages between agriculture and the rest of the economy; iii) the use intensity of the factor with which poor households are primarily endowed – labour – in the growth sector; and iv) the consumption patterns of poor and non-poor households.

In agrarian economies, the agriculture sector's contribution to GDP is fairly large, at about 30 percent, as shown in Table 4.2. Thus, irrespective of the multiplier effects, the direct poverty reduction impacts of agricultural development are already significant. Conditions ii) and iii) in the previous paragraph are closely linked. If agricultural output growth is fuelled solely by intermediate inputs that make little use of domestic resources and/or are produced by capital-intensive industries, the effects on other sectors and households are likely to be small. Haggblade, Hazell and Reardon (2005) attribute the relatively small consumption multipliers in Latin America to the estate-led character of agriculture in that region. Condition iv) is also important, because if additional household incomes are spent on consumption goods and services that are supplied locally, or at least domestically, then growth in non-farm activities will be stimulated.

THE ROLE OF LIVESTOCK IN GENERATING AGRICULTURAL AND OVERALL ECONOMIC GROWTH

The livestock sector makes diverse contributions to rural livelihoods and to agriculture as a whole. Growth of livestock sector activity thereby stimulates growth of the overall economy, through direct income impacts on households engaged in livestock production and via a web of indirect horizontal and vertical multiplier linkages along expenditure and supply chains.

The strength of the income growth and poverty reduction impacts that are attributable to livestock sector development, on the agriculture sector and on the overall economy, depends on the factors listed in the previous section, but pertain more narrowly to livestock as a subsector of agrifood activities and the economy as a whole. Thus, in analogy to the list in the previous section, the size of the income and poverty reduction impacts of livestock sector growth depend on: i) the size of the livestock sector relative to agriculture and to the overall economy; ii) the strength and extent of the linkages between the livestock sector and the rest of the economy; iii) the use intensity of the factor that poor households are primarily endowed with (labour) in the livestock and linked growth sectors; and iv) the consumption patterns for meat, animal products and other allied food and non-food goods.

As seen in Chapter 2 (Table 2.8), in 2007 the average share of the livestock sector in agricultural GDP was about 35 percent, varying among country groupings from a low of 23 percent in low-income countries to highs in middle-income developing regions, such as 43 percent in Latin America and the Caribbean and 45 percent in Eastern Europe and Central Asia. While the stylized pattern is that the share of agricultural GDP in the overall economy tends to decline as countries move from lower- to middle-income status, the share of the livestock sector in agricultural GDP tends to increase. This pattern is consistent with the emergence and modernization of the agriculture sector. As countries move up the development ladder, although the relative importance of agriculture in the total economy may decline, the sectors with higher value added and producing goods with higher income elasticities, such as livestock, fruits and vegetables, expand as the formerly dominant staple goods contract in relative terms. Focusing on low-income countries, where poverty incidence and depth are highest, the importance of the livestock sector

as a catalyst for poverty reduction lies in its superior growth potential within agriculture and the rural economy.

The second factor that influences the size of the income and growth multiplier effects from the livestock sector relates to the strength of linkages between the livestock sector and the rest of the economy. Using the sample countries from the FAO-RIGA dataset, Chapter 3 suggested that purely subsistence households are rare, and that the vast majority of rural households engage in market activities, even though they also produce food (mainly staples) for home consumption. In seven of the 12 sample countries, farm households sold between 30 and 68 percent of their livestock produce, and the poorest households (bottom quintile) sold about the same proportion as their wealthier counterparts. This confirms the tight linkage between rural livestock producers and the local economy, to which they supply primary product to the first-level exchange point in the whole supply chain.

Chapter 2 showed that the impressive growth in demand for livestock products in developing countries is skewed towards more rapid demand growth in urban centres (than in rural areas) as urbanization progresses. Thus, from the first market exchange link for livestock products, in rural areas, the raw material will undergo product transformation and transport at various stages of processing and value addition along the supply chain, until it reaches the final consumers in urban centres. Along this chain, the consumption and production income multipliers will operate to propagate output, employment and income benefits across the economy. Livestock product processing tends to be very labour-intensive and mechanization is difficult and costly, leading to substantial employment opportunities. In Bangladesh, for example, where milk is processed into an array of high-value sweets, it has been estimated that some ten jobs are created for every 100 litres of milk marketed (Omore *et al.*, 2004). Similarly, manual poultry processing currently provides direct employment to nearly 5 000 workers in the main poultry market of Delhi (Gangwar, Saran and Kumar, 2010).

The third factor determining the size of the income multipliers of growth in the livestock sector is the use intensity of the factor that is the rural poor household's primary endowment: labour. Chapter 2 showed that globally, the highest densities of poor livestock keepers are found in mixed crop-livestock systems in South Asia and sub-Saharan Africa. In general, these are integrated smallholder systems where crop by-products and residues are the primary feed for livestock, and livestock are used as draught power in farm operations, livestock manure is used as fertilizer for crops, or both. Chapter 3 provided evidence that among rural households raising livestock, the transformation of crop by-products and residues into usable animal feed, and the use of farm animals as draught power in farming operations are undertaken mainly by household members using manual labour. When the farm is not self-sufficient in inputs, replacement stock and fodder are purchased from neighbouring households, while other locally sourced inputs are produced under labour-intensive technologies. In such systems, both the individual and the community value-added components and producer rates of return are relatively high.

In contrast, in the intensive landless livestock production systems used by corporate enterprises and commercial farming households in peri-urban areas, the main intermediate inputs to livestock production – growing stock, feed and other additives – are supplied by other commercial farms and formula feed suppliers. In these systems, there is very little value addition at the household level.



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The fourth factor influencing the size of the income multiplier effect is the consumption pattern for meat and milk, and its impact on the use of other food and non-food goods by poor and non-poor households. Chapter 2 showed that in the lower-income developing country regions of sub-Saharan Africa, South Asia, and East Asia and the Pacific, more than half (53 to 61 percent) of total expenditure is devoted to food. In contrast, households in high-income countries spend only about 13 percent of disposable income on food.

In these same lower-income regions, about 30 percent of the food budget is spent on staples (bread and cereals). However, income elasticities of demand for food overall are low (typically less than unity), while those for non-food items are relatively high (greater than unity). Given these elasticities and budget shares, as income increases, less than half of each additional \$1 of new expenditure would be devoted to the purchase of food items. Within the food group, livestock and dairy products have higher income elasticities of demand than cereals and bread, and as total expenditure on food rises, the share of cereals and bread falls while about 20 to 25 percent of each additional \$1 of food expenditure goes on meat and dairy products. Among the middle-income regions of Eastern Europe and Central Asia, Latin America and the Caribbean, and the Near East and North Africa, the proportion of additional expenditure devoted to meat and dairy products is even higher, at 30 to 35 percent of food expenditures.

The expenditure patterns in developing countries suggest that a large proportion of the additional income generated by growth in the rural livestock sector will continue to be spent on food products, among which livestock and dairy products will become increasingly important relative to staples in the household food budget. However, as higher levels of income are attained, the non-food component will also grow, in both absolute and relative (share of expenditure) terms. Within the food basket, the increasing importance of livestock generally and dairy products in particular represents a strong consumption linkage that reinforces the emerging agrifood demand that can be met by rural households.

Using a panel dataset assembled from the World Bank's World Development Indicators Database and FAO's Internal Statistical Database spanning the period from 1961 to 2003,

Pica, Pica-Ciamarra and Otte (2008) found a statistically significant causal relationship between livestock sector development and economic growth in 36 of the 66 countries analysed (almost 55 percent). Most of these countries were agrarian or emerging economies. Livestock sector development appeared to be an important driver of per capita GDP growth in 33 of the 36 countries in which a statistically significant relationship was found. In nine of them a bi-directional causality was also found. Increases in livestock sector productivity appeared to be driven by per capita GDP growth in only three countries.

To give a more precise idea of the income growth potential of livestock promotion, Table 4.4 presents impact estimates from two sources. The second and third columns present estimates of household income multipliers for livestock production and livestock product processing, across regions. These results are static estimates of expenditure chain effects derived from Social Accounting Matrices in the Global Trade Analysis Project (GTAP) database and are weighted by country GDP.

In general, the household income multipliers for both livestock and livestock products are higher in developing countries than in high-income countries. This demonstrates two robust characteristics of most developing countries: i) greater contributions of the livestock sector to household income; and ii) higher expenditure shares for agrifood products in lower-income countries.

Overall, the magnitudes of the multipliers of livestock production and of livestock product processing are quite similar, as both act on the demand side of the agrifood economy. Differences among regions and countries can be quite large, however, with the multipliers of livestock product processing being markedly higher than those of livestock production in the Near East and North Africa, and sub-Saharan Africa. The similar resource endowments and economic structures within regions, especially for traditional sector activities, are the primary cause of this. Comparing regions, the livestock and processing multipliers are largest for South Asia and sub-Saharan Africa – the regions with the highest poverty incidences – indicating substantial livelihood potential from livestock sector development. Nevertheless, even in the other regions, which tend to have higher per capita income and lower poverty rates, the livestock sector multipliers are substantial.

Building on analysis of detailed data from Senegal, Roland-Holst and Otte (2006) concluded that although lower-income rural households receive smaller absolute gains from the livestock value chain than higher-income groups, the relative benefits to lower-income households are greater. This strengthens the case for livestock as a pro-poor policy instrument, as the marginal effect of improving livestock supply conditions will disproportionately benefit the country's rural poor majority. Multiplier decomposition analysis revealed that the small absolute gain in livestock livelihoods for the poorest comes almost entirely from direct production income. Rural quintiles 1 and 2 obtain more than three-quarters of their livestock-related income directly from animal (product) sales, thus leaving the food value chain at the earliest stages. Higher-income rural households have less direct participation in livestock production.

Higher-income households receive the largest absolute multiplier benefit, which is almost entirely indirect, from food processing and retailing. These more complex downstream linkages to food value creation explain the higher aggregate income gains for this group and have important implications for the net results of subsector policies. As higher-income



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groups generally have more indirect linkages to the livestock sector, they may capture a large percentage of gains, even from policies targeted elsewhere (Roland-Holst and Otte, 2006).

The last two columns of Table 4.4 present the estimated impact on real GNI of targeted livestock sector development strategies, derived by using a dynamic computer-generated environment model to simulate the effects of 5 percent annual productivity growth in livestock production (third column) and in both livestock production and associated food processing (fourth column). The primary determinants of these impacts are similar to those of the multiplier results, i.e., livestock and ASFs as shares of domestic GDP and aggregate household expenditure respectively. The productivity experiments show the extents of developing countries' unrealized potential in the livestock sector. As documented in the original report (Roland-Holst and Otte, 2010), assuming 5 percent annual productivity growth over the next decade is not unreasonable, particularly for lower-income countries operating far below their sector output potential. Livestock sector development can clearly be a very potent catalyst for livelihood enhancement in West and East Africa, and South Asia, and concerted efforts in the agricultural and food processing sector will often yield synergies resulting in more than additive growth dividends.

Within an intersectoral framework, the sizes of household livestock sector multipliers presented in Table 4.4, although large, are only relevant if they are compared with the multipliers for other sectors of the economy. If the multipliers for other economic activities are larger than those of the livestock sector, there is little justification for promoting growth in the livestock sector because growth in other sectors will have stronger impacts on household incomes. Table 4.5 presents the ratios of the household multiplier of livestock production to the household multipliers of other (sub)sectors, such as crops, fruits and vegetables, manufacturing or services, across regions and economic groupings (country values are weighted by population). A ratio greater than unity indicates that the livestock sector multiplier is larger than that of the comparison sector. The computed estimates for the ratios of fruits and vegetables in two regions have been adjusted to exclude two countries that are obvious outliers: Malaysia in East Asia and the Pacific, and Nigeria in sub-Saharan Africa. The inclusion of these countries significantly inflates the weighted regional values and the overall value for developing countries.

Table 4.4
HOUSEHOLD MULTIPLIERS* AND IMPACTS OF INCREASED PRODUCTIVITY (5 PERCENT ANNUAL GROWTH OVER TEN YEARS) IN LIVESTOCK PRODUCTION AND PROCESSING ON TOTAL GNI, BY REGION

Region/country	Household multipliers		Aggregate GNI growth 2010–2020 (%)	
	Primary livestock production	Livestock product processing	Productivity growth in primary production	Productivity growth in production and processing
EAP	2.7	2.4	4.6	9.0
China	2.2	2.1	4.3	8.1
EECA	2.0	4.4	2.7	4.8
LAC	3.2	3.2	3.8	6.9
NENA	2.3	4.9	7.1	14.6
South Asia	4.7	4.3	6.9	14.3
India	4.7	4.4	6.2	13.4
SSA	2.9	5.4	8.3	18.9
West Africa	3.3	5.2	17.9	44.7
East Africa	4.3	6.8	17.6	43.3
Southern Africa	2.7	5.4	2.4	4.5
All regions	2.9	3.2	3.3	6.5
High-income countries	3.1	3.3	0.0	0.3

* Incremental effects of additional \$1 spending on aggregate national household incomes.

Source: Authors' estimates from the GTAP database 2010.

Table 4.5
RATIOS OF HOUSEHOLD MULTIPLIER OF LIVESTOCK PRODUCTION TO HOUSEHOLD MULTIPLIERS OF OTHER SECTORS, BY REGION

Region/country	Crops	Fruits and vegetables	Manufacturing	Services
EAP	1.5	1.1	1.1	1.0
China	1.4	1.6	1.2	1.2
EECA	1.8	0.8	1.1	0.8
LAC	1.6	1.1	1.4	1.1
NENA	1.3	1.1	1.3	0.9
South Asia	1.3	1.1	1.6	1.5
India	1.3	1.1	1.6	1.6
SSA	1.8	1.4	1.5	1.1
All regions	1.5	1.2	1.4	1.3
High-income countries	1.4	0.9	1.4	0.9

Source: Authors' estimates from the GTAP database 2010.

Table 4.5 reveals that across all developing country regions and for all comparisons, the ratio is always close to or above unity, indicating that at the very least, the livestock sector is as strong as the other sectors in promoting household income growth. Across all developing country regions, the income multiplier for livestock production is about 50 percent higher than that of crops, and only marginally higher than that of fruits and vegetables. Compared with growth in manufacturing and services, livestock sector growth has 1.4 and 1.3 times the household multiplier effect, respectively. Within regions, there is substantial variation in the extent to which the livestock income multiplier exceeds those of comparison sectors, indicating variation in the degree to which these sectors are integrated into the rest of the national economy.

Diao and Nin Pratt's (2007) work on Ethiopia provides a country example of the comparative impacts that growth in various subsectors of agriculture has on growth of the national economy and on poverty reduction. As an agrarian economy, Ethiopia is characterized by a very high poverty incidence, a dominant proportion of the population (85 percent) living in rural areas, and agriculture as the main livelihood activity. Taking 2003 as a base year, poverty incidence at the national level was 44.4 percent. The study established that a business-as-usual scenario, in which agriculture sector growth is low, would bring sluggish growth in the whole economy and rising poverty incidence.

To identify the types of investment that have the largest impact on agricultural growth, and consequently result in more pervasive economic growth and poverty reduction, the authors used a disaggregated economy-wide model that allows analysis of growth and poverty reduction linkages involving the major subsectors in the agricultural economy. The four main agricultural subsectors – staple crops, livestock, traditional exportables (coffee), and non-traditional exportables (fruits, cotton, horticultural products, and others) – were evaluated to assess their contributions to economic growth and poverty reduction, by exogenously increasing the productivity growth rate of one sector while maintaining growth of the others at baseline levels. To allow comparisons among different subsectors, the exogenously determined rate of growth in each, independent of the others, should lead to a reasonable and comparable rate of growth in agricultural GDP up to 2015, in line with the MDG 1 target of halving the incidence of poverty by that year.

The staple crops subsector dominates the structure of agriculture in Ethiopia, representing 65 percent of value added, followed by the livestock subsector, which contributes about a quarter (26 percent). Combined, these two subsectors account for 91 percent of agricultural value added, while the other two each account for less than 5 percent. Obviously, if the productivity growth in all subsectors were identical, the larger ones would produce larger effects on agricultural GDP and overall economic growth and poverty reduction. On the other hand, smaller subsectors have greater capacity to grow rapidly, and the investment required to induce productivity growth would be smaller. Viewing the same relationships from another perspective, to achieve the agreed feasible target of 3.4 to 3.5 percent annual growth in agricultural GDP up to 2015, smaller subsectors need higher rates of productivity growth to achieve similar overall impacts, while productivity can grow more slowly in larger subsectors. In the simulations, the respective individual productivity growth rates above the baseline were determined to be 1.5 percent per annum for the staple crops subsector, 3.4 percent for livestock, 13 percent for each of the non-traditional crops, and 7 percent for coffee. The

Table 4.6
GROWTH AND POVERTY REDUCTION OUTCOMES OF DIFFERENT AGRICULTURE
SECTOR GROWTH SCENARIOS

Indicator	Base year ^a	Staple crops only ^b	Livestock only ^c	Non-traditional exportables only ^d	Coffee only ^e
Agricultural GDP growth rate (%)	2.5	3.5	3.5	3.4	3.4
GDP growth rate (%)	3.1	3.9	3.9	3.6	.6
Poverty rate by 2015 (baseline = 44.4)	45.7	36.7	39.7	40.2	42.0
Change in poverty reduction over baseline by 2015	+1.3	-7.7	-4.7	-4.2	-2.4

^a 2003.

^b An additional 1.5 percent above baseline annual productivity growth rate in 2004 to 2010.

^c An additional 3.4 percent above baseline annual productivity growth rate in 2004 to 2010.

^d An additional 13 percent above baseline annual productivity growth rate in 2004 to 2010.

^e An additional 7.0 percent above baseline annual productivity growth rate in 2004 to 2010.

Source: Diao and Nin Pratt, 2007.

respective impacts on overall economic growth and poverty reduction depend on not only the size of the subsector but also the extent and strength of linkages between the subsector and other subsectors in the economy.

Table 4.6 presents the findings of Diao and Nin Pratt (2007) on the impacts on economic growth and poverty reduction of growth in each of the subsectors.

The model results show that stagnant growth in the agriculture sector under the business-as-usual scenario would lead to rather slow growth of the entire economy, which in turn would result in a worsening of the incidence of poverty by 2015.

Comparing sources of growth, an additional productivity increase of 1.5 percent per year in the staple crops sector, although resulting in roughly the same agricultural GDP growth as growth in the other subsectors, generates the largest decline in poverty incidence. This stems from the structure of the staple crops economy in which small farmers engaged in the activity benefit directly from increased productivity. On the consumption side, staple crops are the most important source of food for both rural and urban poor households, and the poor spend about 70 percent of their total income on staple food crops.

In contrast, achieving economic growth through high productivity growth in the coffee subsector generates the lowest reduction in poverty. This reveals the weak consumption and production linkages between that subsector and the rest of the economy. The livestock sector is second to the staple crops subsector in terms of impact on poverty reduction, with a potential for reducing poverty incidence by 4.7 percentage points from the baseline. However, to take full advantage of the close linkages between the staple crops and livestock subsectors and the rural economy, combining productivity increases in both sectors would result in a large drop in rural poverty from 45.8 percent in 2003 to just 33 percent by 2015. Similar results were generated in comparable simulation studies for Uganda (Benin *et al.*, 2008) and the Southern African region (Nin Pratt and Diao, 2006).

These examples demonstrate that even in a staple crop-dominated agriculture sector, the livestock subsector could work as a partner engine for growth and poverty reduction. As the agricultural economy develops, and average per capita incomes increase, staple crops will recede in relative importance within consumption patterns of the domestic economy. The stimulation of agricultural productivity growth should no longer be confined to staple crops and basic food security, but should expand to support a more diversified, higher-value-added agricultural economy (Timmer, 2005). With a larger livestock subsector, agriculture sector growth will make an even more pronounced contribution. As long as smallholders and the rural population are able to participate productively in the expanding industry – whether as direct producers, processors or participants/workers along supply chains for the main domestic markets – growth in the sector will also contribute to poverty reduction.

DISCUSSION AND CONCLUSIONS

There is general agreement that economic growth in developing countries is necessary for reducing poverty, however the importance of agricultural and rural growth in comparison with industrial and urban growth is often undervalued. Agriculture's declining share in GDP is universally noted, while its potential contribution to employment growth is often overlooked, because it is to a large extent indirect (Mellor, 2003).

While growth is necessary, it is not sufficient for achieving uniform poverty reduction across the diverse economies of the developing world. With different initial conditions and different policy packages, a given rate of growth can lead to either a rapid or a slow reduction in poverty. In a growing economy, a high degree of income inequality among households seriously constrains economic growth's ability to reduce poverty. For growth and development to be pro-poor, they must be inclusive by stimulating the economic activities and income opportunities of households living close to the poverty line. In developing countries, such households are mainly among rural populations and are engaged in agriculture and rural non-farm activities.

As a developing economy grows, the industrial and service sectors increase their shares of value added in GDP, while agriculture's share shrinks. It is tempting to conclude that stimulating the industrial and service sectors at the expense of agriculture is the way to accelerate poverty reduction. However, the evidence shows that except for in a few small island states, such a strategy will be of limited success unless large numbers of the rural poor migrate to urban areas. While such demographic transitions are under way in some places, and have occurred in Organisation for Economic Co-operation and Development (OECD) economies, they generally take generations and often lead to the unintended substitution of large-scale urban poverty for rural poverty.

On the other hand, stimulating growth in agriculture, and turning it into a dynamic sector through productivity improvements, has direct impacts on the income of today's rural poor farmers and non-farm enterprises alike, through intensive local consumption and production linkages. However, to reduce poverty significantly, agricultural growth needs to outpace population growth, and small farmers need to be at the centre of the growth process. Increasing the agricultural productivity of small farms would eventually lead to increased labour productivity, reflected in higher rural real wages. Productivity improve-

ments in agriculture would also spill over to poor consumers, through increased supply and lower prices of basic food items, effectively increasing real incomes.

In agrarian economies, growth led by the livestock sector has very strong poverty reduction potential, and is second only to growth in the dominant staple crops sector in its power to reduce poverty over time. In such economies, a strategy of stimulating growth in both livestock and staple crops has greater poverty reduction potential than a strategy that focuses on stimulating productivity growth in only one of these sectors. As developing economies proceed from an agrarian to a more diversified economic structure, high-value commodities, of which livestock is the largest, become the prime drivers of high agricultural growth rates. Demand for and production of high-value agricultural commodities can grow at 6 to 8 percent a year, whereas it is difficult to sustain growth rates of more than 2.5 to 3.5 percent for cereals (Mellor, 2003). High-value commodities tend to be perishable, which creates a strong need for improved rural infrastructure, particularly roads.

However, as developing countries go through the transition to more diversified economies, the formal sector expands, intersectoral linkages become more market-oriented and economic activities become more nationally, regionally and globally integrated. Under these conditions, growth in the livestock sector must keep pace by improving efficiency, product quality and capacity to compete in a liberalized environment without the artificial props of subsidies and protective policy interventions. The policy issues involved in livestock sector growth are thus more complex than those for cereals, and involve support from an expanding agribusiness and finance sector, but the synergies from balanced growth are potentially huge.

SUMMARY AND KEY POINTS

- Economic growth is necessary for poverty reduction, but the magnitude and speed by which growth can reduce poverty over time are strengthened and accelerated when income distribution is less inequitable, and when the poor can participate in the economic activities that experience expansion.
- For more rapid poverty reduction in developing countries, it is not enough simply to focus on rapid aggregate economic growth; attention must also be given to removing the types of inequalities that limit the poor's access to and capacity to exploit the opportunities for economic advancement.
- For growth to be pro-poor, it must achieve income gains for the poor in an inclusive growth process, promoting demand and market participation for activities that use the poor's resources (mainly labour) intensively.
- To accelerate the poverty reduction potential of economic growth in low-income agrarian developing countries, economic activities need to be stimulated where the majority of the poor are located – in rural communities – and in the economic sector in which most of the poor pursue their livelihoods: agriculture.
- The strong poverty reduction impacts of agriculture-led growth arise not only from agriculture's significance in the overall economy but also from strong consumption and production linkages between agriculture and other sectors of the economy. Agriculture's pervasive expenditure and supply chains generate output, employment and income multipliers from the agriculture sector to rural non-farm economic activities and the overall economy.

- In low-income agrarian economies, livestock form an integral part of predominantly smallholder diversified crop-livestock farming systems. Superseded only by larger-scale staple crops, the livestock sector is the second most important contributor to the agricultural economy. Despite its smaller output than that of staple crops, productivity and income growth in the livestock sector have strong income multiplier and poverty reduction impacts. These result from the demand side via direct and indirect income gains among rural households, and from the supply side via linkage to the staple crops sector as a generator of by-products for livestock feed.
- A combined strategy for livestock and staple crop productivity growth, exploiting the close linkage between these two sectors, would have the strongest income multipliers and poverty reduction benefits.
- As developing countries proceed from agrarian subsistence to more diversified market economies, growth in demand for livestock products and other high-value crops becomes stronger, and the livestock sector increases its share in agricultural value added, together with its potential for direct and indirect income and poverty reduction impacts. Marketing agrifood products with high income demand elasticities, such as livestock and their products, provides a way for the rural poor to participate indirectly but very actively in urban growth, propagating the benefits of this growth without social dislocation and other adjustment costs.

5. Markets: the link between households and the economy

The last two decades have witnessed substantial economic growth and livelihood improvements, which have particularly benefited the world's urban inhabitants. Despite this progress, however, close to half of the developing world's population still lives on less than \$2/day. As discussed in Chapter 2, most of these poor people live in rural areas, where they are largely isolated from the growth in urban areas, and agriculture is the primary determinant of their livelihoods. As rising global incomes lead to faster increases in expenditure on non-staple foods, opportunities should materialize for rural smallholder farmers to participate indirectly in the urban growth process by producing and marketing higher-value food products, particularly those derived from livestock. However, this promise of agrifood development, broader domestic food security and poverty reduction remains far from fulfilled because many practical and institutional barriers continue to limit effective market access for the rural poor.¹⁷

This chapter examines linkages between market participation and livelihoods, with special emphasis on linking the rural poor to urban growth through agrifood supply chains. The chapter begins with an assessment of the relationships among poverty incidence, poverty density and proximity to markets. It then reviews the growth in demand for ASFs in developing countries, and the associated supply responses. The chapter highlights the diversity of supply and value chains in developing countries and the large range of barriers to market access commonly faced by small-scale producers. It concludes by suggesting ways of overcoming these market access barriers and identifying actions that governments could/should undertake if they wish to support poverty alleviation through smallholder market integration.

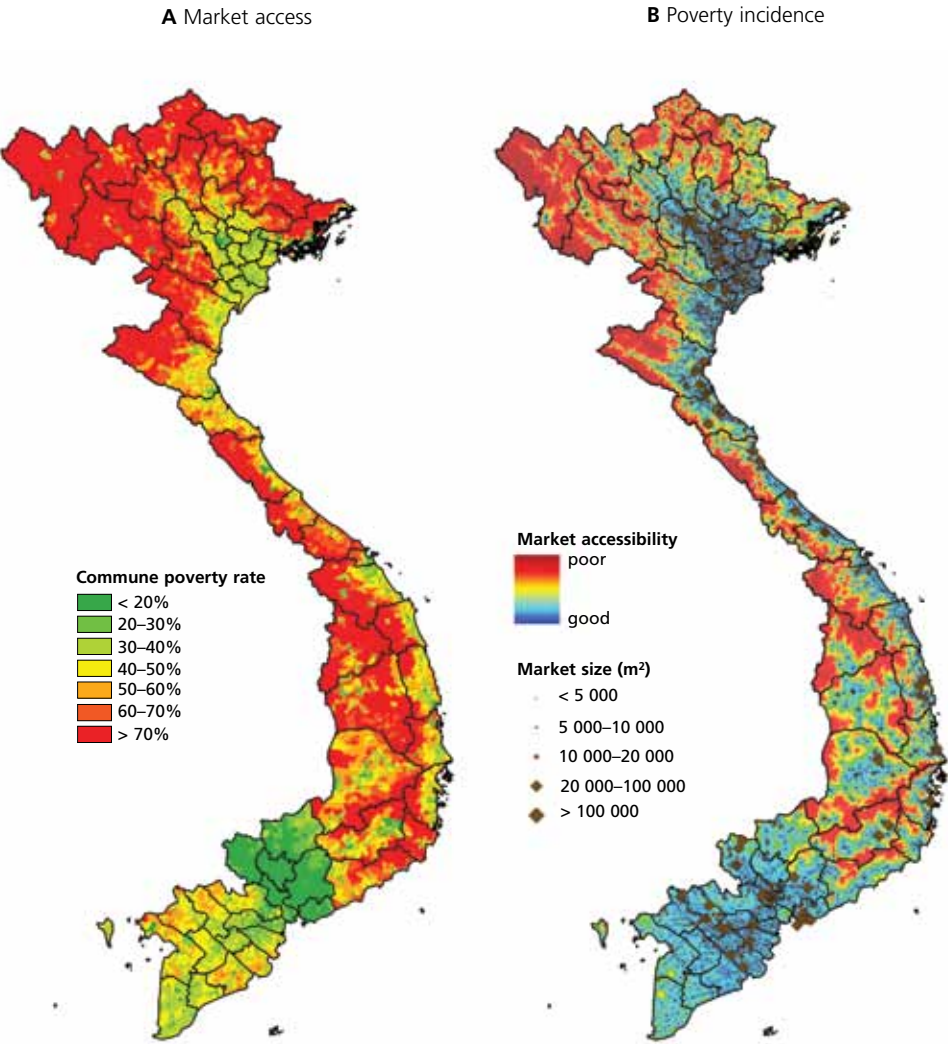
URBAN ECONOMIC GROWTH AND RURAL LIVELIHOODS

Markets¹⁸ are major determinants of livelihoods in modern economies, and improved market access has proved to be a potent catalyst for poverty alleviation in transition economies. In developing countries, rural populations' sustained emergence from subsistence and poverty depends on them becoming market participants. Figure 5.1 illustrates the relationship between market access and poverty in Viet Nam. Figure 5.1B shows the contours of poverty incidence (percentage of the local population below the poverty line, with red being the highest and green the lowest). In Figure 5.1A, formal markets are represented by squares

¹⁷ This issue received attention in the 2008 *World Development Report* (World Bank, 2008). This chapter examines more detailed aspects from a livestock perspective.

¹⁸ Linkages between households and markets are multidimensional. Households can offer labour and resource services in factor markets, purchase consumer goods and agricultural inputs in commodity markets, and market agricultural products directly or sell to intermediaries in agrifood supply chains.

FIGURE 5.1
Market access and poverty incidence in Viet Nam



Source: Epprecht and Robinson, 2007.

FIGURE 5.2A
Poverty incidence and poverty density in Viet Nam, 1999

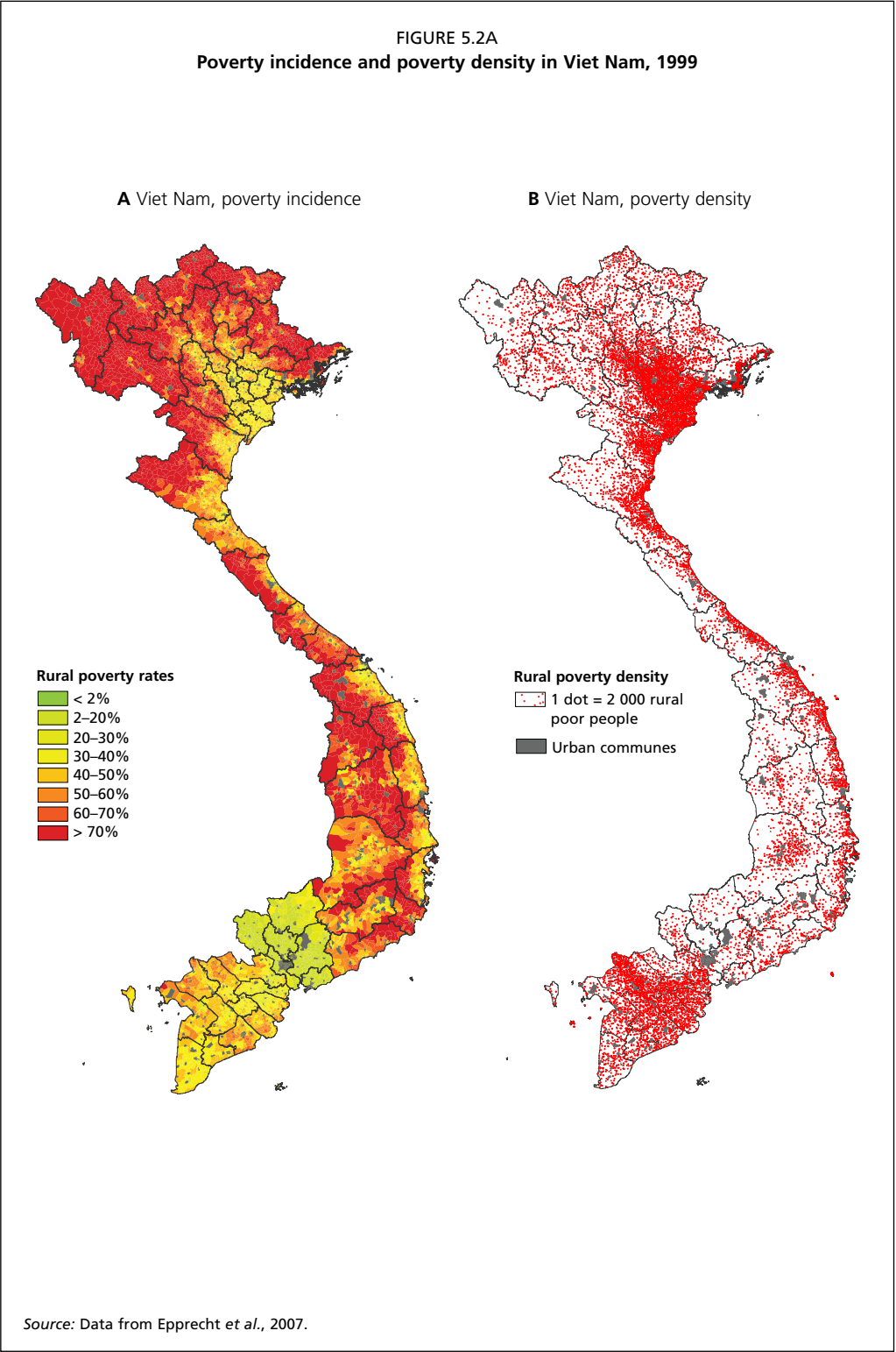
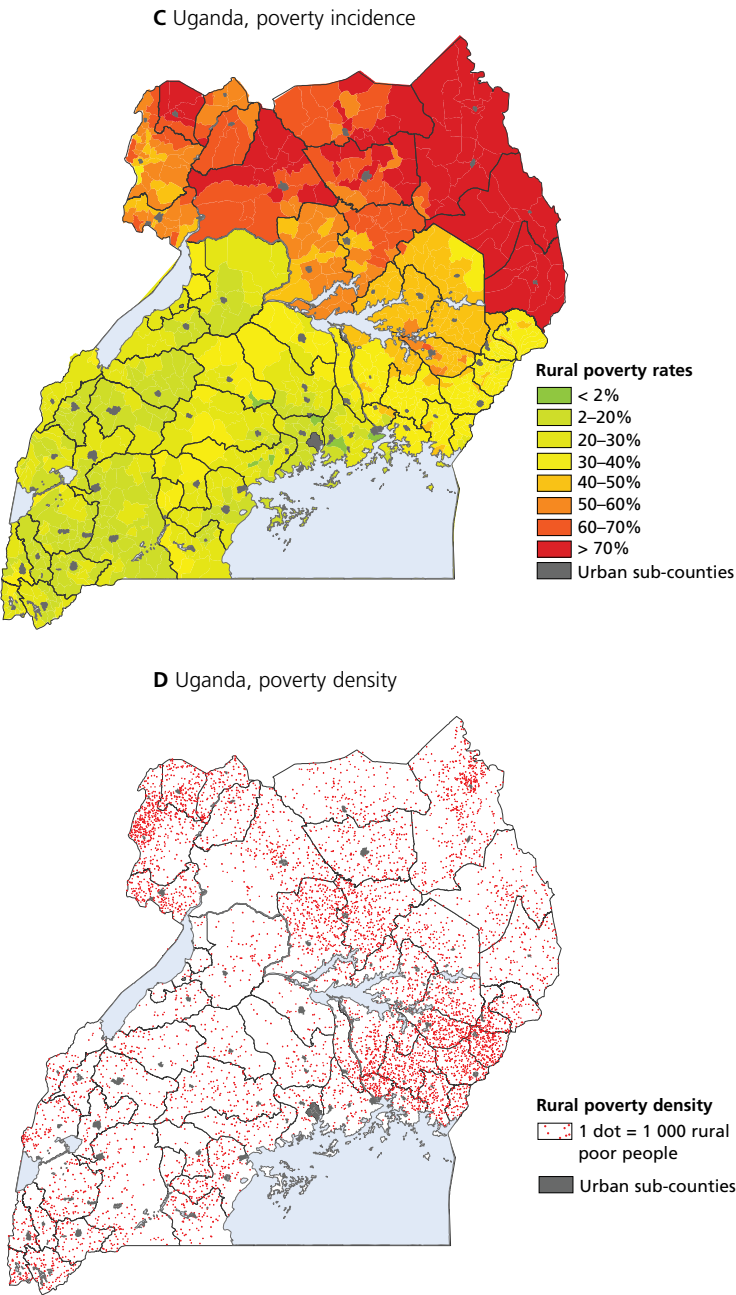
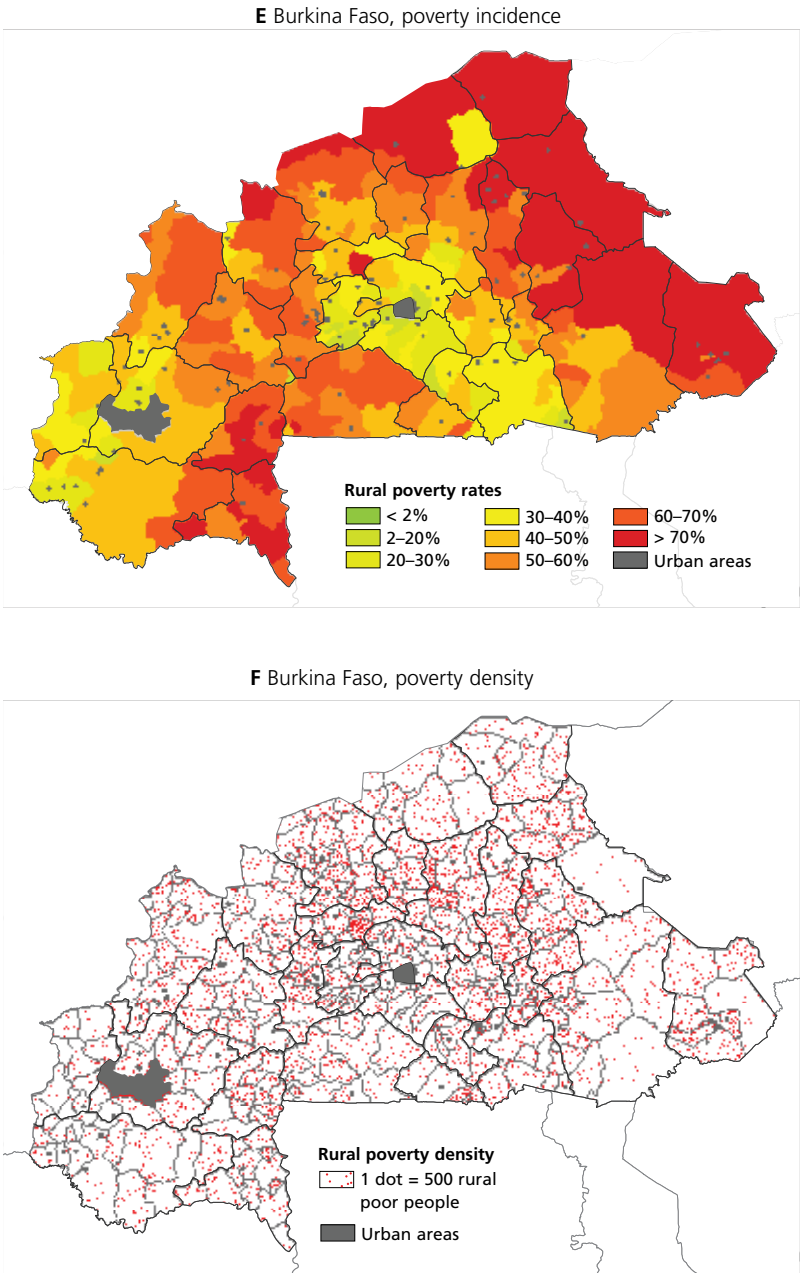


FIGURE 5.2B
Poverty incidence and poverty density in Uganda, 2005



Source: Data from MAAIF et al., 2010.

FIGURE 5.2C
Poverty incidence and poverty density in Burkina Faso, 2006



Source: Data from Kabore, Kone and Ouoba, 2009.

(whose size is proportional to the size of the market). Clearly, poverty incidence (or head-count) is lower near markets, and rises with increasing distance from markets. This finding applies across the vast majority of developing countries.

However, poverty incidence describes only how common poverty is in a given location, and not how many poor people could be affected by a policy or programme that targets that location. As Figure 5.1 makes clear, poverty incidence can be very high in remote areas with little if any market access.¹⁹ Targeted market access policies for reducing poverty in these areas could be quite expensive, requiring large commitments of scarce public investment funds for transport, communication, health and education infrastructure, without helping the majority of the poor. In low-income countries, public funds have high opportunity costs, which make such expenditures difficult to justify on the grounds of cost-effectiveness.

A further implication from this comparison relates to the linkages among growth, trade and poverty reduction. Poor people living in proximity to urban areas may be able to participate in growth induced by trade-oriented industrialization, while the rural poor will not be touched directly by these forces. In the long run, rural households may be able to participate indirectly in urban growth through migration and participation in food markets, particularly if they diversify towards products with relatively high income elasticities (e.g., meat, speciality vegetables, fruit, etc.).²⁰

Most developing economies are undergoing fundamental and sustained demographic transitions as their populations shift from rural to urban residence. This process is sharply increasing urban agrifood demand and presents expanding opportunities for those who remain in the rural sector. Which benefits of growing urban food demand go to rural smallholders and which to rapidly expanding agrifood industries will depend to a significant extent on policy decisions. Without public commitment to promoting smallholders' market participation, it is likely that this group will be economically marginalized, while urban growth masks continuously rising inequality.

GROWTH IN DEMAND FOR LIVESTOCK PRODUCTS IN DEVELOPING COUNTRIES

The last two decades witnessed rapid growth in demand for livestock products in developing countries. The main sources of this growth were continued population growth and rising per capita incomes in developing countries (see Chapter 2). Because livestock products have high income elasticities of demand in low-income countries, rising per capita incomes have been the dominant factor in many countries, which explains why the period has seen increasing per capita consumption of livestock products in emerging economies.

As shown in Table 5.1, from 1995 to 2005, the consumption of livestock products in developing countries grew much faster than the population, and than consumption in developed countries. However, the consumption growth was more rapid in some developing country regions and livestock product categories than others. With the exception of

¹⁹ In northern Viet Nam, poverty incidence appears to be almost proportional to average elevation, reaching nearly 100 percent in mountainous areas.

²⁰ The first great wealth distribution in modern China occurred in the early reform period of the 1980s, when farmers were permitted to sell their own produce in urban markets, rather than delivering it to State intermediaries.

Table 5.1
ANNUAL GROWTH IN CONSUMPTION OF LIVESTOCK PRODUCTS, BY REGION,
1995 TO 2005 (PERCENTAGES)

Region/country	Bovine meat	Pig meat	Poultry meat	Eggs	Milk ^a
EAP	4.0	3.6	4.7	3.6	9.3
China	4.8	3.5	4.9	3.7	12.7
EECA	-2.7	-1.1	5.2	1.4	0.6
LAC	1.6	2.0	4.4	3.0	1.7
NENA	2.6	1.9	5.9	2.9	3.1
South Asia	0.2	0.5	5.2	5.1	3.3
India	-1.2	0.4	4.8	5.3	3.0
SSA	3.0	2.6	5.4	3.0	2.3
All regions	1.3	2.8	4.9	3.3	2.9
High-income countries ^b	0.2	0.9	2.6	0.8	0.8

^a Excluding butter.

^b Based on 2010 World Bank classification.

Source: FAOSTAT, 2010.

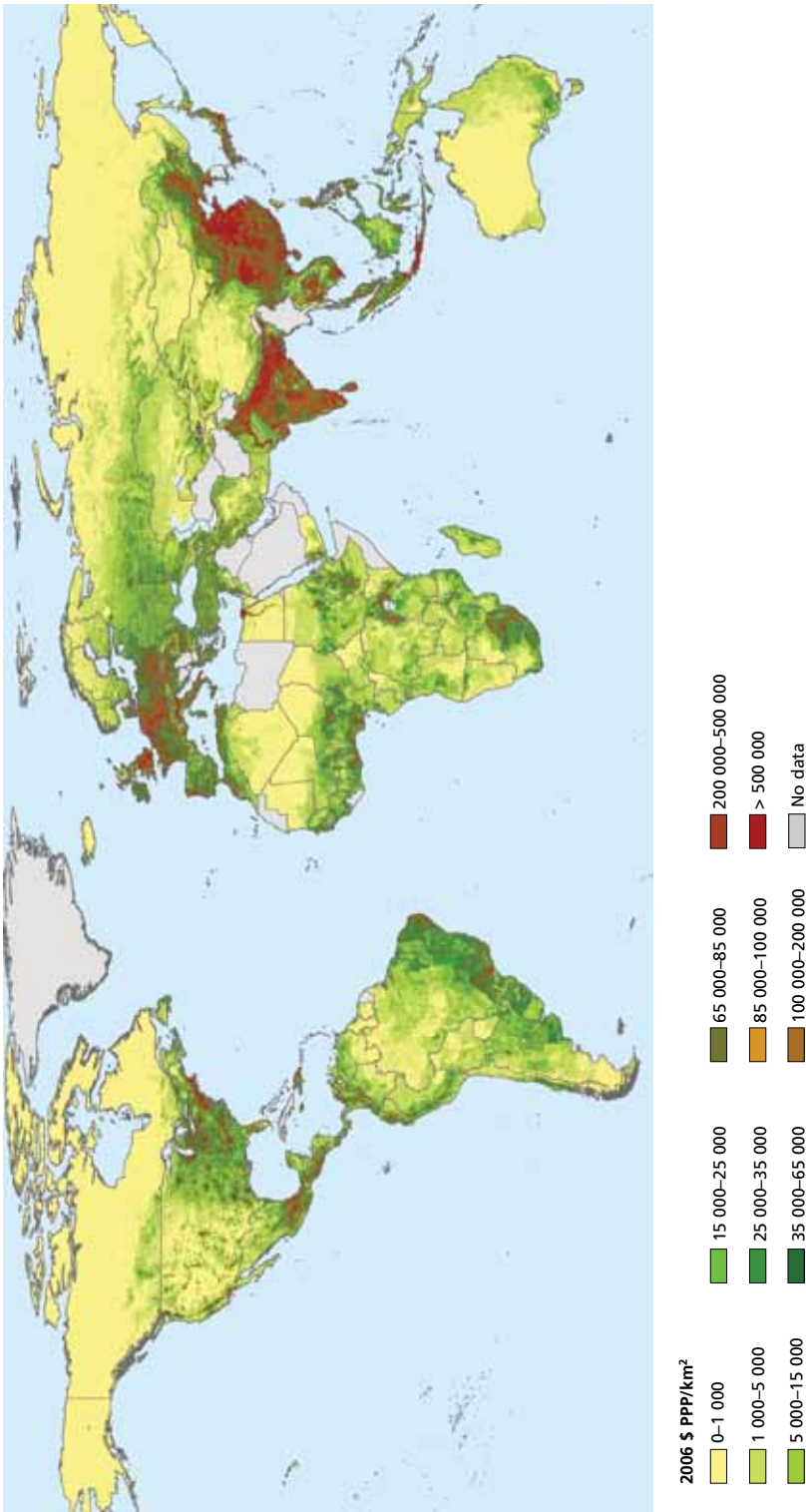
bovine and pig meat in Latin America and South Asia, annual demand growth for all major livestock products in all developing country regions ranged from a low of 1.8 percent (pig meat in the Near East and North Africa and milk in Latin America and the Caribbean) to a high of 8.1 percent (poultry meat in South Asia). Overall, the most rapid demand growth occurred for poultry meat, eggs and milk.

While livestock sector growth rates have been impressive, the significance of livestock production within countries is changing in important ways. Economic development is characterized by both a declining relative size of the agriculture sector in national economies and structural changes within the agriculture sector. In particular, as economic development advances, livestock can emerge as the largest single contributor to agricultural value added: in industrialized countries the livestock sector accounts for an average of 53 percent of agricultural value added, compared with about 35 percent in developing countries (FAOSTAT, 2010). This structural change in agriculture reflects human food consumption patterns, as described in Chapter 2.

Although developed countries have much higher average incomes than developing ones, food expenditure, including on ASFs, is just as concentrated (expressed as United States dollars spent per square kilometre), or even more so, in developing countries because consumers use a large proportion of their income to satisfy their need for food items (Figures 5.3 and 5.4). The current expansion of these already large ASF markets represents enormous income potential for the rural poor, many of whom already own livestock, to provide a complex array of goods and services (see Chapter 3).

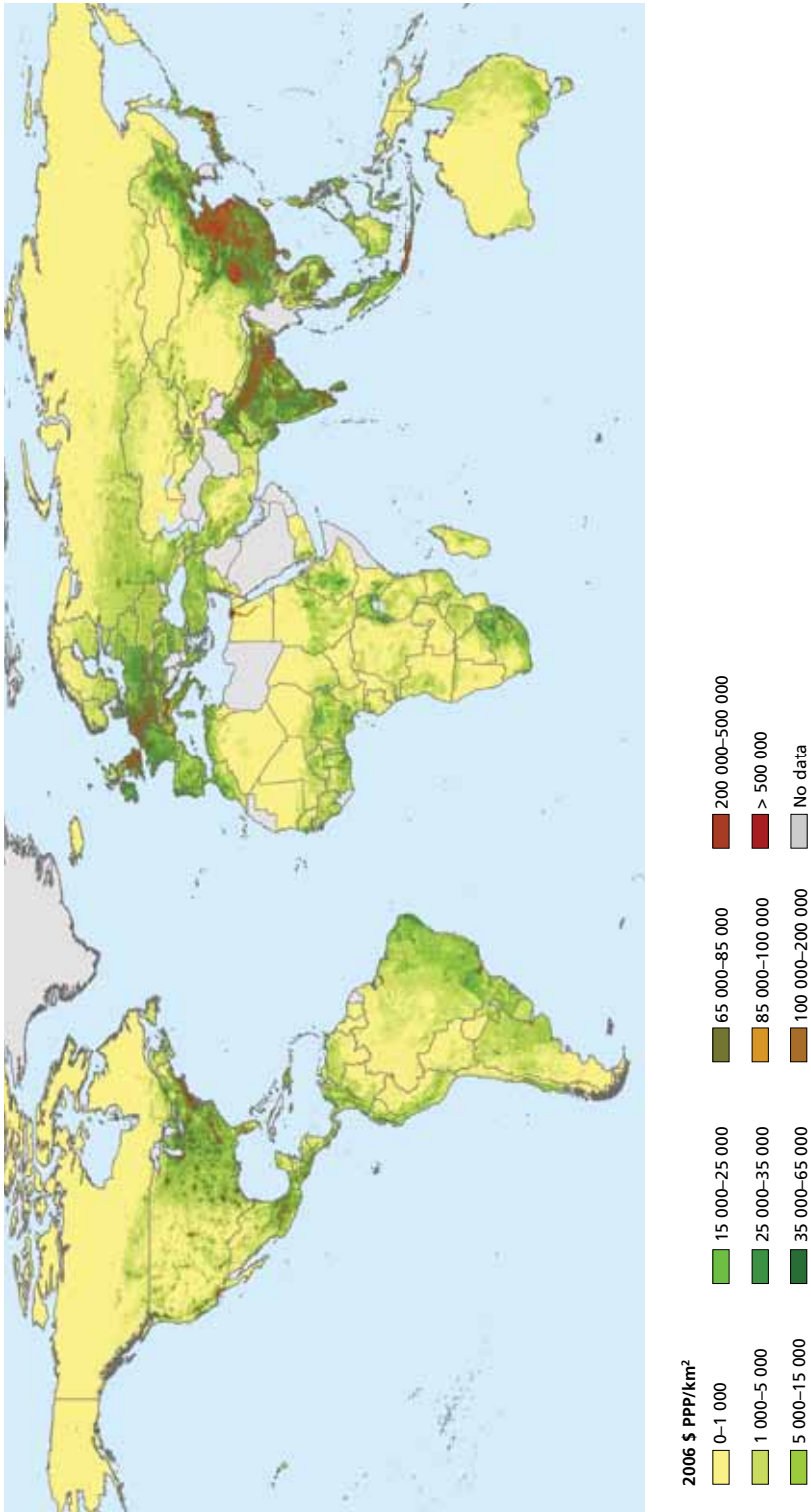
Unfortunately, livestock's vast potential for poverty reduction, associated with appropriate sector development and both its direct and indirect effects, remains largely untapped.

FIGURE 5.3
Food expenditure density



Source: Otte et al., 2008.

FIGURE 5.4
Meat and dairy expenditure density



Source: Otte et al., 2008.

There are many reasons for this:

- Market and institutional imperfections, including inadequate public animal health services and limited access to credit, together with a pervasive array of information and access barriers constrain the livestock-dependent poor from making greater investment in and better use of their livestock assets.
- The prevailing policy paradigm, in which livestock are considered an addition to, rather than an essential component of, smallholder agriculture leads to programmes and policies that fail specifically to address livestock-related market imperfections or capacity development.²¹ Such imperfections usually favour large- over small-scale operators, and have a systemic bias towards industrialization and concentration along the livestock supply chains. They may actually exacerbate rural poverty and demographic instability.
- Unregulated expansion of the livestock sector can have adverse consequences for society, including public health hazards associated with zoonotic livestock diseases and/or environmental degradation from improperly managed livestock production systems. Such externalities disproportionately affect the poor, who depend heavily on the natural resource base for their basic needs and have limited capacity to cope with shocks.

Policy-makers in developing countries, and the international development community should aim to guide livestock sector development in ways that are sustainable while contributing to poverty reduction. Under current circumstances, with smallholder producers expected to constitute a significant proportion of livestock keepers for several decades to come (Nagayets, 2005), this approach will contribute to national food and civil security, expanding agricultural capacity from the bottom up while reducing inequality. The benefits of this policy emphasis will be increased by strong pro-poor multiplier effects extending across the urban and peri-urban lower-income and small enterprise networks that characterize agrifood supply chains in developing countries (see Chapter 4).

Rapid demand growth for livestock products in developing countries mobilizes resources on the supply side, while rural-urban demographic transitions require higher labour productivity in agriculture, and transport infrastructure to move greater volumes of agrifood products. Markets provide essential support for all of this, linking urban demand and sources of supply while mediating consumption and production through a web of product transformation activities and services between the farm and the fork. For rural household enterprises, responses take the form of diverse resource commitments, production and marketing decisions, depending on initial endowments, capacities, customary livelihood strategies, information, attitudes towards risk, and other factors.

It has been amply demonstrated that as agricultural household producers make the transition from subsistence production to a market orientation, income can improve significantly. Income growth via expanded market engagement can come from two sources: increased sales volume, and higher profit per unit. The former would result from higher output and/or more output being diverted from own consumption to the market; the latter can arise from higher product quality, economies of scale or other cost advantages and/or improved bargaining power. Table 5.2 gives an example of the relative magnitudes by which agricultural households' income and its sources increase with the degree of market participation.

²¹ For instance, issues related to the seasonality of feed availability, common property resources, water and livestock insurance receive little attention in the policy agendas of most developing country governments.

Table 5.2
TOTALS AND PROPORTIONS OF AGRICULTURAL HOUSEHOLD INCOME, BY SOURCE AND
LEVEL OF MARKET PARTICIPATION IN VIET NAM (THOUSAND DONG [VND])

Income source	Market orientation of agricultural households					
	Subsistence ^a		Semi-commercial ^b		Commercial ^c	
	Total income	(%)	Total income	(%)	Total income	(%)
Agriculture	3 277	94	6 370	83	15 245	84
Other	195	6	1 307	17	2 989	16
All sources	3 472	100	7 677	100	18 234	100

^a < 25 percent of own production sold in the market.

^b 25–75 percent of own production sold in the market.

^c > 75 percent of own production sold in the market.

Source: Maltoglou and Rapsomanikis, 2005.

From the differences in mean incomes, it appears that increasing market participation to the semi-commercial level is associated with a more than doubling of average household income. In Viet Nam, most agricultural households (59 percent) are already semi-commercial, while the poorest 11 percent remain subsistence farmers. Of course there may not be a direct causal relationship between commercialization and income for this group, but the results strongly suggest that households can improve their income prospects by increasing their participation in markets.

As incomes rise in developing countries, demand for livestock products grows, in terms of not only quantity but also quality and product variety. Enterprises at all scales, from local vendors to urban supermarkets, will differentiate their production capacity to meet these evolving tastes, whether they operate in local, national or foreign markets. Much literature has documented the emergence of such markets, but identifying where and how policies can make this process more inclusive of the rural poor remains a major challenge. Most agricultural and rural households in developing countries are unlikely to be recruited directly into agrifood industrialization. Even intermediate stages of agriculture sector consolidation, such as contract farming, appear to be undertaken at a scale well beyond that of the average smallholder farmer. Industrialization of the agrifood sector is inevitable in most countries, but if the transition proceeds too swiftly it could seriously undermine equity and social stability. At the moment, urban demand growth represents an important opportunity for all domestic food producers, and should be appreciated for its inclusive development potential. The result will be self-directed poverty alleviation, which in most countries would be a welcome alternative to increased rural marginalization and/or sustained fiscal commitments to transfer payments.

At present however, the potential for increased livestock demand to improve domestic livelihoods in developing countries is not only far from being realized, but is possibly even receding. Table 5.3 shows the development of trade balances in various livestock product categories in developing regions, from 1990 to 2007 (the most recent year for which figures were available at the time of writing). For simplicity, quantities of bovine and ovine meat are combined as ruminant meat, and those of pig and poultry meat as non-ruminant meat.

Table 5.3
NET IMPORTS OF LIVESTOCK PRODUCTS, AND ANNUAL CHANGE, BY REGION, 1990 TO 2007

Region/ country	1990 ^a ('000 tonnes)			2007 ^a ('000 tonnes)			Annual change ^a (%)		
	Dairy products ^b	Ruminant meat	Pig and poultry meat	Dairy products ^b	Ruminant meat	Pig and poultry meat	Dairy products ^b	Ruminant meat	Pig and poultry meat
EAP	5 850	780	409	12 502	1 479	3 253	5	4	13
China	974	[123]	[415]	2 308	73	179	5	3	5
EECA	[520]	22	19	[2 585]	645	19	[10]	22	0
LAC	4 361	[595]	[111]	2 389	[2 357]	[3 126]	-4	[8]	[22]
NENA	4 627	405	36	4 687	641	265	0	3	12
South Asia	645	[71]	0	582	[496]	13	0	[12]	33
India	1 009	[72]	0	[519]	[494]	[3]	-3	[12]	[17]
SSA	1 496	102	115	2 710	115	847	4	1	12
All regions	16 459	643	468	20 285	27	1 271	1	-17	6

^a Values in square brackets are net exports/growth rates of net exports.

^b Milk equivalent.

Source: FAOSTAT, 2010.

As shown in Table 5.3, most developing country regions are net importers of animal products. The only exceptions are Eastern Europe and Central Asia, a net exporter of dairy products, and Latin America and the Caribbean, a net exporter of both ruminant and non-ruminant meat. South Asia was also a net exporter of ruminant meat in both years, but by 2007 had become a net importer of poultry meat. Comparison of the data for the two years, and the annual growth rates of the trade balances (last three columns) demonstrate the rapid expansion of both imports and exports, particularly of pig and poultry meat, which grew more than imports and exports of ruminant meat. Generally, regions that were net importers in 1990 increased their import dependency in 2007, by as much as 33 per cent a year for non-ruminant meats in South Asia. Mirroring this growing import dependence in many developing countries, the developed countries have consistently sustained large net exports of all major meat and dairy products.

This suggests that developing country producers face competitive disadvantages both at home and abroad. Limited capacity, higher unit costs or both prevent them from capturing the benefits of robust demand growth at home, while many of the same reasons leave them with limited opportunities for penetrating overseas markets. Capacity constraints can be quantitative, arising from insufficient investment, resource constraints or institutional weakness, or qualitative, when domestic producers cannot meet product standards, which tend to rise with urban incomes and competition from more advanced international agrifood competitors. In either case, developing countries are missing the macroeconomic benefit of capturing demand and value added from both domestic and export markets. More important for poverty reduction, smallholder food producers are likely to be left out of this process completely, as domestic industries scale up to compete head-to-head with foreign industrial food interests.

However, the appearance of significant net exports of some livestock products in Latin America and the Caribbean, and South Asia should not be ignored. These positive trade balances suggest that in some developing countries and regions, the capacity to export has been established and could be extended. Exports need not be directed to developed country markets, where product quality and safety standards are very stringent, but can also be directed to South–South trade channels, exploiting market opportunities presented by the trade gaps in other developing regions and countries. Because of the demographic magnitudes and demand growth rates involved, this kind of trade could be an important growth stimulus.

The main conclusions from these trends in regional trade balances are that while the key market objective of net exporting regions, such as Latin America and the Caribbean and possibly South Asia, is to maintain and expand exports, for net importers the goal is more likely to be import substitution. In both cases, success depends on increasing domestic production at a competitive cost, while maintaining adequate food safety and other quality standards. The standards and rules imposed by importing high-income countries, and harmonized and coordinated by the World Trade Organization, impose heavier constraints on countries dependent on exports than on those focusing on import substitution.

SUPPLY AND VALUE CHAIN DIVERSITY

Growth of aggregate demand for livestock products in developing countries does not by itself increase incomes among rural households; in the absence of more inclusive and efficient markets, many smallholder livestock keepers will continue to produce mainly for home consumption. In broad terms, a market can be defined as the locus of exchange for goods and services between producers and consumers, mediated by networks of intermediaries linking sellers and buyers. These supply chain networks can take many forms, from the most advanced agro-industrial systems to individuals trading backyard animals.

Modern supply chains

As the globalized food system expands, there is increasing vertical integration along livestock product supply chains. Pingali, Khwaja and Meijer (2005) argue that agricultural production processes other than purely subsistence farming systems are becoming increasingly consolidated across input markets, agrifood processing, distribution and marketing. Moreover, the growing commercialization of agriculture is transforming traditional food systems. Multinational reach and technology diffusion are harmonizing both production and management practices, while globalized marketing is promoting the worldwide convergence of tastes.

As modern supply systems expand, the technological, institutional and informational inputs supporting agrifood production are becoming increasingly complex, and growing amounts of information and skills (operational, managerial, regulatory, financial, etc.) have to be maintained within and between each link along the supply chain. Continuous investments are needed to comply with changing product, process, quality and safety standards. In addition, as agriculture becomes increasingly commercialized, the need for highly specialized production units necessitates tighter control and supervision along the supply chain. By implication, modern food systems in highly commercialized agricultural markets

have introduced a new set of entry and transaction costs for producers to be competitive (see e.g., Pingali, Khwaja and Meijer, 2005 for more discussion).

To a significant degree, these trends in technological change have been induced by domestic and international competition, particularly in high-value-added agrifood sectors. Economies of scale are exploited where they exist (Narrod, Tiongco and Costales, 2007; Costales, Gerber and Steinfeld, 2006), and larger markets can confer tighter control over product quality and other transaction characteristics at the single enterprise level, while the advent of traceability regulations clearly favours the development of integrated supply chains. Such consolidation also reduces transaction uncertainty and complexity, through asset-specific investments such as “identity-preserved” supply chains that integrate supply via acquisition and contractual branding (Da Silva, 2005; Hobbs and Young, 2001).

These changes are occurring within, and are to a significant extent facilitated by, a globalizing trading environment in which developed and developing country markets are becoming more closely intertwined or are experiencing *de facto* coordination through international dispersion of hard and soft technologies. These developments are transforming domestic and international agrifood systems, leading to indirect convergence and direct commercial integration of production, processing, distribution and marketing activities (Kirsten and Sartorius, 2002; Da Silva, 2005). For developing countries, this means that opportunities for domestic and overseas market expansion are tempered by strong foreign competition and higher product standards both at home and abroad. In external markets, regulatory standards pressurize developing country exporters to improve technical efficiency, ensure product quality and reduce production costs, to overcome entry barriers and establish market share.²² Meanwhile the prospect of foreign entrants exerts similar pressures on domestic markets, often when domestic firms are at significant disadvantages in terms of technology adoption and average cost/scale.

For distribution, the move towards more industrialized agricultural production systems in the last decade is associated with the robust expansion of modern supermarket and fast food restaurant retailing in developing countries (Reardon and Timmer, 2005). The emergence of these large “one-stop shops” and convenience store chains in developing countries, largely a result of foreign direct investment, has also changed the upstream side of agrifood systems through innovative and efficient ways of procuring agricultural products. These developments are facilitated by advances in information technology that can respond quickly to supply uncertainty and demand conditions in domestic urban and export markets. The modernization of supply chains and their linkages to major urban and export markets induce new relationships between processing and farming enterprises. Perennial competitive pressure increases the need for supply chain functions to be linked by more efficient technology, spanning complex arrays of production, transport and marketing of agrifood goods and services.

Many development economists (see e.g., Kaplinsky and Morris, 2000; Humphrey, 2005; Reardon and Timmer, 2005; Pingali, Khwaja and Meijer, 2005; Barrett, 2008) have stressed that unless smallholder producers are able to improve production processes to meet mod-

²² The albeit significant costs of complying with international sanitary and phytosanitary (SPS) standards may be dwarfed by the other costs of ensuring that products are competitive in recipient markets (Perry and Dijkman, 2010).

ern market standards, they risk being excluded from expanding domestic food market opportunities. This view seems overly pessimistic, and experience suggests that smallholders may capture significant shares of domestic markets for specific products by adopting appropriate practices and technologies, if complementary policies can help them overcome market imperfections.

Consumer demand and supply chains in developing countries

Agrifood supply chains in many developing countries are still far from the paradigm of high-tech, highly integrated systems emanating from OECD economies. Supermarket diffusion across the globe cannot change the reality in developing countries, where the demand for agricultural and livestock products of all kinds depends mainly on the domestic population's income levels, habits, attitudes and expectations of what different suppliers can provide.

In their representation of the world economic pyramid (Table 5.4), Prahalad and Hart (2002) argue that about 4 billion people, or two-thirds of the world's population, are not considered viable markets for high-end and high-quality products by transnational companies. Although about a billion of these people live in extreme poverty, in aggregate this bottom tier of consumers presents considerable purchasing power, for which food products are particularly important.

For livestock product markets, Aho (2010) presents a similar analysis of the relationships among per capita incomes, consumer preferences, and demand for various types of livestock product based on the extent of processing involved. As with Prahalad and Hart (2002), globally only the top income decile – with annual per capita incomes well above USD 20 000 – is a viable market for high-value processed and convenience cold chain products, while the 60 percent of consumers in the lower three income quintiles normally purchase ASFs in live-animal and wet markets, and only occasionally acquire partially processed cold chain products.

These findings strongly suggest that although a subset of domestic consumers in developing countries demand high-end livestock products, these people are still a minority, rep-

Table 5.4
THE WORLD ECONOMIC PYRAMID

Tier	Description	Per capita income (USD/year)	Population (million)
1	Affluent consumers of upper- and middle-income households in developed countries, and a few rich consumers in developing countries	> 20 000	70–100
2 and 3	Poor consumers in developed countries; rising middle classes in developing countries	1 500–< 20 000	1 500–1 750
4	Poor consumers in developing countries	< 1 500	4 000*

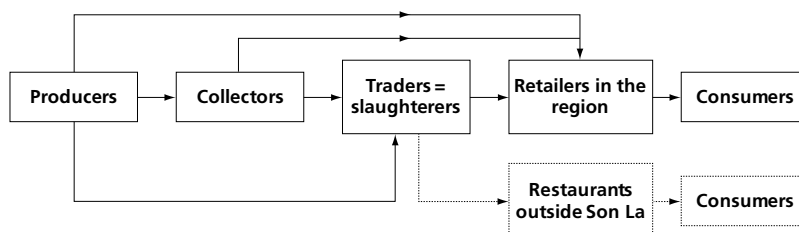
* More than 1 billion of whom live on < \$1/day.

Source: Prahalad and Hart, 2002.

resenting mainly the urban upper-middle class. The needs of these comparatively affluent consumers can be met by high-end commercial – to a large extent corporate – livestock producers with supply chains ending in urban centres, or by imports from developed countries. The far larger proportion of consumers in developing countries have lower purchasing power and more traditional preferences regarding how food is prepared and sold for household consumption. Thus livestock product markets in developing countries exhibit a large degree of diversity, contradicting the common idea of a dominant paradigm for modern, integrated production and marketing systems. In particular, the concept of high-end or high-value supply chains based on industrial animal production, processing and supermarkets, led or accompanied by export market development, will by-pass most households in low-income countries. Instead, small-scale livestock producers in these economies will see a spectrum of market systems, each with its respective supply chain(s), and many alternative paths from farm to fork (Ramsay and Morgan, 2009). In the continuum of market types and supply chains, Ramsay and Morgan (2009) identify the two extremes that producers of livestock products face: the *local market*; and the *industrial inputs market*, where primary livestock products are transformed into processed products for final household consumption.

The supply chains for local markets are mediated mainly by informal and customary networks, which prevail because of their relatively low transaction costs. Product types, forms and production standards are defined by consumers, who demonstrate their acceptance by purchasing the product, and confirm it with repeat purchases. Local markets are usually found in smaller towns, rural areas and urban peripheries. Figure 5.5 gives an example of a local market supply chain, depicting a typical supply chain for indigenous (Ban) pigs in the northwestern province of Son La in Viet Nam (Huong, 2007). The supply chain is short, confined mainly to the province or region (the northwest), where products may either pass through village collectors or slaughterers, or go directly to town retailers who then make the final sale to consumers. Although the product might occasionally reach restaurants or

FIGURE 5.5
Typical supply chain for indigenous (Ban) pigs in Son La province, Viet Nam



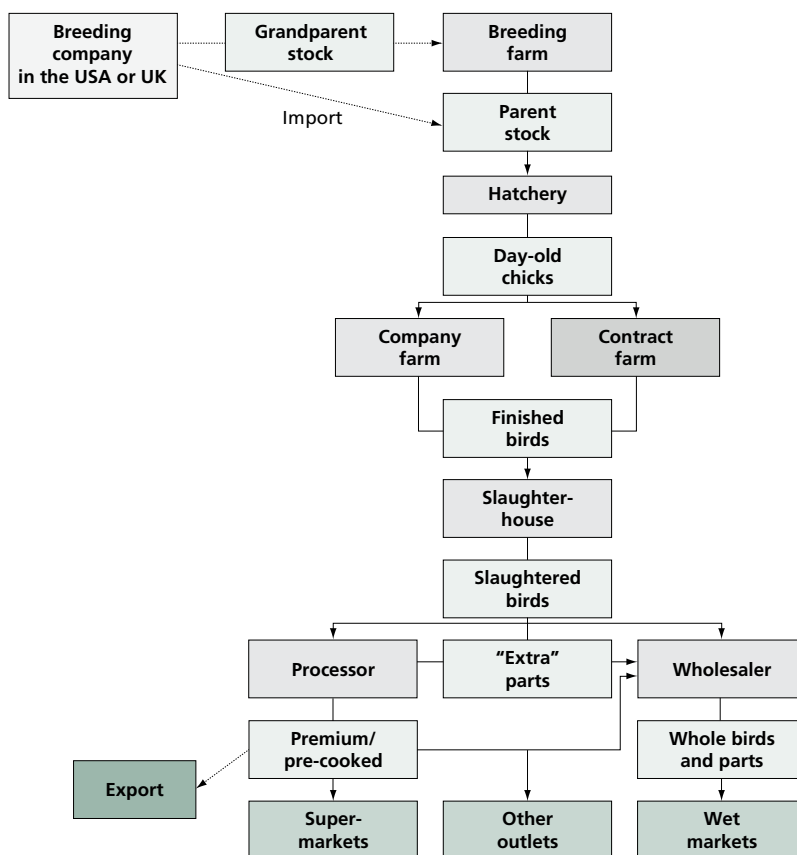
Source: Huong, 2007.

consumers outside the region (e.g., in Ha Noi), where there are premium prices for indigenous pig meat, trade is predominantly within the town or province. In such local market systems, agreements between product suppliers and buyers are generally informal but binding, with violation of an agreement making its renewal unlikely. When buyers have identified reliable suppliers, they provide incentives to obtain assurance that these suppliers' upcoming batches of Ban pigs will be sold to them.

At the other end of the scale, supply chains leading to industrial input markets are mediated by formal exchange norms. As well as by consumer requirements, product standards are defined and enforced by commercial actors along the supply chain (private standards), and/or are codified and enforced by State regulation (public standards). At the point of final demand, industrial input markets are normally linked to large urban centres where mass consumption takes place. An example of a market system dominated by formal contracts between producers and buyers is Thailand's broiler chicken market. Thailand has a well-developed industrial poultry sector, supporting its status as one of the world's largest exporters of these products. Although backyard chicken flocks comprise more than 90 percent of the country's flocks, about 90 percent of broiler chickens are produced in commercial company farms or in contract farms operating large-scale, highly integrated systems, as illustrated in Figure 5.6. In this schematic, a single enterprise could control all the activities in shaded boxes while enjoying substantial market power in its relations with other market participants. Although such a supply chain can make a substantial contribution to national income and food production, smallholders have no place in it. Broiler chickens produced by large company and contract farms are destined for the domestic (two-thirds) and export markets (one-third). Broiler chickens for the domestic market become an industrial input that undergoes the same processing in the integrator company's slaughterhouses as produce for export markets. It should be noted that in spite of this, nearly half of the products from the industrial inputs market do not proceed to high-end consumers in restaurants and supermarkets, but are directed to wholesalers in the general public wet markets (Heft-Neal *et al.*, 2008).

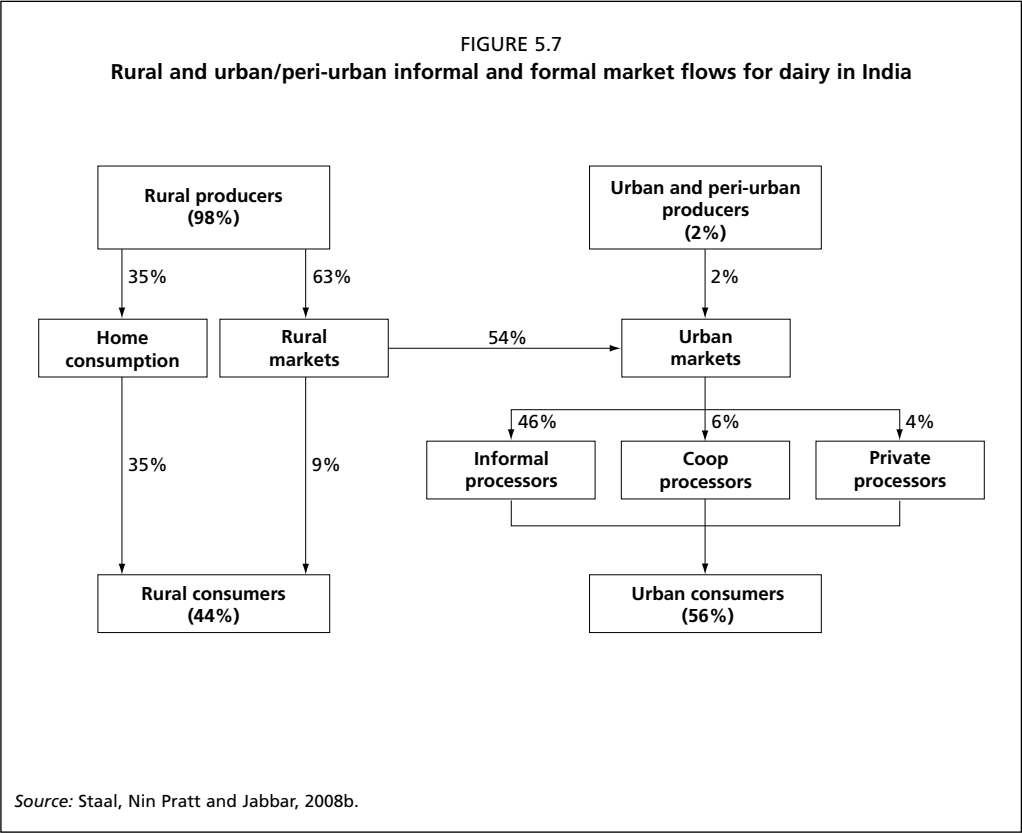
However, developing countries have more than these two extreme forms of very informal local markets and highly sophisticated high-end formal industrial inputs market systems. There is also a wide range of intermediate markets, with increasingly formal market transactions as they proceed from the local market to the industrial inputs market system. Figure 5.7 depicts an example of such intermediate markets, using the rural and urban/peri-urban market flows for milk and milk products in India. In this case, rural household producers account for 98 percent of household dairy output, but about 85 percent of their marketed produce ends up in more distant urban markets, with the remainder being sold in local rural markets (Staal, Nin Pratt and Jabbar, 2008b). The rural output sold in urban markets is not necessarily screened and processed as industrial input for distribution in high-end markets such as supermarkets, hotels or restaurants. More than 80 percent of it passes through informal processors or creameries producing creamless milk and traditional dairy products for sale to sweetshops, tea shops, small restaurants and urban households. These informal creameries also have links to formal dairy companies and private processors, supplying cream from their own transformation processes, which then undergoes further refining for higher-end markets (Fairoze *et al.*, 2006).

FIGURE 5.6
Modern integrated poultry production in Thailand



Source: Heft-Neal *et al.*, 2009.

In other developing countries, intermediate markets may take a different form from that depicted in Figure 5.7, with different shares held by the informal and formal market segments. The differences depend on the product in question, how advanced the marketing infrastructure is in terms of transport and cold chain facilities, and the tastes, preferences and purchasing power of urban consumers. However, a basic feature is that rural and peri-urban households produce livestock products alongside larger-sized and more commercially oriented producers, and compete for market share in urban centres using informal or formal market chains, or both. A review of formal and informal contracting arrangements

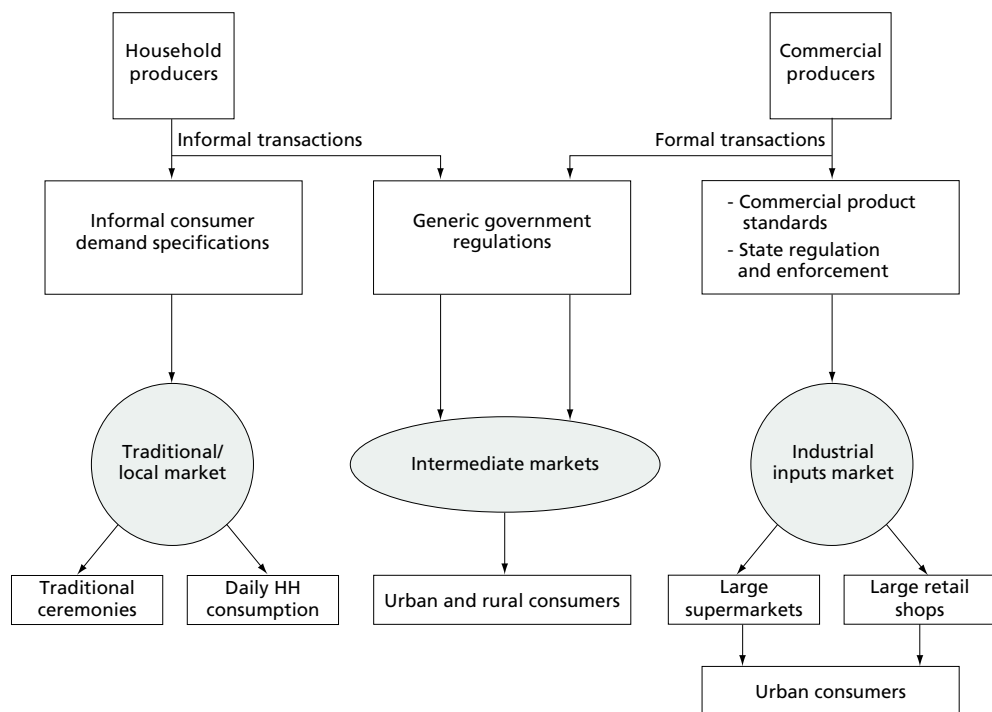


between household producers and processors of livestock products in developing countries shows that in terms of market coverage, intermediate market systems predominate over industrial inputs ones (Catelo and Costales, 2008).

Smallholders are threatened in both rural and urban areas. Because of their greater mobility, larger commercial businesses established in cities can easily develop distribution networks to towns and villages. In this sense, rural households and urban commercial suppliers have opposing captive and target markets. A market actor may be established in the former, but consider the latter for expansion. For market actors, some of the markets where they do not participate intensively are potential markets, which they can try to penetrate when the opportunity arises.

Figure 5.8 presents a schematic of captive and potential markets for the livestock products of household producers and commercial producers. The traditional or local market is a captive market for household producers, but also a potential market for commercial producers, for whom it may represent an attractive diversification and/or expansion strategy. Household producers could already be aiming for a share in intermediate markets, and some households could already be looking at the opportunities presented by the industrial inputs market.

FIGURE 5.8
Captive and potential markets for livestock products of household producers and commercial producers



Source: Adapted from Ramsay and Morgan, 2009.

BARRIERS TO MARKET ACCESS

The observed rapid growth of demand for livestock products accompanied by slower domestic supply growth in developing countries suggests that there are still market opportunities for livestock producers to exploit in most of these countries. This gap represents potential for increased incomes and alleviation of rural poverty for smallholders, both directly and indirectly, through employment and value addition along the relevant supply chains. However, participation in expanding markets for livestock products does not occur automatically. Wherever there are profits to be made in an emerging urban consumption sector, larger commercial suppliers will compete to capture market share for any product. When household producers are unable to participate in the growing markets that attract larger commercial producers, it is generally because of barriers to market access or entry. An entry barrier is deemed to exist when a potential competitor is unable to sell a product at a reasonable price in a market where there is demand for that product. A reasonable price is one that at least covers production and marketing costs (Ramsay and Morgan, 2009). Smallholders in developing countries face a wide array of these barriers.

Because they inhibit otherwise competitive forces, barriers confer some degree of monopolistic power on incumbent firms. In addition to undermining allocative efficiency²³ and transferring wealth, such distortions stimulate further non-competitive behaviour as incumbents seek to sustain or even increase the barriers and the rewards they yield. This creates an adverse cycle in which incumbent firms expend resources on political and other influence and on anti-competitive practices, driving the market towards ever-more wasteful outcomes while denying consumers product variety and higher purchasing power. Other casualties of such processes are the potential competitors who are denied market access. In modern industrial economies, these may be large enterprises that simply have to forego a single product line. For rural smallholder farmers however, the outcome is more serious, as they have only two options for improving their livelihoods: migration or marketing household production.

Market access for smallholders

In agrifood supply at its smallest scale, from the smallholder farm gate, a household sells its product to a trader, initiating a chain of exchange relations across a market system that takes the product through a number of stages to reach final consumers. From the first step, this elemental agrifood supply chain is complicated by many market access barriers and information failures, which individually and collectively undermine the livelihood potential of an activity farmers already pursue. Smallholder livestock supply chains are plagued by the following imperfections:

- *Low input quality*: Although the natural diet of free-range livestock may be an important contributor to taste and other positive product characteristics, it may also be inconsistent with and inadequate for complete physical development and health status. While some feed additives may be seen as artificial, consistent feeding, complete and balanced diets, and medication when needed can improve the quality of smallholder livestock without compromising their favourable product characteristics.
- *Low sanitary standards*: Because farmers may not be rewarded for their investments in protecting the sanitary status of their animals, they are likely to accept higher loss rates and the adverse quality effects of illness, parasites, etc. Downstream, the lower value of the animals leads to lower investment in transit and distribution infrastructure (containers, vehicles, etc.) and lower handling standards.
- *Low bargaining power*: Many smallholders have to sell to monopsonistic traders or assemblers who visit their farms intermittently and often unpredictably. Negotiating with these parties generally entails substantial information asymmetry regarding market values, all of which are favourable to the buyer because farmers have very limited market experience and face high costs for gathering such information.
- *Moral hazard*: Producers and traders have strong incentives to misrepresent the health and other quality characteristics of animals as much as they can. This misrepresentation can be direct, by overstating the quality characteristics of an individual animal, or indirect, by blending stocks to mask the status of inferior animals. This

²³ Allocative efficiency occurs when competitive discipline ensures that resources are recruited into a use at prices that reflect the value of the resources' best alternative use – their opportunity cost. Where there is monopoly power, for example, firms can restrict supply below socially desirable levels, and overcharge society for resource use.

practice is particularly invidious because, for example, it may lead to disease spread within and among flocks, farms and markets.

- *Distrust and low willingness to pay*: Most buyers have at least an instinctive awareness of all the market and information failures already discussed, and of the inevitable adverse selection that results. When they cannot ascertain true quality or producer reliability, individually rational buyers will pay less for livestock products than they would in the absence of such uncertainty.²⁴

Each of these uncertainties undermines willingness to pay and contributes to serious adverse selection bias in markets. Ultimately, this problem feeds back to producers, who have little incentive to produce higher-value animals for market.²⁵ Unless these market imperfections can be overcome, low investments in output and product quality will remain individually rational for smallholder farmers, and the livelihood potential of livestock markets will remain limited for them.

Marketing costs and smallholder market access

Marketing costs represent an important market access barrier, particularly for smaller enterprises. For the rural poor, who are more isolated and have fewer transport choices, logistical and search costs are very high as percentages of income, savings and product value. This limits the rural poor's supply and demand interactions with larger markets. Such costs can be defined as a margin, capturing the *ad valorem* (percentage of value) effect of trade, transport and other transit costs. Trade margins are higher for those who are more distant from markets and for small operators who cannot take advantage of economies of scale. They have two main adverse effects:

- *Reduced comparative advantage*: In a world of heterogeneous resource endowments, skills and other initial conditions, cost differences offer the prospect of gains from trade. Specialization at the international, regional or local level can increase aggregate welfare if it reduces average resource costs and increases real purchasing power. Unfortunately, however, trade margins undermine cost differences, thereby also undermining comparative advantages, and high margins stifle the opportunities for exchange and specialization between diverse economic areas, including rural and urban markets.
- *Reduced agricultural/rural terms of trade*: Rural terms of trade are determined by the ratio of rural prices for rural products (or rural household producer prices), debited for distribution to the domestic market, to rural prices for urban products (or rural household purchaser prices), including shipping costs from domestic urban markets. Thus, rural terms of trade (the purchasing power of farm products) are inversely related to trade margins, higher margins leading to lower rural terms of trade.

Evidence from Viet Nam shows that poverty headcount, agricultural specialization, average market distances and agricultural terms of trade are intimately related, which suggests that overcoming rural poverty will require product diversification, reduced market access costs and higher relative producer prices.

²⁴ Extensive consumer surveys in developing countries confirm consumers' willingness to pay a premium for credible livestock product quality (e.g., Chadwick *et al.*, 2007).

²⁵ The definitive reference for this, based on the example of used car markets, is Akerlof (1970).

OVERCOMING MARKET ACCESS BARRIERS FOR SMALLHOLDER LIVESTOCK PRODUCERS

In the rural sector of most developing countries, household farms are small, diversified enterprises with a large portion of output targeted to actual or contingent subsistence. Diversification is thus a risk management strategy, evolving from self-sufficiency and expectations that the burden of external shocks will be borne individually. For smallholders to emerge from this situation, they need a credible strategy of commercialization, specialization and investments for increasing value added. Unfortunately, their conditions make smallholders unlikely to compete against established commercial agrifood enterprises in urban markets. To be successful, smallholder producers need to emphasize their strengths – traditional product variety and low resource costs – while policies for inclusive development have to be implemented to facilitate their market access.

Choice of product

Economic theories about market entry barriers generally begin with the concept of homogeneous product. When two firms produce the same product, even a small access cost advantage can award the whole market to one firm indefinitely. However, this outcome does not apply in a world with differentiated products, where consumers willingly pay higher prices for products deemed to be more attractive. For example, poultry consumer surveys in four low- and middle-income Southeast Asian economies revealed that a significant majority of urban households in small and medium cities clearly differentiate local genetic varieties of free-range poultry from industrially produced birds, and are willing to pay a substantial premium for the local birds (Chadwick *et al.*, 2007).

A detailed poultry market consumer survey in Ha Noi, Viet Nam provides further information on the food preferences of urban households in developing countries and suggests that demand-side policies offer attractive opportunities for promoting smallholder market participation in appropriate product categories (Ifft, Roland-Holst and Zilberman, 2009a; 2009b; 2011). Respondents were very experienced market consumers. Of particular relevance are the findings that despite living in the capital city, more than 30 percent of households purchased live chickens, and more than 40 percent reported buying whole finished birds. The vast majority (87 percent) of households bought local varieties, paying nearly double the price of industrially produced birds. Thus, the preferred product variety in this relatively low-income country is the most expensive one. This result is particularly significant because smallholders are the main producers of these birds.

To identify the reasons for these observed buying and price patterns, consumers were asked directly about their preferences with respect to chickens. As the previous results imply, price was not a high priority. On the contrary, quality characteristics were paramount in consumers' expressed preferences, including taste, health status and the regularity of availability. Scores for quality (taste and safety) were more than double those reflecting the importance of price. Evidently, Ha Noi buyers value local chicken varieties – which they purchase live – because of the superior taste, and are willing to pay nearly double the price for their quality characteristics. Similar situations were found for pigs in Viet Nam and for poultry in Cambodia, Lao People's Democratic Republic (PDR) and Thailand. These premiums for local, traditionally raised livestock species reveal that smallholders need not

compete head-to-head with commercial competitors. Instead, they can benefit more by investing in the quality of their own products and expanding their livestock enterprises along traditional, resource-efficient lines.

Despite these preferences, 75 percent of responding households in Ha Noi said that they believed the quality of chickens could be improved, suggesting the potential for higher value added for smallholder producers supplying this large urban market. Improvements could take two forms: better flavour and greater product safety. These results show that consumers who are aware of food-borne risks take food safety very seriously, and supply chain and institutional uncertainties are an important source of their perceived risk. Disease risk itself is the most important concern, closely followed by the most important private and public determinants of real and perceived food safety. Food origin is uncertain in the markets studied, with birds passing among several intermediaries, who blend and transport stocks. These intermediaries may provide valuable distribution services, but they undermine the flow of information about product origin and quality, contributing to food safety risks via elevated moral hazard and adverse product selection. The complex nature of some of these interactions and the uncertainties they create is common knowledge, and consumers inevitably discount products accordingly, undermining the incentives for farmers to invest in quality. Credible product traceability schemes would make an important contribution to overcoming this adverse quality/value cycle.

Institutional mechanisms

Smallholders' market orientation can be reinforced by complementary policies and institutions for overcoming the market imperfections discussed previously. These can be policies that target the market failures directly, and measures that address larger issues, such as systemic characteristics of the financial and legal systems. In the financial context, it makes sense to provide targeted micro-credit for promoting smallholders' investment in livestock production and marketing. In the legal framework, contract law needs to be refined to facilitate micro-contracts or agreements between two small enterprises on simple (perhaps even single) marketing transactions. Both these measures could significantly expand the capacity and efficacy of smallholder supply chains.

Microfinance for livestock development: Livestock products provide not only essential nutritional, productivity and environmental services, but also direct income and financial services that act as assets for storing wealth and insuring against income shocks. Because most rural households lack access to formal financial institutions, their transaction costs for such services are very high, and livestock provide a substitute. Unfortunately, savings in livestock are themselves prone to adverse shocks, especially from animal disease. Thus, livestock present savings opportunities for the rural poor, but with a relatively high degree of risk. This is compounded by the financial constraints already mentioned, which limit smallholders' capacity to replace animal stocks after losses from disease or natural disaster. The solution is a credit system, such as micro-credit, that acknowledges smallholders' unique ways of managing financial assets, committing to forward sales and revenue, and carrying forward loan agreements.

Previous research on rural financial access demonstrates how limited the formal and semi-formal financial channels are for households, and suggests that there are significant



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unmet needs as well as established patterns of orderly debt retirement (e.g., Binswanger and Khandker, 1995; Boucher, Guirkinger and Trivelli, 2005; Carter, 1989; Feder *et al.*, 1989; Rutherford, 2000). FAO-PPLPI survey work in Lao PDR reinforces these findings and adds to the challenges by identifying capital constraints among actors in the smallholder supply chain (Channgakham *et al.*, 2010). Credit constraints are widespread, and domestic financial resources are limited for small-scale producers in low-income countries, where those that are available are generally inaccessible to the rural poor and small peri-urban farms and related enterprises. Financial markets in Lao PDR, as in other developing countries, are severely limited, and restrict livestock keepers' access to the capital needed to increase flock/herd sizes, restock after disease outbreaks, or invest in improving product quality or market access. As a result, most small-scale livestock producers are trapped in a subsistence system where production can satisfy only household requirements and the marketing of animals is a residual activity.

Understandably, providing capital to rural areas and smallholder farmers presents a huge challenge, not only logistically, but also in terms of resources. This justifies attempts to identify the regions and households that are likely to benefit the most from increased financial services for smallholder livestock keepers, so that those who stand to utilize scarce resources most effectively can be targeted. Using this approach in Lao PDR, Channgakham *et al.* (2010) conclude that the provinces in the central and southern Mekong corridor are the most likely to benefit from microfinance targeting smallholder poultry producers. These areas are home to a large number of lowland farmers who could use the capital to expand production to meet the demand in urban markets of Vientiane, Savannakhet and Pakse.

Micro-contracting for livestock supply chains: As there are many sources of market failure along smallholder livestock supply chains, institutional mechanisms that link farmers more directly to consumers, or at least to retail vendors, would seem to hold promise for overcoming some market failures. The different parties involved in most urban markets know very little about each other, which compromises the integrity of certificates of product origin and the value that these have conferred (at least since the French wine industry

developed its appellation system). One way of overcoming this would be through a micro-contracting scheme that binds farmers and vendors to terms of delivery.

In industrial poultry supply chains, contracting schemes have proved successful in linking producers directly to vendors, increasing both the quality and the value of products. However, in a smallholder system, conventional contracts are not appropriate because of their complexity and rigid structures and the high commitments they demand. Adapting the contract system to smallholders' needs could help reduce inefficiencies in the poultry supply chain. Micro-contracts, which are informal agreements that allow more flexibility than a formal contract system while linking producers directly to vendors, present a potential solution to the market failures that arise in the smallholder poultry supply chain, and are worth further examination.

Micro-contracts appear to mitigate the problems of asymmetric information by providing direct links between small-scale producers and vendors. However, data from Lao PDR show that small-scale producers are the group that is least likely to use micro-contracts (Behnke, Roland-Holst and Otte, 2010), while intermediary actors are the most likely. Aggregators and vendors make their living from selling goods that they do not produce themselves, and agreements help ensure their profit margins. By using the approach adopted by intermediary agents, who create agreements to establish prices, quantities and times of sale, smallholders could capture some of the profits from the margins that intermediary agents exploit (e.g., Prahalad, 2004).

Farmers' groups/membership organizations/cooperatives: A third class of institutions that could improve smallholders' market access are producer cooperatives and other membership organizations (e.g., Bonin, Jones and Putterman, 1993; Moran, Blunden and Bradly, 1996). These mechanisms offer many advantages to individual household producers, lowering production and transaction costs through economies of scale for logistics, distribution and marketing, while improving profitability through enhanced bargaining power in both upstream and downstream markets. There is ample precedent for such arrangements in higher-income countries. For decades, the development of producer cooperatives has been essential to survival of the family farm enterprise model in OECD agriculture, facilitating modernization while limiting large-scale consolidation in countries with supporting policies. In OECD countries, cooperatives have been valuable instruments for the diffusion of technology and standards, and platforms for more effective information sharing among individual farm operations. Across OECD countries, the diversity of size distributions in agrifood sectors clearly demonstrates the essential role of policy. In the United States of America, for example, large-scale consolidation has advanced strongly, while in France, Japan, the United Kingdom and other countries, smaller farm models have been promoted through legacy certification and other policy initiatives (Bonin, Jones and Putterman, 1993; Fearn, 1995).

Small farm organization in developing countries is strongly influenced by global (and domestic) market forces led by international and urban financial interests pushing for consolidation. Before acceding to this, developing countries should carefully consider policies that smooth sector transition, maintain product diversity, respect traditional consumer values and limit social dislocation among the poor. The history of such efforts has been somewhat mixed, with some developing countries defending gradualism through the pro-

motion of smallholder organization, while others have been openly hostile to this development pathway (Binswanger and Deininger, 1993).

As with contracting, an important advantage of this approach in developing countries would be the stabilization of rural populations, limiting migration to cities by making smallholder producers viable in larger producer networks. This strategy could thereby limit the scope and persistence of poverty in both rural and urban areas.

DISCUSSION AND CONCLUSIONS

This chapter has provided an overview of the role of markets in developing country rural livelihoods, with particular emphasis on the opportunities for households to produce and market livestock products. Steadily rising urban and peri-urban incomes in these countries are rapidly increasing the volume of and revenue from agrifood demand, particularly in higher-value categories such as speciality fruits, vegetables and livestock-based products. Demographic trends of rural-to-urban migration are increasing domestic populations' reliance on marketed food products. These trends present challenges for food security, but also unprecedented opportunities for food suppliers. If the rural poor can be involved in the supply side of this process, the results could be a combination of more inclusive national development, significant poverty alleviation and enhanced food security.

Transition to this virtuous cycle of broad-based domestic food supply is complicated by two factors: a wide array of barriers to effective market participation for smallholder farmers; and competitive conditions that favour livestock supply chain consolidation and international competitors. In many developing countries, domestic agrifood supply chains are plagued by systemic market and information failures that undermine product quality and incentives for smallholders' participation and capacity expansion. At the same time, international and established agro-industrial interests benefit from market entry barriers, including "race-to-the-bottom" cost/price cutting, preferential licensing, regulatory standards and large-scale contracting arrangements that are inaccessible to small enterprises. The result is often marginalization of local and native food varieties and their producers, more limited choice for consumers, and widening rural-urban income disparities.

Willingness-to-pay results across a wide range of countries indicate that consumers put a significant premium on the traditional livestock varieties that have historically been produced by smallholders. As consumers are willing to pay for traditional livestock products, smallholder livestock could continue to contribute to local markets and diets. In addition, smallholder producers are linked to downstream consumers through networks of low-income intermediary enterprises, so their continued viability secures pro-poor multiplier effects across the broader economy. This means that many product development and upgrading initiatives could eventually be self-financed – a welcome substitute for open-ended fiscal commitments to public assistance. Willingness to pay for traditional livestock also suggests that the general public has a distinct preference for these products, countering the pressure from some commercial interests to phase them – and the associated production systems – out.

Unfortunately, the livelihood potential of traditional markets and networks is not being realized. More policy attention should therefore be paid to the design of socially effective and sustainable strategies for smallholders' participation in livestock markets. The livestock

sector transition is set to continue around the world, but its current slow pace means that it is missing an important opportunity to improve the conditions of economically vulnerable rural populations.

Governments have a critical role in enhancing these pro-poor supply networks by supporting grassroots producer cooperatives and extension services and maintaining a general environment that is congenial to small enterprise development. Among other elements, this would include strengthening animal health services, protecting intellectual property rights, supporting the development of private standards and reputation building through labelling or branding programmes, improving existing market infrastructure, and developing small wholesale markets with registered slaughterhouse facilities, in strategic urban locations.

Smallholder farmers' access to information and technology should be improved, particularly for product quality, pricing and other market conditions. On the financial side, micro-credit schemes can accelerate technology adoption and small enterprise modernization, improving product quality/reliability and leading eventually to established brands and reputation that confer higher long-term value added at lower transaction cost. Education on contracting, negotiation and conflict resolution would improve smallholders' market participation. Governments can also reinforce the efforts of farming groups that already apply economically viable production practices, while recruiting farmers interested in emulating these examples. Such efforts can be modelled on Western agricultural producer cooperatives, which are now the primary guarantors of product quality and farm market access in OECD countries.

SUMMARY AND KEY POINTS

- Although poverty is very common in sparsely populated (remote) areas, most of the rural poor live in reasonable proximity to small or large urban centres. This suggests that a strategy for poverty reduction would be to promote market access incrementally, radiating outwards from urban areas.
- Most developing economies are undergoing fundamental and sustained demographic transitions as their populations shift from rural to urban residence. This process is sharply increasing urban demand for livestock products. Most developing country regions are net importers of animal products, and import dependency is generally increasing. Mirroring this, the developed countries have experienced consistently large net exports for all major meat and dairy products.
- As modern supply systems expand, the technological, institutional and information systems supporting agrifood production are becoming increasingly complex. Continuous investments are needed to comply with changing product, process, quality and safety standards. By implication, modern food systems in highly commercialized agricultural markets present a new set of entry and transaction costs for existing and would-be producers to be competitive.
- Agrifood supply chains in many developing countries are still far from the model of high-tech, highly integrated systems that prevails in OECD economies. In lower-income economies, demand for agricultural and livestock products of all kinds depends mainly on the income levels of the domestic population, with only the top income decile being a viable market for high-value processed cold chain products.

Consumers in the lowest three income quintiles normally purchase ASFs in live-animal and wet markets, where the supply chains are mediated mainly by informal and customary networks.

- The current expansion of markets for ASFs in developing countries, and their large degree of diversity represent enormous income potential for the rural poor, many of whom own livestock. However, which benefits of growing urban food demand go to rural smallholders and which to rapidly expanding agrifood industries will depend to a significant extent on policy decisions.
- Unfortunately, livestock's potential for poverty reduction through appropriate sector development remains largely untapped. The reasons for this include market and institutional imperfections; prevailing policy paradigms with systematic bias towards industrialization and concentration, favouring large- over small-scale operators; and the underprovision of public goods and services, the consequences of which affect the poor disproportionately.
- Most agricultural and rural households in developing countries are unlikely to be recruited directly into agrifood industrialization. Even intermediate stages of sector consolidation, such as contract farming, appear to be undertaken at a scale that is well beyond the reach of the average smallholder farmer. Nevertheless, urban demand growth currently represents an important opportunity for all domestic food producers, including smallholders, and should be appreciated for its inclusive development potential.
- Their conditions make smallholders unlikely to compete against established commercial agrifood enterprises in urban markets. For smallholders to engage in growing markets, they need a credible strategy of commercialization, specialization, and investments for increasing value added. To be successful, smallholder producers need to emphasize their strengths – traditional product variety and low resource costs – while policies for inclusive development are needed to facilitate their market access.
- More inclusive national livestock markets will arise only with determined policy commitments to overcoming existing entry barriers, information and agency failures and historic bias in favour of integrated agrifood enterprise development. A variety of policy mechanisms can facilitate smallholder participation and value creation, including product certification, producer cooperatives and contracting. Combined with other enabling policies that facilitate investment and technology transfer, the momentum of emerging ASF demand can be a potent catalyst for more inclusive development and poverty alleviation.

6. Livestock sector policies, institutions and institutional change

The livestock sector's potential for contributing to economic development and poverty reduction has so far remained largely untapped, and it is difficult to identify a single developing country where growth of the sector has been unambiguously pro-poor. Livestock have long been treated as an appendage to agriculture, with both policy-makers and development practitioners giving higher priority to staple crops than to high-value agricultural products such as ASFs or fruits and vegetables. In addition, interventions in the livestock sector have been concerned mainly with technical aspects, focusing on details of animal husbandry, feeding and disease control. Although important, these interventions have disregarded the broader policy and institutional framework in which farmers operate, i.e., the range of incentives and disincentives that underlie household production and consumption decisions. Finally, on the rare occasions when policy and institutional dimensions have received adequate attention, livestock sector policies/programmes have been designed by technical staff in livestock departments, non-governmental organizations (NGOs) or international organizations, with little consultation of other ministries, and limited appreciation of and connection to the non-livestock policies and markets that are critical for both livestock sector development and livestock farmers themselves (FAO, 2009a; Otte *et al.*, 2009).

This chapter emphasizes the relevance of sound policies and institutions for livestock sector growth and development, elaborates a pro-poor livestock sector policy agenda, and draws practical policy and institutional lessons from the empirical evidence to make recommendations that go beyond generalities (such as “improve the delivery of veterinary services”) and help policy-makers and development practitioners design and implement pro-poor livestock sector policies and institutional reforms. The chapter concludes with some operational tactics that may assist outsiders in identifying openings for change in generally hostile political environments, and suggested approaches for promoting effective work at the local level of such environments.

THE NATURE AND ROLE OF POLICIES AND INSTITUTIONS

The importance of policies and institutions in sustaining inclusive and pro-poor growth of the economy cannot be overstated (Campos and Nugent, 1999; North, 1990; Williamson, 2000). The 2008 World Bank Development Report on agriculture for development notes that:

Lack of macroeconomic and political stability limits the development potential of the [agriculture] sector. Political economy problems lead to policy biases and to underinvestment and mis-investment in agriculture. And state resource and capacity problems cause failures in implementing the policy agenda, especially in agriculture-based countries. (World Bank, 2008)

FAO's report on the state of food and agriculture in 2000 reads:

Reducing poverty and food insecurity is not simply a question of enhancing agricultural productivity and production or of generating more income. Institutions are the structuring features that command access of people to assets, to voice and to power over their lives and that regulate competing claims to limited resources. It is fundamental to address those institutional, governance and politico-economic factors that tend to exclude individuals and population groups from progress. (FAO, 2000)

The 2008 PPLPI report on South Asia, the Andean region and West Africa notes that:

In the 1990s, an increasing number of development aid experts and analysts came to realize that technology transfer alone was not going to transform development, especially agricultural development, in ways that would necessarily be beneficial to the poor. Policy and institutional change was identified as a pre-requisite to steer agricultural development towards meeting the needs of the poor. (PPLPI, 2008).

By determining the ways in which economic actors, including livestock farmers, combine their assets for production and consumption purposes, policies and institutions are principal determinants of economic growth and development, including in the livestock sector.

Studies have documented a positive correlation between the level of institutional development and various indicators of economic performance (e.g., Knack and Keefer, 1995;

Box 6.1: POLICIES

Public policies are sets 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 is designed and put into effect. A policy consists of two main elements: i) an objective; and ii) one or more instruments – or tools at the government's disposal – that serve the objective and produce the desired outcomes. The policy objective is a defined long-term socio-economic goal; the policy instruments serving the policy objective are the programmes, regulations, decrees, laws, projects, etc. that affect the ways in which stakeholders – including the government in its diverse forms, and the private sector – interact. Examples of policy instruments include laws/regulations that influence decisions within a household or a ministry, or that affect the relationships between livestock producers and public banks or between smallholders and processors. Policies should not be confused with programmes or projects, which are public- or private-driven actions limited in time and resources and which involve direct interactions with particular stakeholder groups, such as livestock producers and financial institutions. Examples of programmes include the establishment of drought early warning systems, the setting up of a commodity exchange, and the one-off distribution of vouchers to farmers for purchasing livestock services and veterinary supplies at market prices. Programmes, and the projects they include, are often an instrument for implementing a broader policy, and as such should be consistent with the prevailing policy framework. Policies and programmes usually go hand-in-hand, as policy reforms become effective only when supportive programmes nurture change in the ways in which government and private sector institutions and organizations operate.

Sources: ILRI, 1995; Norton, 2004.

Box 6.2: INSTITUTIONS

Institutions can be organizations – including government ones – or formal/informal rules and regulations governing the behaviour of actors (e.g., government, farmers) and among actors (e.g., between farmers and traders). Their major effect on economic growth and development is, ultimately, through the provision of (dis)incentives for investments by public and/or private sector actors (Acemoglu and Robinson, 2008; Lin and Nugent, 1995). Elaborating on Williamson (2000), it is possible to identify four levels of institutions:

- i. *Socially embedded institutions* include norms, customs, mores and traditions. These are largely spontaneous in origin; display a great deal of inertia, evolving over hundreds or thousands of years; influence decision-making; and can be changed by policy reform only in the very long run, if at all. For instance, there are few if any opportunities for rapid development of the beef cattle industry in Hindu India.
- ii. *Structural institutions* include the national constitution, the form of government, government agencies, the system of property rights, the judiciary system, and policy-making authorities. They are slow-moving, requiring about ten to 100 years to bring about change; modifications to the constitution, the closing down or establishment of new public institutions, reform of the property rights system, etc. are not everyday policy shifts. For instance, land reform programmes that improve pastoral peoples' access to and use of common property resources are rarely designed and implemented.
- iii. *Formal laws and regulations* govern the behaviour of and the relationships within and between the private and public sectors. These are fast-moving institutions, which evolve within one to ten years, and are constantly being reviewed, modified and adapted by policy reforms, such as civil sector reforms or the legalization of community-based animal health workers.
- iv. Institutions can also arise from *interactions within and among actors*, operating according to the existing "rules of the game" and resource availability. In the poultry sector, for example, large centralized production units or contract growing arrangements can be viewed as the different institutions that prevail in different contexts, depending on whether the available technologies and rules of the game make it more convenient to hire labourers or to outsource the raising of chicks to independent growers.

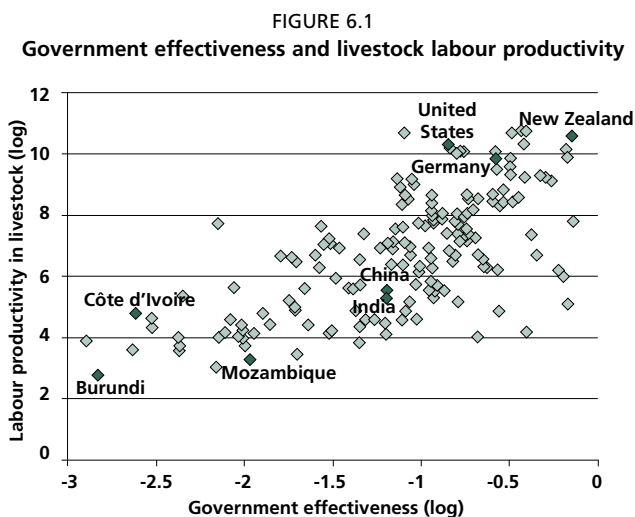
Sources: Adapted from Lin and Nugent, 1995; North, 1987; Ruttan, 2006; Williamson, 2000.

Mauro, 1995; Djankov *et al.*, 2002). Correlation does not imply causation; rather the relationship between policies/institutions and economic development appears to be two-way, as institutions influence the level and pace of economic development, while economic development may nurture institutional changes (Lin and Nugent, 1995; Ruttan, 2006). For example, reform of public veterinary services may induce growth in the livestock sector, which may in turn call for new trade policies on animal feed. However, regardless of the direction of causality between economic growth and policy and institutional change, reforms that provide incentives and opportunities for both large and small investments are a precondition for economic growth and development (Acemoglu, Johnson and Robinson, 2002; Rodrik, Submaranian and Trebbi, 2004).

Documented experience of the relationships among institutions, policies and economic performance relate to the economy as a whole, because indicators of good policies and institutions have been collated at only the macro-level, and there is no comprehensive database for measuring the effectiveness of policies and institutions at the sector level, including the livestock sector. For instance, although some available data provide indications of the level of corruption, degree of political stability, quality of the business environment, and other policy and institutional indicators at the country level (Kaufmann, Kraay and Mastruzzi, 2009), there are no publically available indicators of the reliability of programmes designed by the livestock ministry or of the business environment in the market for animal drugs. However, the attributes of such sector-specific institutions are likely to be associated with those of institutions affecting the whole of society.

Figure 6.1 plots the productivity of labour in the livestock sector against government effectiveness in 168 countries, including developing, industrialized and transition economies. The vertical axis shows the value of livestock production (in PPP dollars) per agricultural labourer (active population in agriculture) (FAOSTAT, 2010) as a proxy for the level of development of the livestock sector. The horizontal axis shows government effectiveness – one of the six governance indicators constructed by the World Bank's Worldwide Governance Indicators Research Project (Kaufmann, Kraay and Mastruzzi, 2009) – which is scored from -2.5 to 2.5, with higher scores implying higher effectiveness. Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to policies.

As expected, Figure 6.1 shows a positive correlation between the overall quality of policies and institutions and the level of labour productivity in the livestock sector. However, it does not answer a critical question: What policies and institutions ensure inclusive and pro-poor growth of the livestock sector?



Sources: FAOSTAT, 2010; Kaufmann, Kraay and Mastruzzi, 2009.

A POLICY FRAMEWORK FOR LIVESTOCK SECTOR DEVELOPMENT

A comprehensive livestock sector policy agenda should look at livestock farming from a broad perspective and take into consideration the multiplicity of elements that directly or indirectly affect sector growth.

Livestock sector development requires that sound macroeconomic policies and a generally conducive institutional framework be in place. For instance, a low inflation rate, stable fiscal policies, a functional judicial system and limited corruption are critical for livestock keepers (and entrepreneurs in general) through providing incentives for planning and making long-term investments in production capacity. However, sound macroeconomic policies and broadly functional institutions are not sufficient to sustain inclusive growth of the livestock sector; owing to limited and asymmetric information and high transaction costs, market imperfections loom large in rural areas and prevent livestock keepers, particularly the asset-poor, from tapping into the opportunities offered by a conducive macroeconomic and institutional environment (de Janvry, Key and Sadoulet, 1997; Serra and Stiglitz, 2008). For example, poor road networks and limited information about animal diseases make it unprofitable for private actors, including animal health service providers and financial institutions, to offer private services and goods in arid and semi-arid sparsely populated pastoral areas. As a result, pastoralists' productive resources and entrepreneurial ability remain untapped, at a net loss for society.

Promoting equitable and efficient growth of the livestock sector therefore requires the design and implementation of a policy agenda that addresses specific constraints of the sector. Such a policy agenda can be divided into three major components, which aim to assist farmers, primarily smallholders (Dorward *et al.*, 2004a; 2004b; Pica-Ciamarra, 2005):

- Policies and programmes to assist smallholders in *managing the basics of livestock production* are public actions that provide livestock keepers with adequate and secure access to basic production inputs, such as land, feed and water for animals, and that help them to cope with risks and shocks, such as natural disasters and price swings. While secure access to basic production inputs and risk-coping mechanisms are pre-conditions for engaging in production, they are not sufficient to ensure that livestock keepers can produce a large enough marketable surplus to rise out of poverty.
- Policies and programmes aimed at *enhancing livestock productivity* include all actions intended to facilitate farmers' access to animal health services, credit, information and output markets – both national and international. All of these resources are essential for farmers' generation and marketing of production surpluses, for improving livestock's contribution to household incomes, and ultimately for sector growth.
- 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 and programmes for *sustaining livestock productivity and competitiveness* include research, environment-related and all the other public actions necessary to support the sustainability and competitiveness of livestock farmers in the medium to long term.

Table 6.1 summarizes the proposed policy framework and its rationale, and lists complementary and/or alternative livestock-related interventions that are available to policy-makers and serve the identified goals.

Table 6.1
A POLICY FRAMEWORK FOR INCLUSIVE GROWTH OF THE LIVESTOCK SECTOR

	Policy goal	Examples of policy instruments	Rationale
Context for livestock policies	Creating a conducive macro-environment	Macroeconomic policies and institutional reforms	Sound macroeconomic fundamentals and high-quality institutions are positively associated with economic and social indicators of well-being
Managing the basics for livestock production	Securing access to land, feed and water	State-driven land and agrarian reform Market-driven land reform Regulation of land rental markets Land titling Recognition of customary tenure Land co-management	Livestock producers need adequate and secure access to land (and associated feed and water resources) to start producing livestock products and by-products
	Providing insurance and risk-coping mechanisms	Livestock insurance Early warning systems Contingency plans Emergency feeding Grazing reserves De-stocking Restocking	Variable returns prevent livestock holders from making efficient use of their resources and lead to adoption of conservative investment decisions
Enhancing livestock productivity and competitiveness	Securing access to livestock/animal health services	Decentralization Cost recovery Joint human-animal health systems Sub-contracting "Smart" subsidies for private service providers Community animal health workers Membership-based organizations "Smart" subsidies for livestock farmers	Livestock keepers are often poor, poorly educated, dispersed, and unable to demand public and private livestock services effectively
	Securing access to credit and other inputs	Portfolio diversification Livestock as collateral for loans Warehouse receipt systems Mobile banking Branchless banking Member-based financial institutions Credit bureaux and scoring	Imperfect and asymmetric information and high transaction costs limit farmers' access to credit and other production inputs, as private agents are rarely willing to serve poor and dispersed livestock producers

(Continued)

Table 6.1
A POLICY FRAMEWORK FOR INCLUSIVE GROWTH OF THE LIVESTOCK SECTOR (CONTINUED)

	Policy goal	Examples of policy instruments	Rationale
Sustaining livestock productivity and competitiveness	Promoting access to national/international markets	Livestock farmers'/traders' associations Livestock brokers Periodic markets Contract farming Market information systems Commodity exchanges SPS standards Disease-free export zones Commodity-based trade Trade-enhancing infrastructure Quarantine zones	Markets' capacity to indicate how livestock producers should allocate their productive resources is constrained by poor communication and transport infrastructure, lack of or limited information, unequal bargaining power among contracting parties, etc.
	Promoting the provision of public goods: research	Decentralization Matching research grants Levy-funded research Competitive research funds Strengthened intellectual property rights Participatory livestock research	Private research centres are willing to invest in profitable breeds/technologies, but poor livestock holders rarely constitute an attractive market for the private sector
	Promoting the provision of public goods: food safety, quality, environment protection	Controlled grazing Co-management of common pastures Livestock zoning Discharge quotas Payments for environmental services Marketing of environmental goods Environmental taxes	Livestock production systems may be associated with negative externalities, which need to be dealt with through collective actions

Source: FAO, 2010a

The policy agenda in Table 6.1 could be used as a reference for identifying priority areas for interventions and exploring possible policy and programme options. However, the design and implementation of successful livestock sector policy and institutional changes require not only broad directions but also practical recommendations to help formulate effective sector interventions.



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DESIGNING AND IMPLEMENTING PRO-POOR LIVESTOCK SECTOR POLICIES AND INSTITUTIONAL CHANGES

Experience of livestock sector growth and its relation to policy design and institutional changes over the last few decades provides five critical lessons to guide the formulation and implementation of pro-poor livestock sector policies and institutional reforms.

Breadth of reforms

Successful growth spurts in the livestock sector have been nurtured by tailored but partial policy and institutional reforms; no country has elaborated and implemented an all-encompassing livestock sector development strategy.

Several developing country governments in Asia, Africa and Latin America – often backed by the international community – have designed more or less wide-ranging livestock sector policies and strategies, such as in Bangladesh (2007), Chhattisgarh, India (2008), Gabon (2008), Indonesia (2000), Malawi (1995), Mali (2003), Mauritania (2002), Orissa, India (2002), Peru (2006), the United Republic of Tanzania (2002) and Zambia (2004). Livestock sector development policies/strategies are usually impressive technical documents, but they have never been fully and successfully implemented because they are built on two rather optimistic assumptions (Easterly, 2008a; Rodrik, 2007). The first of these is that livestock policy-makers have complete knowledge of all the constraints in the sector, which often appears to be the case, as strategies identify dozens of areas for intervention. The second and even more optimistic assumption is that livestock sector policy-makers have the capacity to remove the identified constraints entirely, which entails the adoption of policy instruments both within and outside the livestock domain.

The chances of a comprehensive livestock sector development policy/strategy being perfectly formulated and successfully implemented are therefore small. In practice, from among the many interventions envisaged in a livestock sector strategy, government authorities opt for those that seem technically feasible, stay within the budget constraint, and are politically acceptable. This approach is very pragmatic, and at least something gets done, but such a piecemeal approach has no guarantee of contributing significantly to

development of the livestock sector – in the worst circumstances it may even be welfare-reducing – because all other constraints remain in place (Rodrik, 2007). For example, assume that policy-makers formulate a two-pronged livestock sector development strategy that provides vaccines to villagers and paves feeder roads. The livestock department manages to vaccinate the entire village livestock population, but is unable to induce the ministry of public works to pave the roads. As a result, the increased livestock output may end up in local markets, where prices drop, and livestock keepers may be left no better-off, and perhaps even worse-off, although local consumers may benefit from the greater availability of animal protein. In the worst case, feed shortage or overgrazing due to larger numbers of animals may reduce total output, leaving both producers and consumers worse off.

Broad-based sector development plans are an important tool for building a vision of sector development and creating political consensus, but rather than simultaneously pursuing too many targets in the hope that some will be achieved, policy-makers should identify priority areas for interventions according to selected socio-economic criteria. Many of the policy and institutional reforms that have produced instances of sustained economic growth have been relatively minor, suggesting that when production systems are performing far below their potential, even moderate movements in the right direction can produce major growth pay-offs (Rodrik, 2007). For example, the household responsibility system, which is credited with being one of the pillars of China's phenomenal growth in the last three decades, was based on a marginal liberalization of agriculture while the plan system remained intact: farmers could sell surplus crops freely at market-determined prices after they had fulfilled their obligations to the government under the State order system (Gulati and Fan, 2008).

Target groups

Successful growth in the livestock sector has focused on specific segments of livestock producers, but no successful interventions have targeted the whole gamut of livestock owners, including the poor(est).

In developing countries, most farming households do not possess sufficient productive resources, including farm animals, to rise above the poverty threshold through livestock farming alone, and wage employment is a critical source of income for many of the poor: household surveys in 13 African, Asian and Latin American countries indicate that wage employment contributes up to 47 percent of the income of the poor, defined as those living on less than 2 PPP dollars a day (Valdés *et al.*, 2008; Rae and Zhang, 2009; and see also Chapter 3). For the poorest, therefore, increased off- and non-farm employment opportunities are possibly the most practical pathway out of poverty. In addition, in the course of economic growth, wage employment becomes the most important source of livelihoods, with fewer and fewer people being self-employed: for example, about 13 percent of the workforce in Bangladesh and Madagascar is classified as hired employees; 19 percent in Cameroon; 35 percent in Pakistan; 52 percent in the Philippines; 67 percent in Brazil; 75 percent in Argentina; 86 percent in Japan; about 89 percent in Germany and France; and almost 93 percent in the United States of America (ILO, 2010).

Even if funds were available for major and comprehensive investments in the livestock sector – such as the distribution of highly productive breeds, the adequate provision of animal health services and veterinary supplies, the construction of feeder roads, and the establish-

ment of market information systems and slaughterhouses – any attempt to make all farmers establish profitable business enterprises would be destined to failure. On the one hand, if all livestock keepers (who account for a large proportion of rural households in most developing countries) attempted to produce surplus meat or milk, input costs would increase, output prices would drop and the profitability of livestock farming would decline (Islam and Jabbar, 2005; Pica-Ciamarra and Otte, 2010). This scenario is a typical case of the fallacy of composition: what works for one livestock farmer does not necessarily work for all of them. On the other hand, the main contribution of agricultural growth, including of the livestock sector, to economic development and poverty reduction has been through significant multiplier effects propagated to other sectors of the economy, including via consumption and production linkages, rather than through direct contributions to farmers' livelihoods (Chenery and Syrquin, 1975; Pica, Pica-Ciamarra and Otte, 2008; see also Chapter 4). Indeed, the more small farmers contribute to agricultural growth the better, because smallholder-based growth has proved to be particularly inclusive (Bourguignon and Morrison, 1998; World Bank, 2003): for instance, for every 1 000 litres of milk per day produced in Kenya, small-scale farmers (with fewer than two cows each) create about 60 long-term wage labour opportunities, compared with 44 full-time jobs created by medium-scale farmers (with three to six cows) and 43 by large-scale farmers (more than six cows) (Staal, Nin Pratt and Jabbar, 2008a).

Inclusive livestock sector policy and institutional reforms should therefore target small to medium-sized farms that are able to establish sustainable and lucrative livestock enterprises, which generate employment opportunities in rural areas and provide affordably priced livestock products to rural and urban consumers. As summarized by Upton and Otte (2004):

It is clear that livestock keeping has a direct impact in contributing to the incomes of poor livestock producers. However, given that increased income from agriculture is effective in generating employment in local non-tradable goods and services, a strong case can be made for poverty relief through employment creation as well.... for this pathway to be effective, rapid growth of livestock output and market supply is needed to generate increasing cash incomes for producers. Arguably this rapid growth is more likely to be achieved by targeting livestock development policies on the "not so poor, yet still poor" smallholders, rather than the "very poor".

This does not mean that the very poor should be abandoned. Programmes such as the Bangladesh Model for promoting very small poultry units for poor women produce direct benefits and should be encouraged. However, livestock sector interventions are likely to have more impact on reducing the numbers of the very poor by encouraging "not-so-poor" livestock producers to expand production for the market, which will enable them to spend more on non-agricultural and non-tradable goods and services, thereby creating employment and generating further income growth. Immediate benefits to the very poor are more likely to accrue from interventions in other areas.

Incentives and markets

Many if not all instances of successful and sustained development of the livestock sector have created incentives for "not-so-poor" farmers to invest their productive resources in increasing the profitability of their businesses, including their livestock enterprises (Spielman and Pandya-Lorch, 2009; Werbeke *et al.*, 2009).



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Little can be achieved without the right incentives. Agricultural development is more likely to succeed when policies that encourage farmers, entrepreneurs and companies to invest in agriculture are in place, and when markets provide accurate and timely price signals to these private sector actors (Spielman and Pandya-Lorch, 2009).

Public interventions that have nurtured growth in the livestock sector by directly or indirectly leveraging farmers' incentives include the eradication of rinderpest (or "cattle plague") in almost 130 countries worldwide, the Operation Flood Programme in India, and the eradication of foot-and-mouth disease (FMD) in Uruguay.

Rinderpest is a contagious disease of cattle, which can kill up to 95 percent of infected animals. Worldwide eradication of rinderpest – the last case of which was detected and confirmed in Kenya in 2001 – has been possible because of four major factors: i) cattle are the only reservoir for the virus; ii) an effective thermo-stable vaccine that confers lifetime immunity after a single application was developed in the late 1980s; iii) national governments cooperated closely in the eradication effort, which was coordinated through the Global Rinderpest Eradication Programme (GREP); and iv) farmers had major incentives to vaccinate their cattle, given the high mortality associated with rinderpest and the many high-value contributions cattle make to farmers' livelihoods (Otte and Upton, 2005; Roeder and Rich, 2009). After GREP began, IAEA (1998) reports that in Mali, for example, annual beef output increased by 21 percent, milk off-take by 33 percent, and hide production by 17 percent, while annual herd growth increased from less than 1 to 8.5 percent.

In India, Operation Flood, which ran from 1970 to 1996, promoted the creation of a national dairy industry by linking small-scale farmers, with two to five cows each, to markets. The programme established a network of farmers' cooperatives, at the village level for collecting milk and at the district level for operating processing plants, and state federations for milk marketing and the coordination of interstate sales. By linking production (farmers) to consumption (market and business opportunities), Operation Flood motivated farmers and other actors along the supply chain to invest in milk production and related activities: in 2008, about 13 million farmers were members of dairy cooperatives, and India is currently the largest milk producer in the world:

Operation Flood focused not only on boosting milk production, but also on developing a strong marketing system for milk. The architects of Operation Flood continuously analyzed the rising demand for livestock products and designed an integrated and comprehensive program to meet this demand, complete with supply-chain management systems and centralized quality control. (Cunningham, 2009)

FMD is a highly contagious viral disease that affects cloven-hoofed animals and results in substantial production losses in dairy cattle. Countries that have eradicated FMD impose strict zoosanitary barriers on imports of animal products from infected countries, thereby creating a premium market for livestock products from FMD-free countries. In 1995 Uruguay, where beef represents more than 21 percent of exports in value terms, entered the group of non-vaccinating FMD-free countries and gained access to premium world beef markets – including the United States of the America – for the first time in many decades. The success of the Uruguayan FMD eradication effort is attributed to the active role of producer associations in designing and implementing the strategy in collaboration with national animal health authorities, as the elimination of FMD from the national livestock herd would bring potentially very high returns for producers, as well as for the government. In April 2001, however, Uruguay reported an outbreak of FMD in Soriano state, near the border with Argentina, and at the time of the World Organisation for Animal Health (OIE) May 2010 report, the country had not regained its status of FMD-free without vaccination (it is currently FMD-free with vaccination), largely because of limited collaboration among the concerned stakeholders. Following this outbreak, beef producers lost trust in the public veterinary authorities' capacity to conduct animal disease surveillance and tackle epidemics (Jarvis *et al.*, 2001; Rodriguez Gustá, 2008; OIE Web site,²⁶ 10 January 2011).

Experimentation

Policies and institutions should provide “not-so-poor” livestock keepers and other private and public actors with the right incentives to make good use of their productive resources and, particularly, to set up sustainable livestock enterprises. However, putting these broad principles into practice is far from straightforward.

There are no hard and fast rules for what livestock institutions – such as ministries of animal husbandry – need to do to achieve their objectives; there are many ways of performing a given function and none is always better than the others. The tendency to concentrate on best practice institutions or policies risks creating blind spots while alternative institutional designs that might achieve the desired objectives at lower cost are overlooked (Rodrik, 2007; Banerjee and Duflo 2009). For instance, there are a variety of alternative and complementary options for improving the delivery of animal health services and veterinary supplies in rural areas, including decentralization (e.g., Uganda), subcontracting of private service providers (e.g., Morocco), support to veterinarians for opening animal health clinics in main livestock areas (e.g., India), provision of vouchers for farmers to purchase animal health services and drugs at market prices (e.g., Mali), joint supply of human and animal health services to reduce delivery costs (e.g., Chad), institutionalization of community-based animal health workers (e.g., Indonesia), and support to membership-based organizations providing animal health services to their members (e.g., India) (FAO, 2010a).

²⁶ www.oie.int.



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Implementation of the selected instrument(s) is also fraught with difficulty, because again multiple options are available. For instance, decentralization can mean delegation, deconcentration or devolution; veterinarians, para-veterinarians or NGOs may be subcontracted to deliver animal health services; private actors can receive grants or loans at preferential interest rates for setting up animal health posts in rural areas; and community animal health workers can be trained for a day or for one week, by NGOs or public veterinary schools.

Because there are many ways of performing a single function, such as delivering equitable and efficient animal health services in rural areas, decision-makers have to adopt a strategy for selecting the right instrument and ensuring that it is implemented as it should be. Some instruments may be totally unfeasible because of budget constraints (e.g., there may be no funds for providing grants to private veterinarians for setting up their own businesses in rural areas) or because they are inconsistent with the broader policy and institutional framework (e.g., there are no NGOs to which the delivery of veterinary services can be subcontracted). Decision-makers should concentrate on the one or two potentially feasible alternatives that appear the most promising according to evidence on the ground, research, experience from other countries, and the current political economy in the country.

It can never be certain that the proposed policy/institutional change will work effectively, because there is no such thing as a perfect off-the-shelf institution. To reduce uncertainty and identify the best institutional design for delivering some services, decision-makers may pilot a variety of institutional reforms in different areas, selected randomly from a larger set, and then scale up the most promising alternative to the country level at a later date²⁷ (Banerjee and Duflo, 2008; Duflo and Kremer, 2008). For instance, pilots can be designed to test whether the compensation schedule for subcontracted veterinarians should be fixed, linked to the number of villages visited or linked to the number of animals vaccinated; whether community-based

²⁷ Not all policies/reforms can be piloted; for instance, changes in monetary policy or infrastructural investments cannot be.

animal health workers should receive refresher courses every six months or every year; etc. The objective is to measure the average outputs of identified variables, such as milk productivity or off-take rate, for comparison with the results from groups of individuals who did not participate in the pilot. The costs and benefits of different options can then be compared, so that decision-makers can scale up only the most effective institutional reforms.²⁸

This experimental approach is demanding, but it makes it more likely that major policy and institutional reforms have a positive impact on the ground. Too often, policies and programmes have failed and been abandoned because their institutional design was flawed, despite their valid and sound basic rationales.

Collaboration and coordination

Development of the livestock sector depends, often critically, on non-livestock sector policies and programmes at the macro and agriculture sector levels, such as monetary, trade and rural credit policies. Policies and institutional reforms addressing only animal health, breeding and feeding, which are within the traditional remit of the livestock department, are insufficient to promote sustainable growth of the livestock sector. For instance, public actions that focus exclusively on improving animal breeds and the quality and coverage of animal health services may fail dismally if farmers do not also have access to feed, water and other inputs, and to output markets. What are the incentives for livestock keepers to keep genetically high-potential livestock if they have limited access to feed? Where are they going to sell their surplus meat or milk if they lack access to a remunerative market?

The government institution in charge of the livestock sector therefore needs to design policies and institutional reforms that are consistent with the broader social and economic framework in which livestock farmers operate. It should also collaborate with other relevant ministries, the private sector and civil society. In many circumstances however, governments design and implement livestock sector policies that fail to take adequate account of prevailing sector policies/institutions and that are isolated from, or only loosely connected to, other actors. This is likely to result in misuse of public resources, which may be allocated to ineffective or even harmful public actions. Although individual livestock policies are important, it is the overall governance system – including all its policies and the (dis)incentives they create for actors in the public and private sectors – that ultimately determines whether the development pathway of the livestock subsector will benefit the poor (Pica-Ciamarra and Robinson, 2008).

The ministry/department of livestock's responsibilities are traditionally confined to animal and veterinary public health, breeding and feeding. This makes it difficult to create and build collaboration and partnership with other sectors. However, the current thrust towards market liberalization provides unprecedented opportunities for addressing other

²⁸ Unfortunately, there are no examples of experiments with different institutional designs in the livestock sector; the few experimental interventions so far have focused on the delivery of major public goods, such as health and education. For instance, there is agreement that provision of incentives based on school participation and performance can be an effective tool for improving the education level, but it is not clear whether children or parents should be rewarded. To investigate this question, Berry (2008) worked in India with the NGO Pratham to design a programme in which incentives for encouraging improved reading skills among children took the form of toys for the children or money for their parents. He found that rewarding the children was more effective in improving test scores (which are different from school attendance) than rewarding their parents was.



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binding constraints to livestock sector development. Market-based policy instruments, which are one-off interventions/investments to provide incentives to key actors along the supply chain, are not necessarily linked to the specific domains of the livestock department. For example, while livestock policy-makers are not responsible for regulating micro-credit in rural areas, they could urge financial institutions to explore ways of accepting farm animals as collateral for small loans (as in Uganda). They are not responsible for the national research policy, but they could set up competitive research grants (again pioneered in Uganda) or matching grants (as in Malaysia) to promote livestock research in a given domain. Livestock policy-makers are not responsible for road building, but they could support the establishment of periodic livestock markets (as in Kenya) or facilitate transactions along the supply chain by establishing marketing cooperatives (as in Armenia). They are not responsible for the broader environmental and trade policy framework, but they could promote experiments for sustainable land co-management (as in the United Republic of Tanzania) or contribute to the establishment of livestock export facilities (as in Djibouti) (FAO, 2010a).

Livestock sector policy-makers are primarily responsible for the supply of public goods and market-driven interventions in the major livestock sector domains, and not for promoting changes in the overall policy framework of, for example, the credit and research domain. However, within broader livestock development policy and strategy, they could make efforts to attract investment and entrepreneurship into the livestock domains where development is likely to make the largest contributions to livestock sector growth. One way of doing this is by facilitating partnerships and collaboration with other public and private sector actors that play essential roles in supporting livestock sector development.

NURTURING LIVESTOCK POLICY AND INSTITUTIONAL CHANGES

The political economy of policy-making involves complex interactions among the community, national and international levels, and in-depth analysis is required to understand the political, economic and social structures and institutions that cause livestock policies to be formulated and implemented in distinctive ways in different parts of the world. Within their national systems, smallholders are particularly disadvantaged because

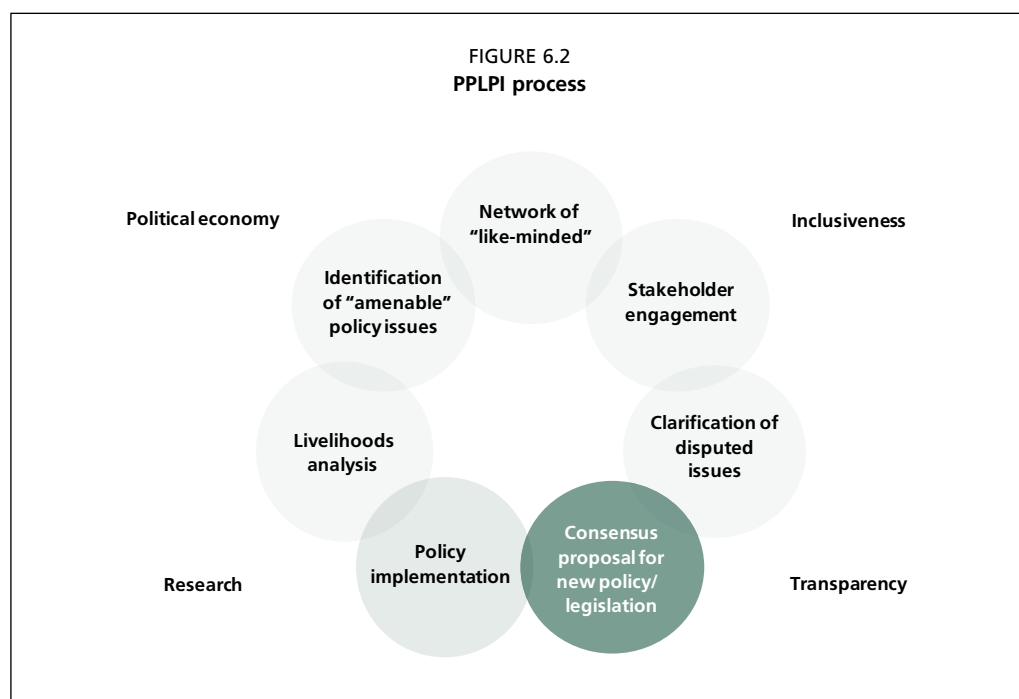
their political participation tends to be mediated through vertical patron-client linkages (Leonard *et al.*, 2010). The rural poor, who are often dispersed and have poor means of communication, face high opportunity costs for collective action, i.e., they cannot afford not to work in order to participate in lengthy and time-consuming policy processes whose outcomes are not immediate and are at best uncertain (Binswanger and Deininger, 1997). In the policy arena, smallholders' interests are therefore represented – if at all – by the better-off, who rarely promote policies targeting and benefiting the rural poor. Without outside help, smallholders are therefore unlikely to engage in effective political action on issues related to their collective interests as producers. A crucial weakness of poor producers is their lack of information on how the larger political system works and the kinds of policies that are feasible and would help them.

Experience shows that external actors can promote pro-poor policy and institutional change from the outside by building partnerships and knowledge exchange networks, rather than by providing policy advice. This approach involves facilitating policy processes, including by assisting stakeholders' access to different sources of knowledge, managing conflicting interests and ideologies, learning from the experience of other stakeholders within and outside the country, and incorporating these lessons into policy dialogues and implementation. Such processes are iterative and lengthy. They require long-term engagement, consistent commitment, and flexible and adaptive process management. As an example, Figure 6.2 depicts PPLPI's engagement in policy processes (see PPLPI, 2008 for details), which involved four main steps:

- identification of the areas where livestock are a livelihood priority;
- evaluation of the policy and institutional context within which livestock-dependent poor have to make their living;
- identification of the political economy – the policy measures or gaps that affect the livestock-dependent poor;
- formation of networks of partners to create or capitalize on opportunities for achieving pro-poor policy shifts.

Careful in-depth policy reconnaissance should precede decisions on where to engage, to ensure that engagement is geographically and temporally located where favourable outcomes are most likely to occur. External actors should therefore serve as catalysts for livestock sector change within broader change processes that have already begun or are being considered, rather than trying to create momentum for change from a standing start. It is also more effective to work with, and often strengthen, existing organizations rather than to create new ones.

External actors can play an important role in fostering pro-poor policy processes only when they are seen as trustworthy partners – respected outsiders with no vested or other interests to protect or promote beyond the highly visible one of seeking a pro-poor outcome. This trust is usually strengthened by partnering/recruiting highly respected national professionals with first-hand experience of the issues involved, who can rapidly gain (or already command) the respect and trust of the disparate parties. Trust is also reinforced by the evidence-based inputs that external actors, such as project staff and consultants, provide to the policy process. Conducting or commissioning research and desk studies that draw on local expertise provides these actors with credible evidence for encouraging policy



and institutional reform. Diffusing charged and emotionally based arguments by introducing carefully considered authoritative evidence is very effective in addressing contentious issues and formulating rational and acceptable ways of moving forward.

An important role for external actors is in facilitating broad, inclusive stakeholder engagement and dialogue. Again, it is undoubtedly easier for outsiders to undertake the tricky process of bringing together groups of people who would not normally meet, and who seem to share little common ground. The identification and involvement of local "champions" – personalities who can articulate the views of specific groups – often proves beneficial in strengthening the voice of marginalized and poor stakeholders who are not usually part of the policy-making process and who lack a channel for communicating their views to government. A lasting legacy of many such processes is the increased capacity of livestock and related associations to engage with government and other authority figures, by continuing to demand rather than timidly asking for their rights.

Another important feature of approaches for spurring pro-poor policy processes is that they must be flexible, to provide stakeholders with the space and freedom to operate. For example, when it becomes desirable to expand the range of stakeholders involved in a process, the time and funding needed for this should be made available. Flexibility also allows creativity in finding solutions and resolving difficult situations. There must be willingness to take risks and try different approaches, otherwise the change processes are very likely to stall.

Principles and lessons emerging from successful experiences in nurturing policy and institutional change in the livestock and other sectors, and which could enable more effective policy assistance, suggest that factors for success include: i) partnerships and participation; ii) national ownership and local champions; iii) flexibility and long-term commitment;

iv) technical, economic and political economy analyses; v) an emphasis on gradual and tailored policy reform; and vi) a dose of opportunism and risk-taking. These are largely known, but have rarely been systematically applied and documented.

DISCUSSION AND CONCLUSIONS

Formulating and implementing policies, and establishing sound institutions capable of nurturing inclusive and pro-poor growth of the livestock sector are more complicated tasks than they seem, as many different policies and institutional arrangements may promote livestock sector growth that benefits the less well-off. However, some “high-order” guiding principles can be identified. At the broader level, functional institutions are a precondition for sustainable growth in all productive sectors, including livestock. At the sector level, livestock policies should:

- be consistent with the broader agricultural and macroeconomic policy framework;
- focus on relatively small and targeted changes rather than attempt to address all the constraints affecting sector development;
- target defined groups of livestock keepers, and enhance the incentives underpinning the investment decisions of these groups;
- build on cooperation and synergies with a variety of actors, both within and outside the livestock sector.

Beyond these generic recommendations, it is difficult to prescribe which livestock sector policies and institutions are the best and how they should be organized to support sector growth and poverty reduction. Even in countries where the overall institutional framework is far from optimal, the livestock sector can record remarkably high growth rates. In Southeast Asia, for instance, military-ruled Myanmar has one of the weakest institutional architectures, Viet Nam is a successful fast-growing country in transition, and the democratic Philippines has gone through several economic up- and downturns in the last two decades. Given these remarkably different economies, the net per capita livestock production index²⁹ developed in some unexpected ways between 1990 and 2009, with Myanmar witnessing the fastest growth rate and currently recording higher labour productivity for milk (measured by the ratio of total production to economically active population working in agriculture) than either the Philippines or Viet Nam, but lower labour productivity in meat production (FAOSTAT, 2010).

In general, a good mixture of public and private sector goods should ensure that the right incentives are in place for farmers to increase their production levels and efficiency. Regardless of the quality of the overall policy and institutional environment, a risk-taking experimental approach to instigating changes and providing incentives to livestock producers is possibly one of the most effective elements for promoting growth of the livestock sector in ways that are inclusive and benefit the poor, as producers or consumers and through the multiplier effects that livestock generate in the broader economy.

Policies and institutional arrangements are essential in mediating how the livestock sector develops, how current and former livestock keepers fare, and how well the needs of consumers – rich and poor, rural and urban – are served. An important insight from PPLPI’s

²⁹ The value (in PPP dollars) of net national livestock production per person compared with that in the base period of 1999 to 2001.

experience is that at the sub-national, national or even regional level, pro-poor policy and institutional changes in the livestock sector can be brought about with relatively few direct inputs into policy processes. Rather than imposing a policy, such inputs need to focus on providing incentives and opportunities for diverse stakeholders to interact effectively.

Potential problems associated with this approach, which may deter more conservative donors or implementation organizations, relate to the length of time required to achieve impact and the difficulty of attributing cause and effect for complex processes. The iterative open-ended nature of policy processes means that policy change does not occur quickly, and once it has occurred, more time is needed to implement the changes, and yet more time before impacts can be observed. Such lengthy timeframes do not fit well into the short, inflexible cycles of most projects. However, this drawback may be more than compensated for by the far-reaching nature of the eventual impacts.

SUMMARY AND KEY POINTS

The basic principles for effective livestock policy-making and promotion of policy and institutional change can be summarized as follows:

- Livestock sector policies should be consistent with the broader institutional and policy framework directing growth in agriculture and in the economy in general.
- Global and national macroeconomic policy contexts can be as important to poor livestock producers as are sectoral policies. There should be balance between: i) macroeconomic policies and sectoral ones (agriculture, livestock); ii) economic policies and social/distributional policies to support the poor; and iii) policies for sector growth and for sustainability.
- Most attempts to carry out wholesale reform of the livestock sector have proved ineffective, and piecemeal implementation can create more harm than good.
- Small tailored policy and institutional changes can generate remarkable returns through enhancing the livestock sector's contribution to economic growth and poverty reduction.
- A wide range of policies and institutions can support livestock sector development, but the specifics of each country setting make a copy-and-paste approach to policy and institutional reform unlikely to work.
- Experimentation is an effective way of identifying the most appropriate institutional and policy reforms for supporting sector growth in different countries. However, it requires a risk-taking approach and willingness to accept failures as well as successes.
- Policy reforms in the livestock sector should target the "not-so-poor" farmers, if the objective is to spur growth that benefits the poor, particularly through the multiplier effects generated by sector development.
- Policy reforms should generate incentives for behaviour change for both public and private sector actors, in the livestock sector and beyond.
- The relationship between policy/institutional reforms and livestock sector development is two-way, as changed institutions influence the level and pace of the sector's growth pattern, while sector development may call for further institutional changes. In other words, the process of designing and implementing policies that sustain inclusive and pro-poor growth of the livestock sector is endless.

- Most governments do not deliberately formulate policies that are anti-poor, but they fail to realize that economic growth, although necessary, is not always sufficient for poverty reduction.
- Conventional approaches in which policy advice is simply transferred to policy-makers and practitioners are unlikely to have much impact; partnerships and knowledge exchange networks and mechanisms should be established to provide policy advice, rather than relying on “authorities”. However, such processes are long, iterative and uncertain in their outcomes.

7. Conclusions for pro-poor livestock sector development

Over the last two generations, poverty reduction has advanced significantly around world, but it is still very much work in progress. The global incidence of extreme poverty (< \$1.25/day) in developing countries has declined significantly, from 42 percent in 1990 to 26 percent in 2005. However, the absolute number of extremely poor people is still an alarming 1.4 billion (down from 1.8 billion in 1990), and it is estimated that about 2.6 billion people are living on less than \$2/day. In spite of declining poverty incidence throughout the developing world, in some regions – notably South Asia, sub-Saharan Africa and the Near East and North Africa – the number of extremely poor increased between 1990 and 2005.

A disproportionate 70 percent of the world's extremely poor and 60 percent of the poor live in South Asia and sub-Saharan Africa, where much of the land is in arid and semi-arid agro-ecological zones. Poverty is closely related to malnutrition, and in 2004 significant majorities of the world's protein-energy malnourishment (72 percent), vitamin A deficiency (75 percent) and iron-deficiency anaemia (58 percent) were recorded in these two regions, although together they represent only about a third (40 percent) of humanity. Efforts to reduce poverty and improve nutrition should therefore focus closely, but not exclusively, on South Asia and sub-Saharan Africa.

Because of their many contributions to nutrition and economic survival in developing countries, livestock can play an essential role in improving poor people's livelihoods everywhere, particularly in rural areas, where most of the world's poor reside. This chapter summarizes findings regarding how to facilitate livestock policy in ways that confer benefits to poor people. This apparently simple question has many answers, because policies must be adapted to the multitude of complex challenges and opportunities facing the world's poor. Nevertheless, some general lessons can guide progress towards more effective poverty reduction, while local realities inform policies for achieving more inclusive and lasting benefits.

AGRICULTURE AND THE RURAL NON-FARM ECONOMY

Poverty and food insecurity are more prevalent in rural than urban areas, and about three-quarters of those classified as extremely poor or destitute live in rural areas. Significant majorities of the populations of both sub-Saharan Africa (70 percent) and South Asia (65 percent) were classified as rural in 2005, while 58 and 50 percent respectively of these region's total populations were classified as agricultural (FAOSTAT, 2010). Rural populations are thus predominantly agricultural, and agriculture is the most important sector affecting poor people's livelihoods in most developing countries.

Typically, agriculture accounts for 40 to 60 percent of rural households' total income, while the remainder is derived from the rural non-farm economy (RNFE) and remittances.

This raises important questions regarding the roles of agriculture and the RNFE in rural poverty alleviation.³⁰ In their review of non-farm income diversification, Barrett, Reardon and Webb (2001) conclude that for the poorest, diversification is “desperation-led” and results in portfolios with low marginal returns, while the extremely poor face substantial barriers to high-return niches in the RNFE. Promotion of the RNFE is thus likely, at least initially, to increase rural wealth disparities until the benefits of rapid growth among the better off trickle down to the poorer subpopulations through demand for hired labour. Wiggins and Proctor (2001) caution against overly optimistic expectations for rural industrialization, suggesting that “rural areas may have comparative advantage only in primary activities based on immobile natural resources and closely related activities”, and the oft-cited expansion of the RNFE is in many cases triggered by agriculture-led growth (Hazell *et al.*, 2010; Start, 2001; Thirtle *et al.*, 2001) and requires supporting infrastructure (Byerlee, Diao and Jackson, 2005). Improvements in agriculture are thus the “best bet” for broad-based and rapid rural growth and poverty reduction in low-income, agriculture-based countries (Kydd and Dorward, 2001).

While the poor derive about half of their income from agriculture, at least half of total expenditure by low-income households goes on food, often without attaining satisfactory levels of nutrition. As many agricultural households are food-insecure, some degree of income diversification is often pursued as a strategy for stabilizing income flows and consumption (Barrett, Reardon and Webb, 2001). Improving food production and markets should therefore benefit both producers and consumers, a distinction that can be somewhat fluid in rural areas, where households may be net sellers during the harvest period and net buyers later in the year (Barrett, 2008; Irz *et al.*, 2001). Given the relatively high cost of transporting food, and the pervasiveness of rural food insecurity, it makes economic sense to promote the production of food close to where it is needed.

Agriculture thus retains a critical role in reducing poverty and enhancing food and nutrition security because it is central to rural livelihoods and no other activities have the same potential for supporting broad-based pro-poor growth (e.g., Irz *et al.*, 2001; Kydd *et al.*, 2002).³¹ In addition to its direct benefits, bottom-up agricultural growth also has powerful leverage effects on the rest of the economy, especially in the early stages of economic transformation, when consumption linkages prevail (Irz *et al.*, 2001; Hazell and Diao, 2005). This does not mean that development efforts should focus exclusively on agriculture, but that policy-makers and donors should be more aware of the pro-poor bias of agricultural growth and should not discount agriculture as obsolete when considering how and where to invest development resources. Policy-makers and donors should pay more attention to the complementarities and synergies among different investment options rather than regarding these options as mutually exclusive.

LIVESTOCK AND CROPS

For agriculture to realize its poverty-reducing potential, it is essential that agricultural growth outpaces growth of the agricultural population, which in turn requires that

³⁰ The diversification of rural households is not a recent phenomenon. In 1975, for instance, Kenyan smallholders already derived half or more of their incomes from non-farm sources (Hazell and Diao, 2005).

³¹ In Africa, for instance, industry employs only about 10 to 15 percent of the labour force, and its employment elasticity is low compared with that of agriculture (Hazell and Diao, 2005).

agricultural productivity be increased (Irz *et al.*, 2001; Thirtle *et al.*, 2001). Only then will agriculture make lasting contributions to food security, offering sufficient income to producers, while improving poor consumers' real incomes by reducing food prices. This double-dividend poverty-reducing impact of agricultural productivity growth can be substantial, and empirical estimates show that each 1 percent increase in yields leads to a reduction of between 0.6 and 1.2 percentage points in the proportion of people living in extreme poverty.³²

In economies that remain heavily dependent on agriculture, livestock form an integral part of predominantly smallholder diversified farming systems. In these settings – which remain the norm across the low-income world, especially where poverty rates are highest – the majority of rural households keep some farm animals, and poor households are even more likely to do so (Pica-Ciamarra *et al.*, 2011). At the global scale, the livestock sector is the second most important contributor to the agricultural economy, superseded only by large-scale staple crops. However, smallholders generally have no comparative/competitive advantage in the production of staples, and limited participation in staples markets, often as net buyers (Barrett, 2008), while the same does not hold for labour-intensive high(er)-value horticultural and livestock products. In addition, demand for high-value agricultural commodities grows more rapidly than that for staples, so high-value commodities offer superior income prospects for smallholders. Raising livestock productivity and production, which results in higher value creation per unit of labour and/or land, would thus appear to be a promising avenue for accelerating rural poverty reduction. In the context of smallholder milk production in India, for example, Mellor (2003) argues that “if the domestic livestock industry meets the demand growth, it will double in size every ten years, will soon account for over half of agricultural GDP and bring about rapid growth in overall agricultural production and incomes”. Tiffin (2003) and Burke *et al.* (2007) note that in Senegal and Kenya investments by respectively the middle-income and better-off segments of the farming community are directed towards livestock rather than crops, and in Senegal a market for crop residues (as animal feed) has developed, with higher prices for groundnut and cowpea hay than for grain.

Although livestock generally have lower total output value than staple crops, productivity growth in the livestock sector can have significant poverty reduction impacts, both directly and through multiplier effects. The direct role of livestock in poverty reduction has been empirically documented in Kenya by Burke *et al.* (2007). By exploiting the close linkages between crops and livestock in most smallholder systems, a strategy for combined productivity growth in livestock and staple and cash crops³³ would have the strongest income multipliers and poverty reduction benefits.³⁴ According to Poulton, Kydd and Dorward (2006), agriculture development planning should therefore focus on promoting horticultural and livestock production and marketing activities.

³² Minten and Barrett (2008) elaborate this relationship using a comprehensive, spatially explicit dataset from Madagascar.

³³ For example, expanding production of organically grown fruits and vegetables in developing countries is increasing the demand for animal manure (Bradford, 1999).

³⁴ Where feasible, smallholders have been found to increase their income share from livestock and exploit crop-livestock synergies (e.g., Faye and Fall, 2000; Tiffin, 2003).

SMALLHOLDER LIVESTOCK PRODUCERS AND POOR LIVESTOCK KEEPERS

Agricultural populations in developing countries continue to expand, and more than two-thirds of the world's 3 billion rural people reside on farms of less than 2 ha³⁵ (IFPRI, 2005). In many developing countries, average farm sizes are declining (Hazell *et al.*, 2010), and small farms will continue to dominate the agricultural landscape in the developing world for at least another 20 years, especially in Africa and Asia (Nagayets, 2005). Compared with average farm sizes of 121 ha in North America, 76 ha in Latin America and the Caribbean, and 27 ha in Western Europe, the corresponding value for Africa and Asia is 1.6 ha (Nagayets, 2005). Averages mask distributions of landownership, but farms of more than 10 ha are extremely rare in sub-Saharan Africa and Asia, and the average size of farms in the top quartile of a sample of five sub-Saharan countries ranged from 1.8 to 5.9 ha (Jayne, Mather and Mghenyi, 2010). Thus, in sub-Saharan Africa and Asia relatively "large" farms become "small" when compared with their counterparts in the rest of the world. Nevertheless, even in this universe of small farms, the average farm size in the top quartile was five to 15 times as large as that in the bottom quartile, with at least one-quarter of the farm households in the surveys quoted by Jayne, Mather and Mghenyi (2010) approaching landlessness. For most households in the bottom landholding quartile, even a doubling of crop income would have little impact on their absolute level of income or poverty rate. A pragmatic aspect of rural development is that increased smallholder market participation and productivity growth must go hand-in-hand with increased migration of smallholders out of agriculture (Barrett, 2008).

Although livestock keeping has a direct positive impact on the incomes of poor livestock producers, and although livestock ownership and income from livestock are more evenly distributed than landownership and crop income (Mellor, 2003; Zezza *et al.*, 2011), the observations of Jayne, Mather and Mghenyi (2010) that increased agricultural output brings minimal improvement to the welfare of marginal agricultural households also hold for livestock keepers. Significant direct impacts on household incomes through improved livestock production are likely to be felt only by households for which livestock already constitute an important enterprise (e.g., Garcia *et al.*, 2006), while other households are more likely to benefit indirectly through growth linkages and enhanced nutrition security. To trigger this initial growth impulse, livestock development policies and related interventions should probably target a subset of the most eligible farmers – "upper" smallholder livestock keepers – who have the minimum asset base for engaging sustainably in market-oriented livestock production, rather than focusing on marginal livestock keepers, who have insufficient assets to produce a regular surplus from their livestock. While upper (e.g., top quintile) smallholders do not use natural resources any more efficiently than lower (e.g., bottom quintile) smallholders do,³⁶ they achieve higher returns on farm labour (e.g., Garcia *et al.*, 2006; see also Chapter 3). Increased labour productivity is essential for linking smallholder production to poverty reduction (Collier and Dercon, 2009) and requires larger

³⁵ The World Bank (2003) defines smallholders as farmers with a low asset base operating on less than 2 ha of cropland.

³⁶ An "inverse productivity" relationship, in which yields per hectare are higher on smaller farms, is found across a wide variety of contexts. Explanations include that the economies of scale large farms may enjoy are outweighed by labour supervision costs or market imperfections (e.g., Eswaran and Kotwal, 1986; Barrett, 1996).

farm/herd sizes, investment in mechanization, and diversification into higher-value products.³⁷ As instable food prices and high marketing margins encourage poor producers to prioritize staple food production for own consumption before diversifying into higher-value commodities for sale (Poulton, Kydd and Dorward, 2006), increasing smallholder productivity involves the development of supply chains that serve small-scale farmers and provide them with the necessary links to suppliers and consumers (Diao, Hazell and Thurlow, 2010).

This does not mean that very poor or marginal livestock keepers should be abandoned, but reductions in the numbers of the very poor are likely to be faster if “more eligible” smallholder livestock producers are encouraged to expand production for the market through investments that enhance productivity. This group can also offer important leadership in technology adoption/diffusion, and provide a basis for local spill-overs of network externalities. To take advantage of economies of scale in processing and marketing, development efforts should also facilitate vertical linkages between market-oriented livestock producers and commercial or cooperative companies. Similar to promotion of the RNFE, this strategy is likely to increase rural wealth disparities, at least initially, and may therefore need to be complemented with safety net programmes to support the most vulnerable until the increased income from agriculture generates employment in local non-tradable goods and services. Identifying the smallholder (livestock) producers most likely to respond to market incentives, and finding the right mix of interventions to exploit the complementarities among various actors in livestock production and marketing are complicated tasks that require highly context-specific approaches. Self-selection mechanisms, such as enterprise credit and a wide array of public goods and services that facilitate productivity growth and market access, can reduce this complexity. The social costs of prematurely dismissing smallholders as unproductive and uncompetitive, as well as those of unselectively promoting smallholder production irrespective of initial endowments are likely to be very high, as either approach will lead to large rural majorities being trapped in low-income subsistence activities.

POOR PEOPLE AND POOR REGIONS

It has often been stated that the majority of the poor live in rural areas, but the term “rural” needs to be more precisely defined. Wiggins and Proctor (2001) describe rural areas as “spaces where human settlement and infrastructure occupy only small patches of the landscape, most of which is dominated by fields and pastures, woods and forest, water, mountain, and desert”. They provide a useful categorization of rural areas into “peri-urban”, “middle countryside” and “remote”. Although poverty incidence tends to be highest in sparsely populated remote areas, numbers of poor people are usually much higher in areas where overall (headcount share) poverty incidence is relatively low but population density is high, i.e., the majority of the rural poor live in the middle countryside, not very far from urban areas/small towns. This evidence suggests that a strategy for poverty reduction should build on urban-rural growth linkages and promote market access incrementally, radiating outwards from urban areas into the middle countryside. Focusing poverty reduction efforts on the middle countryside is likely to be more cost-effective than focusing on sparsely populated remote areas, because: i) the required per capita investments in infra-

³⁷ See Tiffin (2003) for an example of smallholder intensification in Nigeria using crop residues and other inputs to increase livestock income, and hiring ox-drawn equipment to apply more manure for increasing crop revenues.

structure and services will be significantly lower; and ii) the market opportunities – and hence the possibility of moving from subsistence to market integration, which is essential for poverty reduction – are much greater.

For remote areas there are few proven development strategies other than outright transfers, which poor countries can ill afford. These areas may support some subsistence farming and extensive livestock production, but smallholder agriculture is unlikely to function as a substantial driver of growth. In the longer run, these areas should perhaps be left to provide environmental and recreational services, while the best available livelihood strategy may be for some household members to migrate to urban areas and provide remittance income, with remaining family members meeting their food needs through own production. Public policy emphasis here should be on reducing vulnerability rather than increasing productivity, and on providing opportunities for building skills that can be used outside agriculture.

In contrast to the relatively bleak development prospects for remote areas, the rapid expansion of urban residents' demand for high(er)-value foods represents enormous income potential for farmers in peri-urban areas and the middle countryside. It is in the latter where agriculture can probably play the greater role in poverty reduction, because the largest share of the poor, mostly mixed crop-livestock farmers, reside in the middle countryside, and people in peri-urban areas have a far wider range of non-agricultural livelihood opportunities.³⁸ There is ample scope for increasing the productivity of mixed farming through better crop-livestock integration, particularly in semi-arid rainfed areas in South Asia and sub-Saharan Africa. Increasing the output of mixed farming systems is probably the most environmentally benign form of increasing agricultural production, because mixed systems are at least partially closed (Thomas *et al.*, 2002) and intensification of the livestock component of mixed farming can reduce the number of animals and the emissions per unit of animal product (Bradford, 1999). Thus, intensification of market-oriented mixed smallholder farming systems could simultaneously enhance agricultural sustainability and contribute to poverty reduction.

Unfortunately, smallholder agriculture's potential to achieve this kind of urban demand-driven poverty reduction remains largely untapped. The reasons for this are attributable to a wide array of market and institutional imperfections; the prevailing policy paradigms in developing countries, where a systematic bias towards industrialization and concentration favours large- over small-scale operators; and the underprovision of local public goods and services, the consequences of which affect the poor disproportionately.

THE PUBLIC AND PRIVATE SECTORS

Growth in food demand is concentrated in urban centres, and this has several implications. First, meeting this demand requires the development of physical communications, transport and marketing infrastructure to link rural producing areas to the towns. There is need for public sector investment in this area, because the transaction costs associated with weak

³⁸ In peri-urban settings the production of high-value, perishable agricultural products such as milk is already highly profitable, and the main agricultural policy emphasis should be on avoiding the pollution and managing the human health risks that arise from intensive livestock production in close proximity to large human populations.

infrastructure are a substantial deterrent to agricultural producers generally and smallholders in particular. However, physical infrastructure alone is not sufficient to stimulate broad-based agricultural intensification. Poverty-reducing agricultural intensification involves the development of supply chains around smallholder farmers with “simultaneous and complementary investments in all links in the supply chain” (Poulton, Kydd and Dorward, 2006). The need for complementary investments from several different market participants makes each individual investment highly risky, as its success depends on the investment decisions of other players. These circumstances create a low investment equilibrium trap, in which all the actors (usually low-income) along the supply chain are denied the benefits of growth and higher incomes because of coordination failure. Transaction costs and risks thus inhibit competitive private sector market activities at critical stages in agricultural transformation, and pure competition is not always the best form of market development (Dorward *et al.*, 2004b).

To overcome these obstacles, where market mechanisms fail to deliver private agency, public leadership is needed, such as “pump-priming investments” (Poulton, Kydd and Dorward, 2006), which lower individual investor costs and/or perceived risks. These “big push” commitments support complementary decision-making by different actors along a supply chain, and help bring economic activity to a critical threshold at which economic growth is self-sustaining. Historical evidence shows that State interventions have been important in supporting critical stages of agricultural market development (Dorward *et al.* 2004b), but also that the most essential public expenditures for supporting agriculture do not necessarily lie in the agriculture sector itself (Foster, Brown and Naschold, 2001). For public agencies mandated to support agriculture, the most important role does not concern public expenditure, but policy-making, regulation and provision of services that the private sector will not provide (Foster, Brown and Naschold, 2001).

Agricultural development requires coordinated interventions across sectors, and policy priority must be given to providing an enabling rural environment for commercial activities (Burke *et al.*, 2007). Such an enabling environment requires mechanisms for overcoming the entry barriers to high-return activities, and institutional arrangements that reduce transaction costs and risks. A key challenge to the development of agriculture in areas dominated by smallholder farmers is the establishment of coordination systems involving combinations of government agencies, civil society, farmers’ and other professional organizations, and agribusiness firms. This requires drawing on local knowledge and not presuming that outside answers are best; trial and error experimentation; and rigorous independent evaluation (Easterly, 2008b). There is no universal blueprint for agricultural development and poverty reduction, and it is vital that donors support experimentation and learning rather than imposing generic development models.

CONCLUSIONS

For accelerated reduction of poverty and associated food insecurity at the global level, development efforts need to focus on regions and countries at early stages of economic development – sub-Saharan Africa and the poorer regions of South and Southeast Asia. The following are some lessons learned and recommendations for these regions:

- Experience suggests that – partly by default – agriculture remains one of the most important sectors for rural poverty alleviation, but that increases in productivity, particularly of labour, are necessary for agriculture to realize its poverty-reducing potential.
- Agriculture is dominated by smallholders, who are seen as part of the problem, but need to be regarded as part of the solution.
- An important way of increasing labour productivity in smallholder agriculture is diversification into high(er)-value agricultural products (horticulture, aquaculture, livestock), but diversification into livestock is constrained by a multitude of entry barriers, which are substantial for most low-income households and which include investment, technology and market access.
- Increased income from agriculture generates employment in local non-tradable goods and services, and a strong case can be made for agriculture-induced poverty reduction through secondary employment creation.
- Agricultural intensification may bring more rapid gains in poverty reduction if policy interventions focus on the most eligible “upper” smallholders in favoured areas (who are still predominantly poor, even though they are not the poorest of the poor), while less endowed households will benefit indirectly through spill-overs such as technology diffusion and increased demand for non-tradable, local goods and (especially labour) services.
- For the less favoured agricultural households, livestock do not provide many growth opportunities, but act as important safety nets. Policy emphasis here should be directed to reducing vulnerability, for example by protecting livestock assets.
- Agriculture is heterogeneous, highly complex and affects a large set of stakeholders. Agricultural development therefore requires approaches that are carefully adapted to initial local conditions, and large-scale blueprint planning is likely to fail. Experimentation with modest but targeted interventions, and continuous learning from the results are more likely to lead to the desired outcome of poverty eradication.
- Transaction costs and the risks of coordination failure are high in agriculture, and public leadership is needed to promote lower-income agrifood supply chains. For public agencies mandated to support agriculture the most important role is policy-making, coordination, regulation and the provision of services that the private sector will not provide.

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Annex 1

2010 World Bank country groupings and income classifications

SUB-SAHARAN AFRICA

Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cape Verde
Central African Republic
Chad
Comoros
Congo
Côte d'Ivoire
Democratic Republic of the Congo
Eritrea
Ethiopia
Gabon
Gambia
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mayotte
Mozambique
Namibia
Niger
Nigeria
Rwanda
Sao Tome and Principe
Senegal
Seychelles
Sierra Leone
Somalia
South Africa
Sudan

Swaziland
Togo
Uganda
United Republic of Tanzania
Zambia
Zimbabwe

SOUTH ASIA

Afghanistan
Bangladesh
Bhutan
India
Maldives

EAST ASIA AND THE PACIFIC

American Samoa
Cambodia
China
Democratic People's Republic of Korea
Fiji
Indonesia
Kiribati
Lao People's Democratic Republic
Malaysia
Marshall Islands
Micronesia (Federated States of)
Mongolia
Myanmar
Palau
Papua New Guinea
Philippines
Samoa
Solomon Islands
Thailand
Timor-Leste
Tonga
Vanuatu
Viet Nam

EASTERN EUROPE AND CENTRAL ASIA

Albania
Armenia
Azerbaijan
Belarus
Bosnia and Herzegovina
Bulgaria
Georgia
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Moldova, Republic of
Poland
Romania
Russian Federation
Serbia and Montenegro
Tajikistan
The former Yugoslav Republic of Macedonia
Turkey
Turkmenistan
Ukraine
Uzbekistan

LATIN AMERICA AND THE CARIBBEAN

Argentina
Belize
Bolivia (Plurinational State of)
Brazil
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
Ecuador
El Salvador
French Guiana
Grenada
Guatemala

Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the
Grenadines
Suriname
Uruguay
Venezuela

MIDDLE EAST AND NORTH AFRICA*

Algeria
Djibouti
Egypt
Gaza Strip
Iran (Islamic Republic of)
Iraq
Jordan
Lebanon
Libyan Arab Jamahiriya
Morocco
Syrian Arab Republic
Tunisia
West Bank
Western Sahara
Yemen
Nepal
Pakistan
Sri Lanka

HIGH-INCOME COUNTRIES

Andorra
Antigua and Barbuda
Aruba
Australia
Austria
Bahamas
Bahrain
Barbados
Belgium
Bermuda
Brunei Darussalam
Canada
Cayman Islands
China, Hong Kong SAR
Croatia
Cyprus

Czech Republic
Denmark
Dhekelia and Akrotiri SBA
Equatorial Guinea
Estonia
Faroe Islands
Finland
France
French Polynesia
Germany
Greece
Greenland
Guam
Guernsey
Hungary
Iceland
Ireland
Isle of Man
Israel
Italy
Japan
Jersey
Kuwait
Liechtenstein
Luxembourg
Malta
Monaco
Netherlands
Netherlands Antilles
New Caledonia
New Zealand
Northern Mariana Islands
Norway
Oman
Portugal
Puerto Rico
Qatar
Republic of Korea
San Marino
Saudi Arabia
Singapore
Slovakia
Slovenia
Spain
Sweden
Switzerland
Trinidad and Tobago
United Arab Emirates
United Kingdom
United States of America
United States Virgin Islands

LOW-INCOME COUNTRIES

Afghanistan
Bangladesh

Benin
Burkina Faso
Burundi
Cambodia
Central African Republic
Chad
Comoros
Democratic People's Republic
of Korea
Democratic Republic of the
Congo
Eritrea
Ethiopia
Gambia
Ghana
Guinea
Guinea-Bissau
Haiti
Kenya
Kyrgyzstan
Lao People's Democratic
Republic
Liberia
Madagascar
Malawi
Mali
Mauritania
Mozambique
Myanmar
Nepal
Niger
Rwanda
Senegal
Sierra Leone
Somalia
Tajikistan
Togo
Uganda
United Republic of Tanzania
Uzbekistan
Viet Nam
Yemen
Zambia
Zimbabwe

* Referred to as the Near East and North Africa throughout this document.

Source: World Bank. 2010. *World Development Report 2010*. Washington, DC.

Annex 2

FAO-PPLPI Working Papers

No. Title

- 50 Policies and narratives in Indian livestock: good practices for pro-poor change
- 49 Livestock market access and poverty reduction in Africa: the trade standards enigma
- 48 Livestock production systems in South Asia and the Greater Mekong sub-region
- 47 Accessibility mapping and rural poverty in the Horn of Africa
- 47 Barriers to market entry, poor livestock producers and public policy
- 45 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
- 44/3 Dairy development for the resource poor – part 3: Pakistan and India dairy development case studies
- 44/2 Dairy development for the resource poor – part 2: Kenya and Ethiopia dairy development case studies
- 44/1 Dairy development for the resource poor – part 1: a comparison of dairy policies and development in South Asia and East Africa
- 43 Household expenditure on food of animal origin: a comparison of Uganda, Viet Nam and Peru
- 42 Predicted impact of liberalisation on dairy farm incomes in Germany, Viet Nam, Thailand and New Zealand
- 41 Rethinking government roles in livestock sector development in dynamic markets: case studies from Thailand, Malaysia and Viet Nam
- 40 Comparable costings of alternatives for dealing with tsetse: estimates for Uganda
- 39 Dynamic poverty processes and the role of livestock in Peru
- 38 Dairy development programs in Andhra Pradesh, India: impacts and risks for small-scale dairy farms
- 37 Policies and strategies to address the vulnerability of pastoralists in sub-Saharan Africa
- 36 Poverty mapping in Uganda: an analysis using remotely sensed and other environmental data
- 35 The political economy of international development and pro-poor livestock policies: a comparative assessment – revised and expanded
- 34 The economics of milk production in Cajamarca, Peru, with particular emphasis on small-scale producers
- 33 The economics of milk production in Hanoi, Viet Nam, with particular emphasis on small-scale producers
- 32 The politics of livestock sector policy and the rural poor in Peru
- 31 Developing countries and the global dairy sector, part II: country case studies
- 30 Developing countries and the global dairy sector, part I: global overview
- 29 Livestock, liberalization and democracy: constraints and opportunities for rural livestock producers in a reforming Uganda
- 28 Navigating the livestock sector: the political economy of livestock policy in Burkina Faso
- 27 Livestock policies for poverty alleviation: theory and practical evidence from Africa, Asia and Latin America
- 26 The political economy of pro-poor livestock policy in Cambodia
- 25 International rules, food safety and the poor developing country livestock producer
- 24 Geographical dimensions of livestock holdings in Viet Nam: spatial relationships among poverty, infrastructure and the environment

- 23 An appropriate level of risk: balancing the need for safe livestock products with fair market access for the poor
- 22 Animal health policy and practice: scaling-up community-based animal health systems, lessons from human health
- 21 The contribution of livestock to household income in Viet Nam: a household typology based analysis
- 20 The economics of milk production in Chiang Mai, Thailand, with particular emphasis on small-scale producers
- 19 The political economy of pro-poor livestock policy-making in Ethiopia
- 18 EU policy-making: reform of the CAP and EU trade in beef and dairy with developing countries
- 17 Funding animal healthcare systems: mechanisms and options
- 16 The economics of milk production in Orissa, India, with particular emphasis on small-scale producers
- 15 The politics of livestock sector policy and the rural poor in Bolivia
- 14 Pathways out of poverty in western Kenya and the role of livestock
- 13 Poverty, livestock and household typologies in Nepal
- 12 The political economy of international development and pro-poor livestock policies: a comparative assessment
- 11 A public choice approach to the economic analysis of animal healthcare systems
- 10 The role of livestock in economic development and poverty reduction
- 09 Livestock production and the rural poor in Andhra Pradesh and Orissa States, India
- 08 Trade, political influence and liberalization: situating the poor in the political economy of livestock in Senegal
- 07 A review of milk production in Bangladesh with particular emphasis on small-scale producers
- 06 A review of household poultry production as a tool in poverty reduction with focus on Bangladesh and India
- 05 The political economy of pro-poor livestock policy-making in Viet Nam
- 04 Methods for the assessment of livestock development interventions in smallholder livestock systems
- 03 A review of milk production in Pakistan with particular emphasis on small-scale producers
- 02 A review of milk production in India with particular emphasis on small-scale producers
- 01 A study of the role of livestock in Poverty Reduction Strategy Papers (PRSPs)

Available at www.fao.org/ag/againfo/programmes/en/ppipi/workingpapers.html.

Annex 3

FAO-PPLPI Research Reports

No. Title

- 10-03 Livestock sector development, economic growth and poverty reduction
- 10-02 Global public health and transboundary animal diseases: issues and options, approaches and concerns
- 10-01 Integrated poverty assessment of livestock promotion: an example from Viet Nam
- 09-07 A rapid rural appraisal of the family-based poultry distribution scheme of West Bengal, India
- 09-06 Animal health in the 21st century: challenges and opportunities
- 09-05 The “livestock revolution”: rhetoric and reality
- 09-04 Contract farming as an institution for integrating rural smallholders in markets for livestock products in developing countries: II. Results in case countries
- 09-03 Sericulture: an alternative source of income to enhance the livelihoods of small-scale farmers and tribal communities
- 09-02 Poultry, food security and poverty in India: looking beyond the farm-gate
- 09-01 Supporting livestock sector development for poverty reduction: issues and proposals
- 08-12 Contract farming as an institution for integrating rural smallholders in markets for livestock products in developing countries: I. Framework and applications
- 08-11 Food markets and poverty alleviation
- 08-10 Implementation of a certified smallholder supply chain and test marketing traceable free range chicken: I. Methodology
- 08-09 Supply chain auditing for poultry production in Thailand
- 08-08 Animal health policies in developing countries – a review of options
- 08-07 The livestock sector in the World Development Report 2008: re-assessing the policy priorities
- 08-06 Zoonotic disease risks and socioeconomic structure of industrial poultry production: review of the US experience with contract growing
- 08-05 Information failures in livestock markets: evidence from Lao PDR
- 08-04 Determinants of participation in contract farming in pig production in northern Viet Nam
- 08-03 Poultry supply chains and market failures in northern Viet Nam
- 08-02 Poultry market institutions and livelihoods: evidence from Viet Nam
- 08-01 HPAI and international policy processes – a scoping study
- 07-14 Demand-oriented approaches to HPAI risk management
- 07-13 Strengthening market linkages of smallholder pig producers through informal contracts in northern Viet Nam
- 07-12 PPLPI’s Livestock Development Goals: Application of LDG1 to Peru, Senegal and Viet Nam
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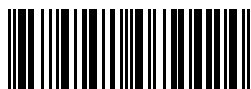
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Livestock contribute to the livelihoods of an estimated 70 percent of the world's rural poor. The increasing demand for animal protein in low- and middle-income countries provides an opportunity for the poor to improve their livelihoods. However, the nature of livestock farming and marketing of livestock and their products 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 development for poverty reduction: an economic and policy perspective reviews major aspects of the livestock-poverty interface with the objective of identifying the conditions under which livestock can be an effective tool for poverty reduction; the interventions that allow livestock's poverty reduction potential to be unlocked, and the contexts in which they do so; and ways of facilitating sustainable implementation of these interventions.

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