3. Livestock, food security and poverty reduction

The livestock sector is one of the fastest-growing segments of the agricultural economy, particularly in the developing world. As demand for meat and dairy products in the developing world continues to increase, questions arise as to how this demand will be met and by whom. Parts of the sector, particularly poultry and pig production, have followed a trend similar to that in developed countries, where large-scale production units dominate output. The expansion of such trends across the whole livestock sector will have major implications for poverty reduction and food security. To date, the transformation of the livestock sector has occurred largely in the absence of sector-specific policies; this gap needs to be addressed to ensure that the livestock sector contributes to equitable and sustainable development.

Despite rapid structural change in parts of the sector, smallholders still dominate production in many developing countries. Livestock can provide income, quality food, fuel, draught power, building material and fertilizer, thus contributing to household livelihood, food security and nutrition. Strong demand for animal-based foods and increasingly complex processing and marketing systems offer significant opportunities for growth and poverty reduction at every stage in the value chain. These new market opportunities and livelihood options face rapidly changing patterns of competition, consumer preferences and market standards; these may undermine the ability of smallholders to remain competitive. They should also be carefully managed to ensure that women and men have the same prospects in this rapidly changing sector. Policy reforms, institutional support and public and private investments are urgently needed (i) to assist those smallholders who can compete in the new markets, (ii) to ease the transition of those who will exit the sector, and (iii) to protect the crucial safety-net function performed by livestock for the most vulnerable households.

Productivity growth in agriculture is central to economic growth, poverty reduction and food security. Decades of economic research have confirmed that agricultural productivity growth has positive effects for the poor in three areas: lower food prices for consumers; higher incomes for producers; and growth multiplier effects through the rest of the economy as demand for other goods and services increases (Alston *et al*., 2000). Agricultural growth reduces poverty more strongly than growth in other sectors (Thirtle *et al*., 2001; Datt and Ravallion, 1998; Gallup, Radelet and Warner, 1997; Timmer, 1988). Recent research suggests that livestock sector growth can also promote broader economic growth (Pica, Pica-Ciamarra and Otte, 2008) and that smallholders can contribute to this (Delgado, Narrod and Tiongco, 2008). However, serious questions and policy challenges must be addressed if the potential of the livestock sector to promote growth and reduce poverty is to be met in a sustainable way.

This chapter explores the role of livestock in food security and in the livelihoods of men and women living in poverty. It also examines the potential for livestock to serve as an engine of growth, poverty reduction and long-term food security for these most vulnerable people. The chapter discusses the conditions under which smallholders may be able to use livestock as a pathway out of poverty. Livestock sector policies must take into account producers' differing capacities to participate in modern industrialized value chains (capacities that are often dictated by sociocultural and gender issues) and the crucial safety-net function served by livestock for many smallholders.

Livestock and livelihoods

Livestock are central to the livelihoods of the poor. They form an integral part of mixed farming systems, where they help raise whole-farm productivity and provide a steady stream of food and revenues for households. However, livestock's role and contribution to livelihoods in developing countries extends well beyond what is produced for the market or for direct consumption.

Livestock play many other important roles, including: as a provider of employment to the farmer and family members (Sansoucy, 1995); as a store of wealth (CAST, 2001); as a form of insurance (Fafchamps and Gavian, 1997); contributing to gender equality by generating opportunities for women; recycling waste products and residues from cropping or agro-industries (Ke, 1998; Steinfeld, 1998); improving the structure and fertility of soil (de Wit, van de Meer and Nell, 1997); and controlling insects and weeds (Pelant *et al.*, 1999). Livestock residues can also serve as an energy source for cooking, contributing to food security. Livestock also have a cultural significance – livestock ownership may form the basis for the observation of religious custom (Horowitz, 2001; Ashdown, 1992; Harris, 1978) or for establishing the status of the farmer (Birner, 1999). The non-tradable roles played by livestock commonly vary between different parts of a country, and almost certainly among countries. They are also likely to change over time as economic conditions of livestock owners evolve.

The number of poor people who depend on livestock for their livelihoods is not known with certainty, but the most commonly cited estimate is 987 million (Livestock in Development, 1999) or about 70 percent of the world's 1.4 billion "extreme poor".[2] Table 10 shows this estimate broken down by agro-ecological zone and type of farming system. Data in the FAO RIGA database (FAO, 2009a), which compiles information from nationally representative household surveys from 14 countries, indicate that 60 percent of rural households keep livestock (Table 11).

Data from the 14 RIGA countries are shown by expenditure quintile in Figures 11–14. Livestock keeping is pervasive among all income brackets of rural households (Figure 11). In about one-third of the countries in the sample, poorer households are more likely to be engaged in livestock activities than are wealthier households. While there is no clear relationship between income level and engagement in livestock activities, it is clear that, in all the countries, even the poorest households commonly keep livestock.

The extent to which livestock contribute to income varies across countries and income levels (Figure 12). The share of household income derived from livestock ranges from less than 5 percent for many households to

[2] Defined as those with consumption of less than US$1.25 per person per day, measured in constant 2005 purchasing power.

TABLE 10
Number and location of poor livestock keepers by category and agro-ecological zone

AGRO-ECOLOGICAL ZONE	CATEGORY OF LIVESTOCK KEEPER		
	Extensive graziers	Poor rainfed mixed farmers	Landless livestock keepers[1]
		(Millions)	
Arid or semi-arid	87	336	ns
Temperate (including tropical highlands)	107	158	107
Humid, subhumid and subtropical	ns	192	ns

[1] People in landless households keeping livestock; not industrial landless production systems.
Note: ns = not significant.
Source: Livestock in Development, 1999.

TABLE 11

Percentage of rural households owning livestock, share of income from livestock and number of livestock per household, by country

COUNTRY AND YEAR	SHARE OF RURAL HOUSEHOLDS OWNING LIVESTOCK	SHARE OF INCOME FROM LIVESTOCK[1]	SHARE OF LIVESTOCK PRODUCTION SOLD	NUMBER OF LIVESTOCK HELD PER RURAL HOUSEHOLD[1]
		(Percentage)		*(TLU[2])*
Africa				
Ghana (1998)	50	4	23	0.7
Madagascar (1993)	77	13	47	1.6
Malawi (2004)	63	9	9	0.3
Nigeria (2004)	46	4	27	0.7
Asia				
Bangladesh (2000)	62	7	28	0.5
Nepal (1996)	88	18	41	1.7
Pakistan (2001)	47	11	na	na
Viet Nam (1998)	82	15	62	1.1
Eastern Europe				
Albania (2005)	84	23	59	1.5
Bulgaria (2001)	72	12	4	0.5
Latin America				
Ecuador (1995)	84	3	27	2.8
Guatemala (2000)	70	3	18	0.9
Nicaragua (2001)	55	14	14	2.1
Panama (2003)	61	2	17	2.0
Average of above[3]	60	10	35	0.8

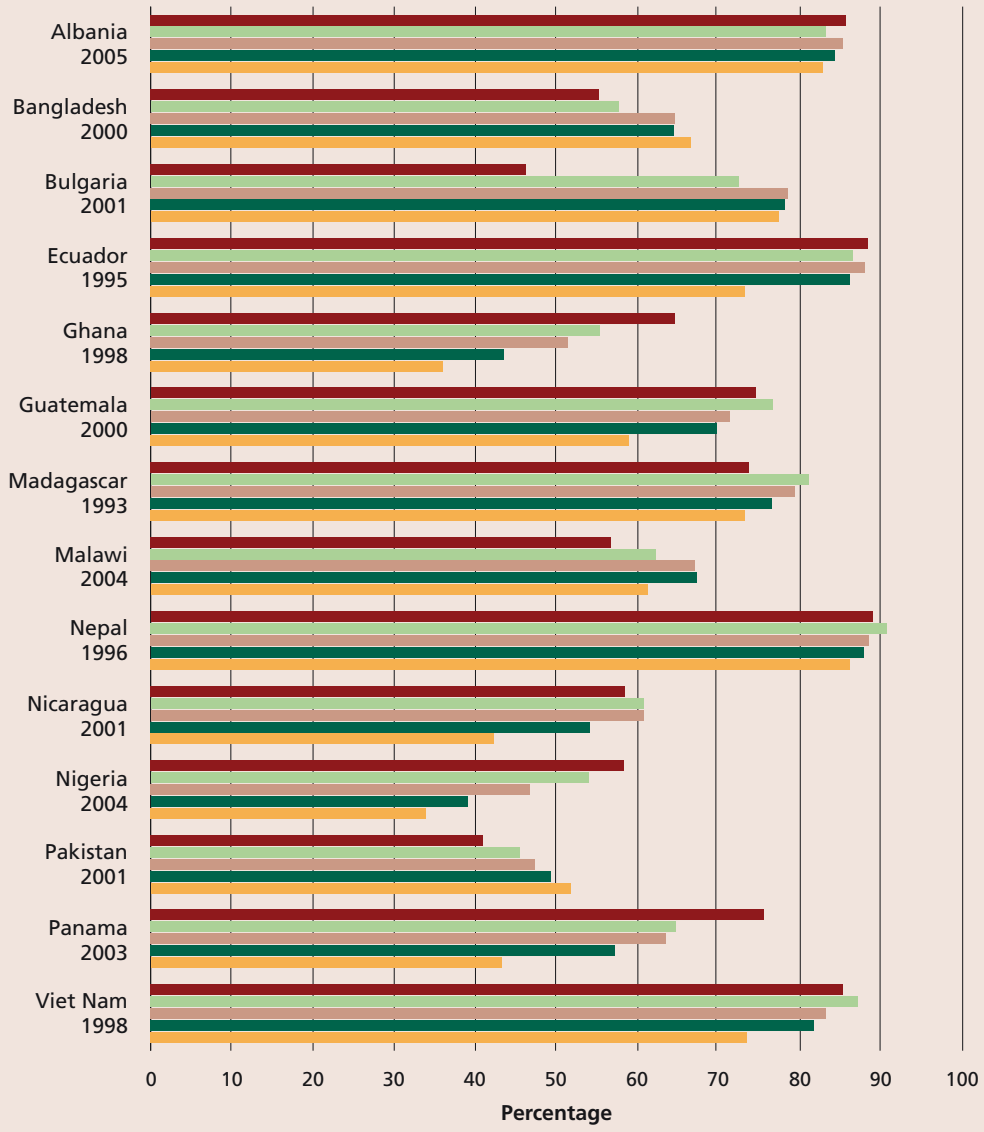
[1] Including all rural households in the samples, whether they hold livestock or not.
[2] The number of livestock is computed using the tropical livestock unit (TLU), which is equivalent to a 250 kg animal. The scale varies by region. For example, in South America, the scale is: 1 bovine = 0.7 TLU, 1 pig = 0.2, 1 sheep = 0.1 and 1 chicken = 0.01.
[3] The total weighted average by rural population.
Note: na = not available.
Source: FAO, 2009a.

over 45 percent for middle-income households in Malawi. Although there is no systematic pattern, in several instances poor people earn a larger share of their income from livestock than do the wealthier households.

While the majority of rural households in the RIGA sample keep livestock, the average livestock holdings tend to be small, ranging from 0.3 tropical livestock units (TLUs) in Malawi to 2.8 TLUs in Ecuador. Holdings tend to be smaller in the African and Asian countries and larger in the Latin American countries (Figure 13). Also, although the proportion of households keeping livestock does not seem to be clearly associated with income level, average holdings tend to increase with wealth in 8 out of the 14 countries.

The proportion of livestock production sold, in terms of value, differs widely among countries in the sample, but not among expenditure quintiles (Figure 14). There seems to be no clear relationship between income levels and the share of livestock production that is sold. In several cases, the share of livestock production sold is less for the lowest-expenditure quintiles than for higher-expenditure quintiles, indicating that livestock are kept more for own consumption by the less well-endowed households, while they are kept as a source of cash income by better-off households. However, the pattern

FIGURE 11
Percentage of rural households owning livestock, by expenditure quintile



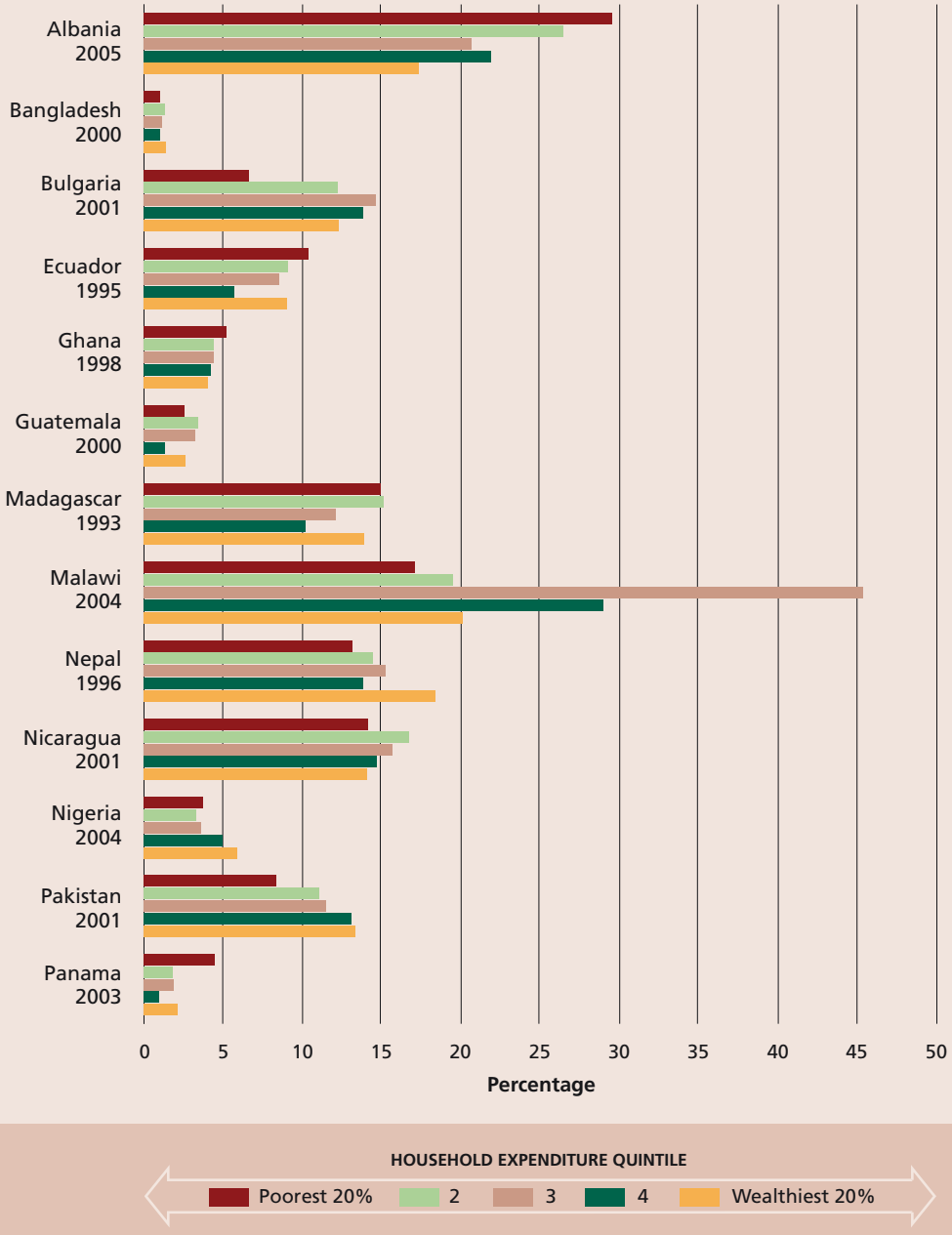
Source: FAO, 2009a.

is not similar across the countries, with several countries revealing differences.

In all the countries considered, more men than women own livestock, and households headed by men have larger livestock holdings than households headed by women. This is particularly true in the case of large animals (cattle and buffalo). Inequality in livestock holdings is particularly acute in Bangladesh, Ghana, Madagascar and Nigeria, where male-headed households keep more than three times as many livestock as do female-headed households (Anriquez, forthcoming). However, in the case of small livestock, particularly poultry, women play

a much larger role. A large percentage of poultry production in Asia takes place in backyards, and it is mostly women who own and take care of the poultry. In Indonesia, 3.5 percent of poultry production takes place in the industrial sector, whereas 64.3 percent occurs in backyards. Poultry production in backyards by women is also substantial in Cambodia, the Lao People's Democratic Republic and Viet Nam (FAO, 2004b). In many other countries and regions, women own poultry, sometimes in numbers greater than do men, and, unlike with other livestock, have the right

FIGURE 12
Share of income from livestock activity in rural households, by expenditure quintile

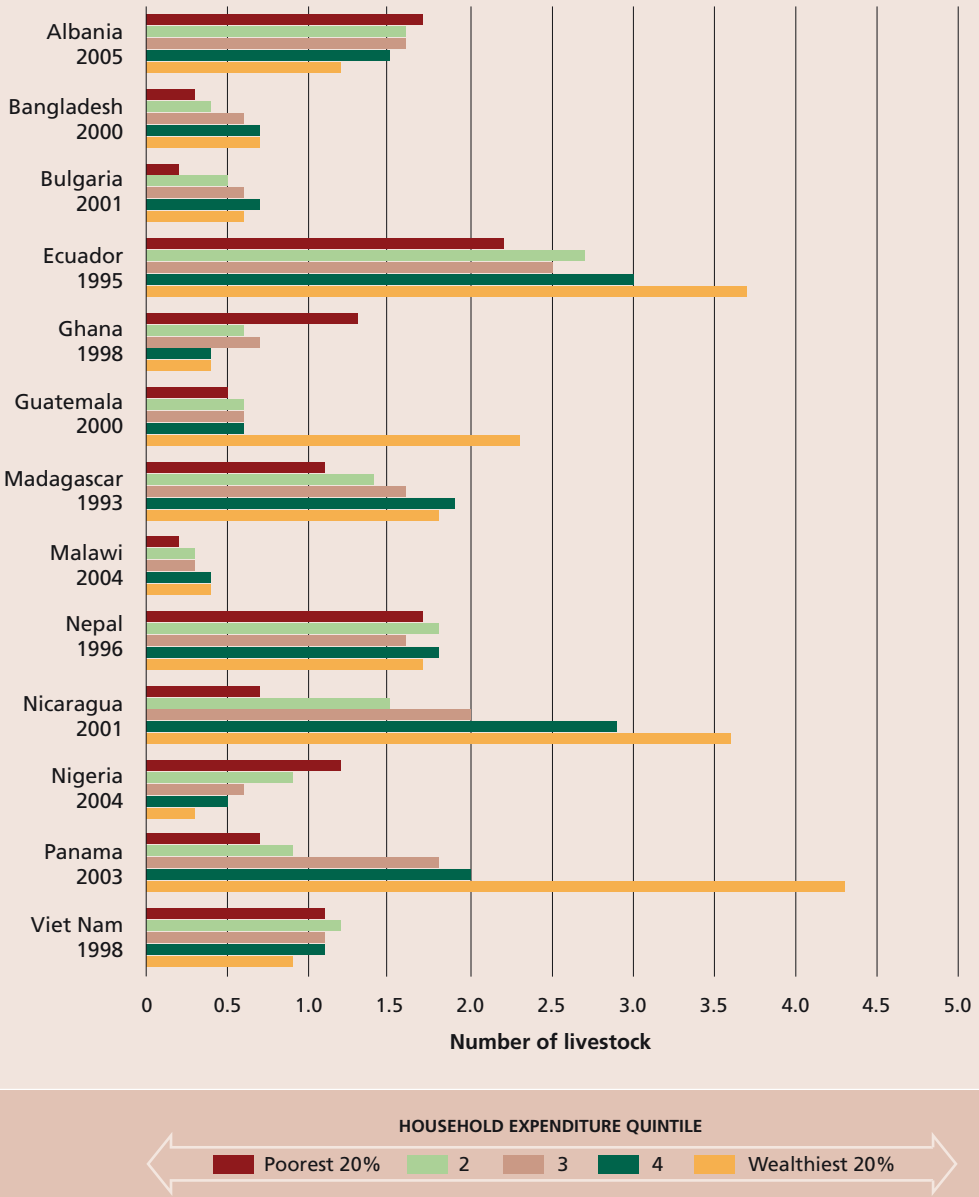


Source: FAO, 2009a.

to dispose of the poultry they raise without consulting men. The fact that women are responsible for poultry production in these areas has implications also for programmes to combat avian influenza.

The evidence from the RIGA database is generally consistent with the earlier findings. For example, Delgado *et al*. (1999) studied 16 different countries to compare the dependence on income from livestock of "very poor" and "not so poor" households. They found that most poor rural households are dependent on livestock to some extent, but the "not so poor" are likely to be much

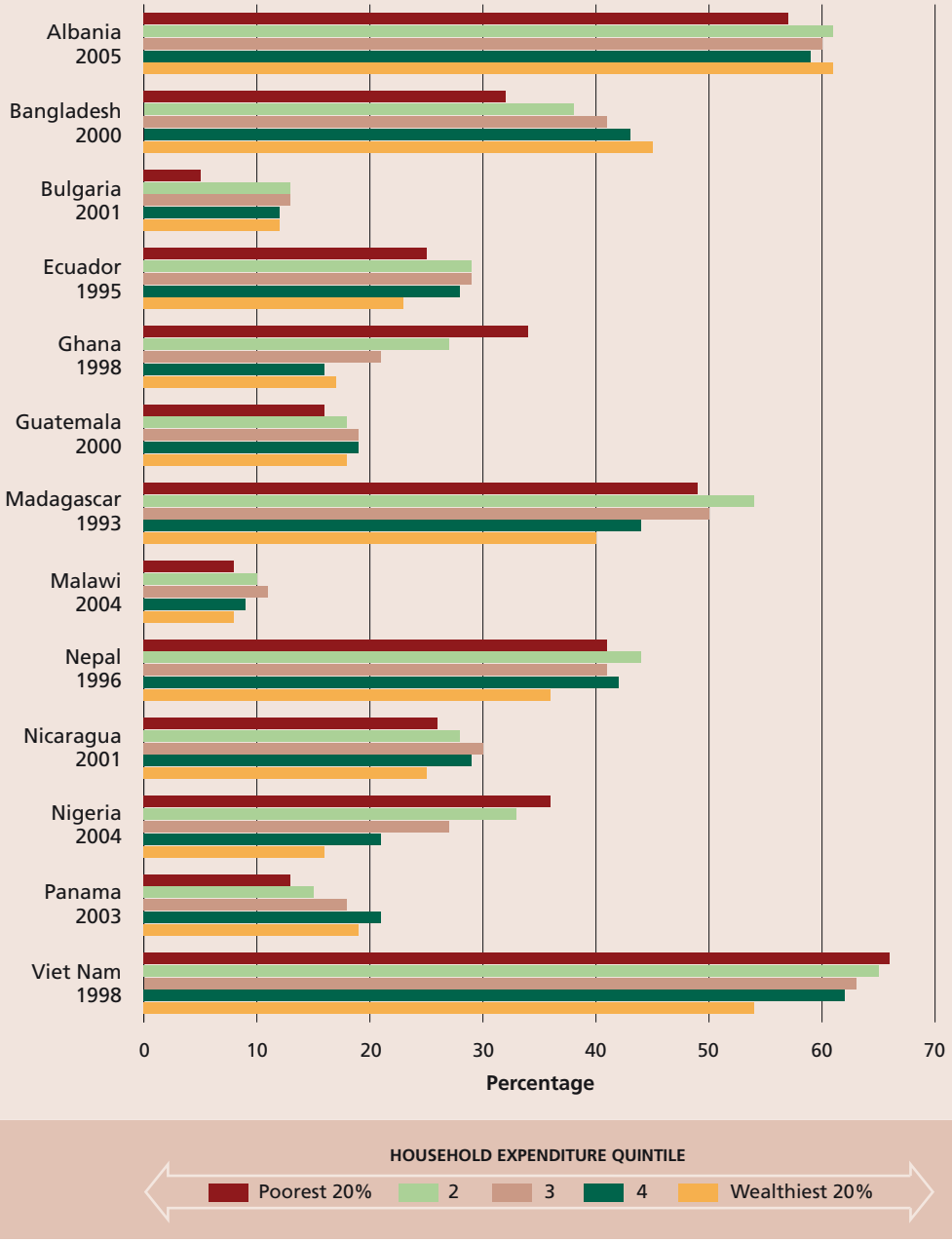
FIGURE 13
Number of livestock held by rural households, by expenditure quintile



Note: The number of livestock is computed using the tropical livestock unit (TLU), which is equivalent to a 250 kg animal. The scale varies by region. For example, in South America, the scale is: 1 bovine = 0.7 TLU, 1 pig = 0.2, 1 sheep = 0.1 and 1 chicken = 0.1.

Source: FAO, 2009a.

FIGURE 14
Percentage of households' total livestock production that is sold, by expenditure quintile



Source: FAO, 2009a.

more dependent on income from animals than are the "very poor". In contrast, Quisumbing *et al*. (1995) found that, in many instances, the poor earn a larger share of their income from livestock than do the wealthy because they can exploit common property resources for grazing, so keeping production costs low.

Livestock and food security

Undernutrition remains a persistent problem in many developing countries. The latest FAO figures (FAO, 2009c) indicate that nearly one billion people in the world are undernourished. Food security exists

BOX 4

Food versus feed: do livestock reduce availability of food for human consumption?

It is often assumed that lack of food for the poor and hungry could be remedied by reducing demand for feed. In reality, the relationship between feed demand and food security is complex, involving both physical and economic dimensions.

Each year livestock consume 77 million tonnes of protein from feed that is potentially suitable for human consumption, whereas only 58 million tonnes of protein are contained in food products supplied by livestock (Steinfeld *et al.*, 2006). In terms of dietary energy, the proportionate loss is much greater. This loss is a result of the recent trend towards more concentrate-based diets for livestock. However, this simple picture does not tell the whole story. It obscures the fact that proteins contained in animal products are of higher quality for human nutrition than those in the feed provided to the animals.

Also, from an economic perspective, it is important to remember that hunger and food insecurity are, in most cases, not a supply problem but a demand problem, caused by lack of purchasing power. In the hypothetical case in which the livestock sector did not compete with humans for food, the surplus grain would not simply become available as food; rather, the reduced demand would mean that most of it would not be produced. However, while livestock may not directly take food from those who currently go hungry, they do contribute to raising overall demand, and thus prices, for crops and agricultural inputs. This tends to favour net producers but puts net consumers (in both urban and rural areas) at a disadvantage.

An important aspect that is often not considered is that livestock and their feed also make a contribution to food security objectives by providing a buffer in national and international markets that can be drawn upon in case of food shortages. In the previous world food crises of 1974/75 and 1981/82, overall grain supplies fell significantly. The livestock sector provided an important buffer function by contracting or switching to alternative feed supplies, thus contributing to lowering demand for grains. A similar buffer function has also been observed in the most recent food crisis in 2007 and 2008.

when all people at all times have access to adequate levels of safe, nutritious food for an active and healthy life. The livestock sector is central to food security, not only for rural smallholders who rely directly on livestock for food, incomes and services, but also for urban consumers, who benefit from affordable high-quality animal-based food. Livestock play an important role in all four main dimensions of food security: availability, access, stability and utilization.

Availability refers to the physical availability of adequate levels of food in a particular location. Food is made available through home production, local markets or imports. **Access** refers to the ability of people to acquire food. Even if food is physically present in an area, it may not be accessible if prices are very high or people lack purchasing power. Backyard and extensive grazing systems that rely on waste products and land that cannot be cultivated contribute unambiguously to the availability of food. The intensive livestock systems described in Chapter 2 are an important source of affordable animal-based foods for urban consumers. By making efficient use of resources, they provide abundant low-cost food, contributing to the availability of and access to food. This role will become increasingly important as demand for livestock products continues to grow in coming years. At the same time, rapid growth in demand for livestock products means that, as noted earlier, one-third of all cropland is now used to produce livestock feed. Other things being equal, this competition for land traditionally reserved for the cultivation of other crops puts upward pressure on prices of staple foods and may undermine people's access to food. This is discussed in Box 4.

Most rural households, including the very poor, keep livestock. Livestock contribute directly to food availability and access for smallholders, often in complex ways. Smallholders sometimes consume their home production directly, but they often choose to sell high-value eggs or milk in order to buy lower-cost staple foods. The indirect role of livestock in supporting food security through income growth and poverty reduction is crucial to overall development efforts. When calculating the economic contribution of livestock to individual households, it is also essential to recognize that men and women typically face different livelihood opportunities and constraints in managing livestock. Selling livestock allows resource-poor families to earn more income, but this may not always translate into improved nutrition, depending on whether it is men or women who have control over the income generated. The extent to which nutrition is improved depends on whether increases in income create more diverse diets. In the long run, there is an established connection between income growth and improved nutrition. However, in the short run, policy interventions may be necessary to promote increased consumption of foods of animal origin in the diets of the poor.

Stability is the third dimension of food security. Livestock contribute to the stability of food security of rural households by serving as an asset, a store of value and a safety net. Livestock can be used as collateral for credit, sold for income or consumed directly in times of crisis, thus buffering external shocks to the household such as an injury or illness of productive family members. Livestock also provide draught power, fertilizer and pest control in mixed farming systems, contributing to total farm productivity and hence to food security.

The fourth dimension of food security – **utilization** – is particularly relevant in the case of livestock and animal-based foods. Research shows that livestock products are an excellent source of high-quality protein and essential micronutrients such as vitamin B and highly bioavailable[3] trace elements such as iron and zinc. This "bioavailability" is particularly important for mothers and small children, who find it difficult to obtain adequate levels of micronutrients in a plant-based diet. Small quantities of animal-based foods can provide essential nutrients for maternal health and the physical and mental development of small children.

Livestock and nutrition

The impact of poor nutrition on child growth and mental development is well documented and includes stunted growth and increased risk of infectious disease morbidity and mortality. Over the long term, undernutrition impairs cognitive development and school performance. Undernutrition is morally unacceptable, but it also comes at a high economic price. It reduces work performance and productivity in adults, lowers human capital development and constrains the potential for economic growth of countries (FAO, 2004a). Undernutrition can also make women, men and children more vulnerable to diseases such as malaria, tuberculosis and HIV/AIDS.

Foods of animal origin can provide high-quality protein and a variety of micronutrients that are difficult to obtain in adequate quantities from foods of plant origin alone. Although essential minerals such as iron and zinc are also present in cereal staples, they have lower bioavailability in plant-based foods owing to their form and the presence of inhibitors of absorption such as phytates; they are more readily bioavailable in foods of animal origin.

Six nutritive elements that can be lower in primarily vegetarian diets and that are provided by animal-based foods include vitamin A, vitamin B_{12}, riboflavin, calcium, iron and zinc. Health problems associated with inadequate intake of these nutrients include anaemia, poor growth, impaired vision and blindness, rickets, impaired cognitive performance and increased risk of infectious disease morbidity and mortality, especially in infants and children. Animal-origin foods are particularly rich sources of all six of these nutrients, and relatively small amounts of these foods, added to a plant-based diet, can substantially enhance nutritional adequacy.

The high nutrient density of animal foods has a further advantage in food-based interventions targeting vulnerable groups such as infants, children and people living

[3] Bioavailability refers to the degree to which nutrients are absorbed and utilized by the organism.

with HIV/AIDS, who may have difficulty consuming the large volumes of food needed to meet their nutritional requirements.

Available evidence indicates that in the poorest countries, where micronutrient deficiencies are most common, a moderate intake of foods of animal origin will improve the nutritional adequacy of diets and improve health outcomes. The Nutrition Collaborative Research Support Program reported strong associations between the intake of foods of animal origin and better growth, cognitive function and physical activity in children, better pregnancy outcomes and reduced morbidity resulting from illness in three parallel longitudinal observational studies in disparate ecological and cultural parts of the world, i.e. Egypt, Kenya and Mexico (Neumann *et al.,* 2003). These associations remained positive even after controlling for factors such as socio-economic status, morbidity, parental literacy and nutritional status.

Better access to foods of animal origin through the promotion of livestock together with nutrition education can thus be considered a strategic intervention for avoiding the poverty–micronutrient–malnutrition trap (Demment, Young and Sensenig, 2003). Reviews of livestock interventions and their role in nutrition improvement and poverty reduction, although limited, show that livestock can play an important role in human nutrition and health and in poverty reduction in developing countries (Randolph *et al.,* 2007). Such interventions should be gender-specific to ensure that they effectively target food-insecure and vulnerable groups. Box 5 presents the example of a dairy-goat development project in Ethiopia, which significantly

BOX 5
The Dairy Goat Development Project in Ethiopia

Food and Agricultural Research Management (FARM)-Africa is an international non-governmental organization working to reduce poverty by enabling African farmers and herders to make sustainable improvements to their well-being, through more effective management of their renewable natural resources. The Dairy Goat Development Project was initiated in Ethiopia to improve family welfare by increasing income and milk consumption. It did so by improving the productivity of local goats managed by women, through a combination of better management techniques and genetic improvement.

Before the Dairy Goat Development Project, 21 percent of the households involved in the project had no access to milk; 67 percent made occasional purchases of milk for about one-quarter of the year. Forty-two percent of the households surveyed consumed meat, with an annual average consumption of 1.3 kg of meat per person. The remaining 58 percent of households consumed no meat at all. Following the project, each participating household was milking its lactating goats twice a day and was obtaining an average of 75 litres of goat milk per household per year. Average per capita milk consumption was 15 litres/person per year. Further, each household sold an estimated 50–100 kg less cereal grain, which used to be sold to buy milk.

A similar intervention by FARM-Africa in another location in Ethiopia increased the per capita availability of milk by 109 percent, energy from animal sources by 39 percent, protein by 39 percent, and fat by 63 percent. The proportion of animal protein reached 20 percent. During the 3-year study, 67 households (63 percent) slaughtered 77 goats. This provided an average of 575 g of meat/person per year. The study concluded that developing the capacity of poor rural households to own and manage small livestock, such as dairy goats, had a direct impact on a family's ability to challenge the vicious cycle of poverty and undernutrition and could significantly improve their access to and consumption of foods of animal origin.

Source: Ayele and Peacock, 2003.

increased poor households' access to foods of animal origin.

While there are strong arguments for promoting livestock in developing countries to improve nutrition and health, it is important to recognize that excessive consumption of foods of animal origin may have adverse health effects, such as obesity and associated chronic diseases, including heart disease and diabetes (WHO/FAO, 2003). In a recent major review of the evidence on food, nutrition, physical activity and cancer undertaken by the World Cancer Research Fund and the American Institute for Cancer Research, the panel of international experts involved in the review judged the evidence that red meats and processed meats are causes of colorectal cancer as "convincing" (red meats referring to beef, pork, lamb and goat from domesticated animals). There was considered to be limited evidence that fish and foods containing vitamin D (found mostly in fortified foods and animal foods) decrease the risk of colorectal cancer. But the Panel judged that milk probably protects against colorectal cancer. The Panel also noted limited evidence suggesting that red meats and processed meats are causes of other cancers (WCRF/AICR, 2007, pp. 116, 129).

A "nutrition transition" is occurring in rapidly growing economies in the developing world (Popkin, 1994). Rapid changes in diet and decreasing levels of physical activity are leading to one form of malnutrition (obesity) replacing another (undernutrition). Growing consumption of high-fat animal products is one of several contributing factors. Using data on Chinese adults, for example, Popkin and Du (2003) have shown linkages between increased fat intake from animal-origin foods and a change in disease patterns. Sometimes these dietary shifts occur so rapidly that the two forms of malnutrition coexist in the same population. This has been referred to as the "double burden of malnutrition" (Kennedy, Nantel and Shetty, 2004). Globally, by 2000, roughly equal numbers of people were overweight and underweight (Gardner and Halwell, 2000). The World Health Organization (WHO) estimates that more than 1.6 billion people are overweight, a number that is projected to increase to 2.3 billion by 2015 (WHO, 2006).

The costs for developing countries that have to face this double burden of malnutrition are large. The human and financial costs of prevention and treatment of obesity and non-communicable diseases are high and place huge strains on existing health care systems. In the European Union (EU), the cost of obesity to society has been estimated at about 1 percent of GDP (WHO, 2006). In China, the economic cost of diet-related chronic diseases has already surpassed that of undernutrition – a loss of more than 2 percent of GDP (IFPRI, 2004; World Bank, 2006a). In Latin America and the Caribbean, such costs have been estimated at 1 percent of GDP of the region (PAHO, 2006).

Such diet-related concerns are often considered lifestyle choices over which governments have little control. Governments can and do attempt to influence consumption patterns, however, through education, incentives and broader agricultural and food policies (Schmidhuber, 2007). Pacific island countries, which have the highest obesity rates in the world (International Obesity Taskforce, 2009), have taken drastic measures to address diet-related health concerns. The Government of Fiji, concerned about the high fat content of sheep meat (mutton flaps) and turkey tails and the health consequences of importing such products, imposed an import ban on mutton flaps and instituted a ban on the sale (whether imported or locally produced) of these high-fat foods (Nugent and Knaul, 2006; Clarke and McKenzie, 2007). Following the lead of Fiji, the Government of Tonga imposed an outright ban on the importation of mutton flaps. In 2007, the Government of Samoa also banned the importation of turkey tail meat in support of measures aimed at curbing the rapidly expanding problem of obesity and diet-related non-communicable diseases.

Livestock sector transformation and the poor

The transformation of the livestock sector described in Chapter 2 is occurring most rapidly in developed countries and in developing countries that are experiencing strong economic growth. Livestock production remains largely unchanged in the poorest countries, where consumption and production of meat and milk have increased little, if at all, over recent decades. Livestock are kept under traditional management

systems by poor, small-scale farmers, for whom they are an important safety net, providing both high-quality food and cash in times of need. Non-tradable livestock products and functions remain important in these systems. Livestock products are processed and marketed largely through informal systems. Nevertheless, even in the poorest countries, an emerging urban middle class has stimulated a fledgling, albeit small, formal market that supplies certified, processed and packaged products.

Wherever rural poverty persists and non-farm employment options are limited, small-scale mixed crop–livestock systems persist. Globally, it is estimated that 90 percent of milk and 70 percent of ruminant meat is produced in mixed systems, as are more than one-third of pig and poultry meat and eggs. In these mixed systems, livestock typically generate up to one-third of farm income. Mixed crop–livestock systems thus make important contributions to the livelihoods, incomes and food and nutritional security of the rural poor (Costales, Pica-Ciamarra and Otte, 2007).

In poor countries with pastoralist populations, traditional herders support subsistence livelihoods and sell live animals through local markets. In some countries in the Horn of Africa and the Sahel, pastoralists also supply cattle, sheep, goats and camels to traders who export live animals to traditional trading partners, mostly in the Near East and the growing coastal urban centres in West Africa. However, increasingly stringent sanitary standards threaten this trade. Pastoralism is under threat worldwide as mobility and access to traditional grazing areas become ever more restricted through border controls and the expansion of cultivation or, especially in parts of Africa, conservation-oriented activities. In addition, climate change appears to be making arid and semi-arid areas even drier and extreme weather events, including drought and floods, more common. Traditional coping mechanisms tend to fail in these situations and pastoralists are abandoning livestock production, voluntarily or involuntarily, in increasing numbers (Thornton *et al.,* 2002).

In those developing countries where income growth and the rise of an urban middle class have stimulated demand for livestock products, smallholder livestock keepers continue to operate in rural areas, but larger-scale, more-intensive and technologically sophisticated commercial operators begin to appear in peri-urban areas, especially in the poultry sector. Integrated operations also become established, in which large companies or cooperatives supply inputs and provide markets for small and medium-sized contract growers.

With economic growth, non-farm employment opportunities increase, rural wages rise, supermarkets extend their reach beyond urban centres and demand for livestock products increases further. Small-scale livestock keepers start to leave the sector as their need to keep a few livestock diminishes and the attractiveness and viability of the enterprise decline. The average size of holding of poultry and pigs tends to increase, although dairy herds often remain small. Even in rapidly growing markets, production and marketing of milk may still be dominated by the informal sector. Vertically integrated operators become larger and increasingly dominant, and small-scale poultry farmers find it increasingly difficult to stay in business, although small-scale pig keepers tend to be more successful in this regard.

In the most rapidly growing economies, smaller-scale livestock producers, especially of poultry and pigs, either join the ranks of subsistence farmers or leave the sector. A few may graduate to larger-scale operations. However, in many other countries "dual-track" development of the poultry sector has occurred, with backyard/village and industrial poultry existing together (see Box 6 for the example of China). This situation is likely to persist as long as rural poverty exists and local regulations permit, and has implications for human and animal diseases, which are discussed in Chapter 5. In countries that have seen little or no increase in poultry consumption, such as most African countries, the vast majority of production remains in backyard and village poultry flocks, frequently managed by women.

Livestock and poverty alleviation

Expanding markets for livestock products would appear to offer opportunities for improving the incomes of the many rural poor who depend on livestock for their livelihoods. However, while the growth and

BOX 6
Sector transition – poultry in China

Over recent decades, China has seen an enormous increase in production of poultry meat and eggs through a combination of a growing number of birds and increasing productivity per bird. Feed conversion ratios for broilers in large-scale enterprises improved markedly between 1985 and 2005 and are now comparable to those achieved in similar operations in Europe and North America. Dramatic improvements in transport infrastructure since the mid-1980s have facilitated the rapid intensification of the poultry sector. Railways are especially important for feed distribution and roads for transport of poultry products.

In 1985, production was dominated by more than 150 million small-scale poultry farmers, each keeping a few birds to supplement other farming activities. At the time, there were virtually no large-scale operations. Since then, there has been a rapid increase in intensification, with a trend towards fewer, larger, privately owned operations. Between 1996 and 2005, some 70 million small-scale poultry farmers left the sector, mostly in the more economically developed east of the country and around major cities. Over the same period, large-scale operations (with annual output of more than 10 000 birds) expanded their share of production from about one-quarter to one-half.

Today, the commercial broiler market is dominated by large, integrated companies that control the entire production and marketing chain: feed, breeding, fattening and processing. One large, integrated operation in Fujian Province, for example, produces 50 million broilers a year and employs 4 000 employees – one job for every 12 500 birds produced annually. Extrapolating this ratio to the national level suggests that the integrated broiler sector provides around 800 000 jobs (Bingsheng and Yijun, 2008). Contract rearing is the norm, with the integrator supplying feed and chicks, together with various services and advice, and buying back finished birds.

Between 1985 and 2005, the proportion of farming households that kept poultry fell from 44 percent to less than 14 percent. However, more than 34 million rural households still keep backyard poultry, and poultry remain an important source of income and food for poor households, especially in the less-developed western part of the country. However, backyard producers play a marginal role, if any, in meeting burgeoning market demand. As food marketing channels extend their reach ever further into the rural areas, and non-farm employment options increase, the need for rural households to keep poultry is declining (Bingsheng and Yijun, 2008).

In China, the livestock sector in general is becoming less important as a source of income for small-scale farmers. The contribution of this sector to incomes fell from 14 percent in 1990 to 9 percent in 2005, and in the most developed eastern provinces the share is even lower. As non-farm employment options for rural people increase and rural incomes rise, backyard livestock rearing, which is labour-intensive, becomes less attractive. In addition, rural populations are reported to be becoming less tolerant of the nuisance, such as flies and odour, caused by backyard livestock. Increasingly, the rural people work in village or town enterprises. In addition, it is estimated that up to 140 million former rural dwellers are now migrant workers in cities. The predominant trend among the young in the eastern provinces has been to leave agriculture and take up jobs in the non-farm sector (Bingsheng and Yijun, 2008), although the recent economic crisis has slowed or reversed this trend, at least temporarily.

transformation of the sector have created opportunities, the degree to which these can be harnessed by people living in poverty and in marginalized areas is not clear. The rapid changes in food demand in some parts of the developing world have required the livestock sector to produce as much as possible, as quickly as possible, as cheaply as possible and as safely as possible. This emphasis on speed, quantity, price and safety has created a bias towards large-scale intensive production, especially in some subsectors such as poultry and pigs. However, the situation in the dairy subsector appears to be different, and there are cases where smallholders have played a dominant role in satisfying growing demand (see Box 7).

The nature of the livestock sector has changed dramatically in some parts of the world, although the impacts vary among countries, species and genders. Countries where per capita consumption of livestock products has increased dramatically over recent decades, especially the rapidly emerging economies such as Brazil, China and India, are diverging from those where consumption remains static or is decreasing, such as much of sub-Saharan Africa. At the same time, within the countries in which transformation of the livestock sector has taken off, a widening gulf is opening between a small-scale traditional sector, where women play an active role, at one extreme and a growing large-scale, intensive sector, in which men tend to dominate, at the other.

As economic growth continues to drive livestock development, there is increasing pressure for parts of the sector to industrialize. Overall, while strong growth within the sector should be seen as a positive sign of economic development, the *speed* of change may put pressure on smallholders. Some livestock producers will probably find it hard to adjust quickly enough to safeguard their income and, in some cases, their food security. Experiences in OECD countries from the 1950s onwards show that changing production structures require labour markets to adjust. However, when the transition is extremely rapid, as is happening in the livestock sector in many places today, the implications for poverty and food security can be dramatic and warrant intervention.

For the past decade, researchers and policy-makers have assumed that growth in the livestock sector was primarily demand-driven (Delgado *et al*., 1999) and that policies should aim at supporting demand growth and improving market opportunities (World Bank, 2007). Recent research however, shows that supply-side factors are also important. In many developing countries, growth in the livestock sector actually leads to GDP growth (see Box 8). This means that policies aimed directly at promoting productivity growth in the livestock sector can support broader economic growth. The complex value chains for animal-based foods – from feed and animal production through processing and marketing – mean that growth in the sector can generate strong backward and forward economic linkages and employment opportunities, with important impacts on growth that favours the poor. Creating the conditions necessary for smallholders to take advantage of these opportunities is a major policy challenge, requiring careful attention also to gender issues and environmental dimensions. Overcoming supply constraints for smallholders and increasing their productivity are important both to allow them to benefit from the demand-led gains and to allow the sector to play its role as a driver of growth.

Demand growth will continue to be a significant factor driving trends in the livestock sector in the future. However, supply-side factors, including relative competitiveness of different production systems and supply constraints faced by different producers, will also shape the sector and influence its contribution to poverty alleviation.

Reducing rural poverty through agricultural development alone is difficult. The challenge for livestock development is to foster development in rural areas in ways that benefit entire rural communities, and not only those who are engaged in livestock activities. Rural development policies can further facilitate the transformation of the sector by creating alternative opportunities for income generation and employment.

The objective of livestock sector development policies should be to enhance the competitiveness of smallholder production systems, where feasible, while mediating sector transition and protecting the poorest households, which rely on livestock as a safety net. Poor people need

BOX 7
Sector transition – dairy in India and Kenya

India, now the world's largest milk producer, witnessed a fourfold increase in milk production from cattle and buffalo between 1963 and 2003. Over the same period, the average herd size decreased. Production increases were obtained through a 40 percent increase in the number of farms engaged in milk production and an increase in the proportion of crossbred dairy cows in the national herd. In 1982, fewer than 5 percent of animals in the Indian dairy herd were crossbred. By 2003, this proportion had nearly trebled. It has been estimated that 56 percent of production growth can be accounted for by the increased number of milking animals and 37 percent by the higher productivity of the crossbred animals. Smallholder dairy production received an important impetus from the active support of government-sponsored programmes, such as Operation Flood, and a major effort to market milk in urban areas (Staal, Pratt and Jabbar, 2008a).

In 1999/2000, it was estimated that dairying in India, including production, processing and marketing, engaged around 18 million people, 5.5 percent of the national workforce. Of these jobs, 92 percent were in rural areas, 58 percent were occupied by women and 69 percent by socially and economically disadvantaged groups. Annual returns to farm-level labour in dairying are 2.5 times those for agriculture in general. For every 1 000 litres of milk produced per day, 230 jobs were generated by the smallest farms but fewer than 18 jobs by the largest commercial farms. However, the majority of farms are small, with 80 percent of the national herd being kept on farms with eight or fewer milking animals (Staal, Pratt and Jabbar, 2008a).

Kenya has also experienced a fourfold increase in milk production over the past four decades. As in India, smallholders dominate production in Kenya, accounting for 85 percent of all milk produced. An estimated 2 million households are engaged in dairy farming in Kenya, together maintaining a national herd of some 5 million crossbred or exotic dairy cattle. The typical farm is small – 1–2.5 hectares, depending whether it is located in a high- or medium-potential area – and dairy farming is often integrated with crop farming in mixed crop–livestock systems. Use of zero- or semi-zero-grazing systems is common, and fodders are routinely cultivated for feed. Milk is predominantly marketed through informal systems, which supply mostly raw milk to consumers via small-scale market agents. Most Kenyan consumers prefer cheaper raw milk over significantly more expensive pasteurized milk. As the vast majority of people boil milk before consumption, potential health problems associated with consumption of raw milk are largely avoided. Alongside the informal marketing system, a well-organized but smaller formal sector supplies processed and packaged milk to more affluent, urban consumers (Staal, Pratt and Jabbar, 2008b). Production and marketing of milk in Kenya is a major

to be considered broadly, including their roles as consumers, market agents and employees, as well as small-scale producers and, possibly, as providers of environmental services (FAO, 2007a). All of this needs to take into account gender-related issues to ensure that the needs, priorities and constraints of women and men, both young and old, are taken into consideration in the design and implementation of livestock sector development policies.

Competitiveness and the livestock sector

A series of country case studies, focused on countries with rapidly developing economies (Brazil, India, the Philippines and Thailand), have investigated the competitiveness of smallholder livestock producers (Delgado, Narrod and Tiongco, 2008). The studies showed that relative efficiency gains varied

source of employment and small-business opportunities, both for family labour and hired employees.

Based on survey data collected between 1997 and 2000, the sector is estimated to provide 841 000 full-time jobs at the farm level, including self-employment and both permanent and casual hired labour. On average, 77 jobs are created for every 1 000 litres of milk produced per day (compared with just one job for every 2 500 litres produced in the Netherlands). The smallest farms, with up to two cows, generate twice as many jobs per 1 000 litres of milk as larger farms with six or more cows (Staal, Pratt and Jabbar, 2008b). Return to labour at the farm level is close to four times per capita GDP, suggesting that dairying provides significantly higher incomes to farmers than rural waged labour could offer. An additional 54 000 well-remunerated jobs are provided by milk marketing; average wages are three times the government minimum wage (Staal, Pratt and Jabbar, 2008b). The Kenyan example shows that a successful, growing livestock subsector can be dominated by small-scale producers and represent a significant source of employment and small-business opportunities.

However, in both India and Kenya, the development of the dairy subsector may have relied largely on specific national circumstances.

In India, the dairy sector's growth depended in large part on the use of buffalo which, unlike high-yielding dairy cattle, are well adapted to tropical climes. Today, across India, more than half of all milk is produced from buffalo. Cross-bred cattle numbers are increasing but they still account for less than 14 percent of the total cattle population. Milk and dairy products are the predominant culturally acceptable animal protein source. Although meat consumption is increasing, especially among younger, more cosmopolitan Indians, hundreds of millions of Indians remain vegetarian (*The Times of India*, 2005). The sector has received significant financial and political support for more than 50 years: modernization of the dairy sector was a government priority in the very first Five-Year Plan, while in the 1970s Operation Flood targeted cooperative development at the village level and physical and institutional infrastructure for milk procurement, processing and marketing at the district level (Staal, Pratt and Jabbar, 2008a).

In Kenya, the dairy sector built on a strong base and benefited from favourable climatic conditions in the Kenyan highlands, which are well suited to keeping exotic dairy breeds.

Globally, dairy production and trade are dominated by the temperate regions of the developed world. Heat stress in the humid tropics depresses productivity of high-yielding dairy cattle, such as Holsteins, which puts temperate regions at a comparative advantage. The majority of countries within the humid zone are, therefore, not traditional milk-producing and consuming countries.

as scale of operation increased, although not in a linear fashion: there was a significant gain in efficiency in moving from very small backyard production to smallholder commercial (e.g. from rearing 15–20 piglets a year to rearing 150–200, or from 1–2 milking cows to a herd of 15–30 head); further large efficiency gains were not then achieved until much larger increases in unit size occurred. Vertical coordination, including cooperatives and various contract farming arrangements, were also associated with increased efficiency as a result of reduction in transaction costs.

Overall, small farms were less efficient at securing a profit (a measure of efficiency of use of resources) than large farms, even when family labour was not included as a cost. The studies looked at various determinants of profit efficiency, including dealing with environmental externalities. In general, small-scale farmers made greater efforts, and therefore incurred

more costs, in mitigating environmental impacts of their livestock. On larger farms, the balance of evidence showed that those farms that expended the greatest efforts on environmental mitigation were also relatively more profitable per unit of resources used. This is perhaps because those farms that prioritized environmental mitigation also adopted other types of best practice, which tended to boost productivity.

Two factors seemed to be particularly important for the relative competitiveness of smallholder producers: transaction costs and labour costs. On the one hand, economies of scale associated with input and output markets tended to favour large-scale producers, offering lower transaction costs relative to those faced by small producers. This difference was particularly significant in the poultry and pig sectors. On the other hand, small-scale producers often used family labour, which may arguably have a lower opportunity cost, at least where much of the labour is contributed by women and children and alternative employment options are limited. This represents a competitive advantage over large-scale enterprises, which depend on labour hired at prevailing market rates, but has important social implications for school attendance of boys and girls.

Small-scale farmers typically face higher transaction costs than do large-scale enterprises. It is more difficult and costly for them to access high-quality inputs (especially feed), credit and technology. On the output side, market information is particularly important in higher-end markets, where quality is important. The impact of transaction costs differed across the countries and sectors studied (Delgado, Narrod and Tiongco, 2008). In the dairy sector, transaction costs had little impact on profit efficiency, as feed was largely forage-based, not requiring access to credit. However, transaction costs could be high in dairy distribution and processing, with the costs tending to be higher for small farms than larger ones. In some countries, this was causing smallholders to leave the sector as dairies considered it too costly to serve them. Transaction costs had a greater impact on competitiveness in the poultry and pig sectors than in the dairy sector because of

BOX 8

The livestock sector – why supply-side factors matter

A recent study carried out by Pica, Pica-Ciamarra and Otte (2008) found a statistically significant causal relationship between economic growth and livestock sector productivity growth in 36 out of the 66 developing countries examined. Most of the 36 countries are agricultural-based or transforming economies. In 33 of the 36 countries, livestock sector productivity appears to have been a driver of per capita GDP growth. In nine of these, causality was bidirectional: livestock sector growth stimulated economic growth and economic growth positively affected livestock sector productivity. Only in three of the 36 countries was there a unidirectional causality from growth in per capita GDP to increases in livestock sector productivity.

Overall the study indicates that the orthodox paradigm of increased agricultural productivity as a driver of economic growth in developing countries also applies to the livestock sector. This implies that a vision of the livestock sector as primarily driven by exogenous factors may mislead policy development. Whereas policies that enable smallholders to sell profitably in high-value markets may be important, policies addressing the fundamental constraints to the development of the livestock sector may be equally important. Thus, policies aimed at improving smallholder productivity should not focus only on basic staple crops but also on livestock products, which may be basic food items and an important source of income in many rural communities in developing countries.

Source: Pica, Pica-Ciamarra and Otte, 2008.

the critical needs for credit to buy feed and stock and for access to market information.

Reducing transaction costs for small producers

High transaction costs for smallholder producers can be reduced through collective action, such as the setting up of cooperatives and various forms of contract farming. Such arrangements also have potential to incorporate smallholders in high-value supply chains from which they would otherwise be excluded. This kind of arrangement can also encourage gender equality by providing equal access to resources, including capacity building targeted equally at women and men. Contract arrangements vary and often involve the contractor supplying genetically superior breeds (particularly in poultry and pig production), feed, advice and support, and a guaranteed market for the end product.

Formal contracts are often made between integrator companies and larger-scale farmers in peri-urban locations, rather than with rural smallholders. They often demand a form of bond as collateral to mitigate the integrator company's initial risk in engaging with a new producer. The tendency of formal contracts to favour larger farmers stems from the economies of scale achieved by integrator companies in dealing with fewer suppliers that offer larger volumes, as well as avoiding the high transaction costs associated with dealing with and monitoring a large number of smallholders with different capacities to deliver (Costales and Catelo, 2008). Moreover, contract farming has not always been welcomed by small producers because it often offers them reduced margins and less independence (Harkin, 2004). In China, integrator companies have been found to honour contracts only when market prices exceeded the contract prices, providing a disincentive for farmers to enter into such contracts (Zhang *et al.,* 2004).

Smallholders are more commonly involved in informal contracts than in formal ones. Entry into such contracts requires a degree of prior social capital, such as membership of a farmers' organization or established reputation, rather than just physical collateral (Costales and Catelo, 2008). Smallholders tend to be the target of formal contracts only when they are the dominant production system and majority suppliers in locations where the integrator company operates, when they possess sufficient human capital and are receptive to training within the system, or when the integration of smallholders in a particular location in the supply chain is an explicit goal of the integrator company.

In general, smallholders do not participate in contract farming but independently produce and sell in spot markets. In a review of case studies on various types of contract, Costales and Catelo (2008) found that the "ability of contract farming in efficiently and profitably integrating rural smallholder producers in high-value markets, revealed rather mixed results, with some promising successful cases, and many failed ones." One successful example is that of dairy sector cooperatives in India. The success of the dairy sector cooperative movement in Gujarat, India, was coupled with links to the green revolution and support to agriculture in general through, for example, technology transfers (Staal, Pratt and Jabbar, 2008a). The Indian example highlights the importance of linking and integrating sector development to wider agricultural and rural development for the benefit of smallholders in livestock (see Box 9).

Analysis of the overall benefits of contract farming by smallholders has thus shown mixed results. In some cases, contract farming has been shown to be more profitable than farming independently, but in others – such as small-scale pig producers in the Philippines – independent farms were more profitable. Crucially, contract farming tends to increase the competitiveness of large farms relative to small, and there are cost and quality-control incentives for the integrators in dealing with fewer, larger producers rather than with many smaller producers.

It appears that smallholder producers can stay in business provided that the opportunity cost of family labour remains low and they can benefit from some sort of collective organization and support network to reduce transaction costs. Where alternative employment options offer higher wages, such as the more developed parts of China, the competitive advantage of smallholder producers disappears and there

BOX 9

Kuroiler™ chickens – linking backyard poultry systems to the private sector

The development community increasingly recognizes the role of backyard poultry production in sustaining and enhancing poor peoples' livelihoods in developing countries. Market-oriented backyard poultry enterprises are seen as a stepping stone for the poorest households, enabling them to take the first step towards breaking out of the vicious circle of poverty and deprivation. There is growing evidence to demonstrate that keeping poultry can enhance the food and nutrition security of the poorest households, improving livelihoods and promoting gender equity (Ahuja and Sen, 2008; Ahuja, 2004; Dolberg, 2004).

The private sector also sees business potential offered by backyard poultry. One example of private-sector involvement in backyard poultry production is the development of the Kuroiler™ breed, developed in India by Kegg Farms Private Ltd in 1993. The Kuroiler™ breed was bred for the Indian rural market and is supplied to farmers through a network of local suppliers.

In the first year, the company sold more than 1 million day-old Kuroiler™ chicks. In 2005–06, it sold 14 million – an annual growth rate of almost 22 percent sustained for more than a decade. A field study of Kuroiler™ production (Ahuja *et al.*, 2008) showed that, in the sample selected, a large proportion of those raising the birds were landless households or marginal farmers with less than one acre of land. On average, households raising Kuroilers™ generated more than five times as much from their poultry enterprise as did households that kept non-Kuroiler™ poultry.

There were, however, aspects of the operation that required attention. There was no monitoring of vaccination, mortality or the level of drug use in the chain. This has significant implications for reducing risk and containing losses in the chain. The risk-bearing ability of participating households is extremely low, and any sign of inherent risk – in the form of a disease outbreak, for example – could be destabilizing. The study suggested that addressing such issues required public or private investment in skill building in poultry management, livelihood analysis, and certification of various inputs used in the value chain.

is likely to be a mass exit from the sector as farmers are drawn into more remunerative employment. However, in a context of overall economic development, people leaving the livestock sector to take up new, better-paid waged employment cannot be considered a negative development.

Livestock policies for sector transition

Rapid growth and transformation in the livestock sector offer both challenges and opportunities for smallholders and require a difficult balancing act by policy-makers. Scarce public and donor resources should not be spent on fighting the forces of economic change; rather, they should focus on mediating change to produce more desirable outcomes for all members of society.

Growth in the livestock sector offers significant opportunities to enhance food security and reduce poverty, but concerted gender-sensitive action is required to help those smallholders who can compete to take advantage of the emerging opportunities. Without appropriate support for technological and institutional innovation, many smallholders will be unable to respond to the opportunities to supply new markets, and the divide will widen between those who can successfully negotiate change and those who cannot. Some smallholders will leave the sector as the forces of competition erode their competitiveness and as the opportunity cost of their labour rises. For many others, livestock will remain an important part of their sustenance or survival

strategy. The safety-net function of livestock for these people should be recognized, but it should not be considered a development strategy in its own right.

A mix of policy change, technological and institutional innovation and investment is needed. Building locally specific capacity that can respond to change is especially important. In all cases, the imperative should be to see livestock sector management in the broader context of rural development; that is, to create a rural sector that is as dynamic as the manufacturing and service sectors and that can provide a range of alternative remunerative activities both within and outside livestock production *per se* (PPLPI, 2008).

Significant and sustained innovation in national, regional and global food and agricultural systems will be required in order to support rural development. In the case of livestock, the notion of capacity for innovation needs to be expanded to encompass the complex set of activities, players and policies involved in developing, accessing and using knowledge and technology for agriculture and food-system innovation (World Bank, 2006b). Research arrangements need to pay more attention to technology demand from users, particular poor women and men, and other key economic actors, such as entrepreneurs and industrialists, who can create new opportunities for growth and welfare (Hall and Dijkman, 2008). Innovations in livestock production, processing, utilization and distribution usually take place where different players in the sector are well networked together, allowing them to make creative use of ideas, technologies and information from different sources, including from research.

The viability of small farmers in general – not just in livestock production – continues to be an important matter of debate. In managing sector transition, a significant difficulty lies in identifying sets of policies that work in different contexts. Three categories of small-scale livestock keepers should be considered: (i) small commercial operators who are and can remain competitive given appropriate policies, institutional support and investments; (ii) backyard producers who keep livestock only because the lack of alternative opportunities makes it feasible; and (iii) the very poor who keep livestock primarily as a form of insurance or safety net. Governments should help those smallholders who can thrive, while recognizing that some will be forced to leave the sector and will need assistance in the transition. Broader rural development policies aimed at the creation of off-farm employment, for both women and men, along the value chain within the sector or outside the sector may provide more stable long-term incomes for those who currently use livestock for survival rather than for production.

Some small commercial livestock producers are competitive and can take advantage of the growth opportunities in the sector. In rapidly growing economies where the livestock sector is in the early stages of transition, smallholders need support in order to be able to participate in the transition. Appropriate interventions include: support for technological innovations to increase productivity and to meet increasingly stringent health and food-safety standards; access to capital and credit for investment; access to input and output services and markets; and improved transportation and communication infrastructure. The capacity to respond to changing contexts and conditions is essential if smallholders are to thrive. Such capacity relates not only to financial, technical and infrastructure requirements, but also involves routines and networks that, in combination with policies, allow technology and other forms of information to be put into productive use (World Bank, 2007).

Some smallholders are unlikely to be able to compete as the livestock sector becomes increasingly concentrated and linked to modern processing and marketing channels. These producers require support as they leave the sector. Many livestock producers move out of the sector as the opportunity cost of family labour rises. The development of off-farm rural employment opportunities, through improving the quality and access to general education for girls and boys, can assist these households in finding new, more sustainable livelihoods. In these scenarios, the objective of pro-poor development policies for the livestock sector should be to mediate sector transition in which the roles of poor women, men and youths are

considered broadly, including as consumers, market agents and employees, as well as small-scale producers.

The very poor, who rely on livestock primarily as a safety net, need policies and institutional arrangements that reduce their vulnerability. Livestock production may remain a pillar of livelihoods and safety nets for poor households for many years to come. As discussed in Chapters 4 and 5, there is a need to minimize risks from zoonotic and food-borne diseases and environmental hazards to these livestock keepers themselves and the wider community (Sones and Dijkman, 2008).

Key messages of the chapter

- Livestock are important to the livelihoods of a large percentage of rural women, men and children living in poverty. They play a number of different roles, from income generation and the provision of inputs into mixed cropping systems to providing a buffer against environmental and economic shocks. Policy-makers need to consider the multiple roles of livestock in the livelihoods and food security of the poor.
- Smallholders need support in order to take advantage of the opportunities provided by an expanding livestock sector and to manage the risks associated with increasing competition and closer linkages with modern value chains. This requires significant and sustained innovation in national, regional and global food and agricultural systems, and a mix of policy and institutional change, capacity building, technological innovation and investment that is gender-sensitive and responsive.
- Policy-makers need to consider the different capacities of smallholders to respond to change. Some smallholders may be unable to compete in a rapidly modernizing sector and will give up their livestock, as opportunity costs for family labour rise. Broader rural development strategies aimed at creating off-farm employment for women, men and youths can ease their transition out of the livestock sector.
- Policy-makers need to recognize and protect the safety-net function performed by livestock for the very poor. Within the livestock sector, poor people are particularly vulnerable to risks related to zoonotic diseases and environmental hazards.