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

	% of value of total household livestock production									
	Landholding size class *(ha)*					Herd/flock size class *(TLU)*				
Country	< 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.

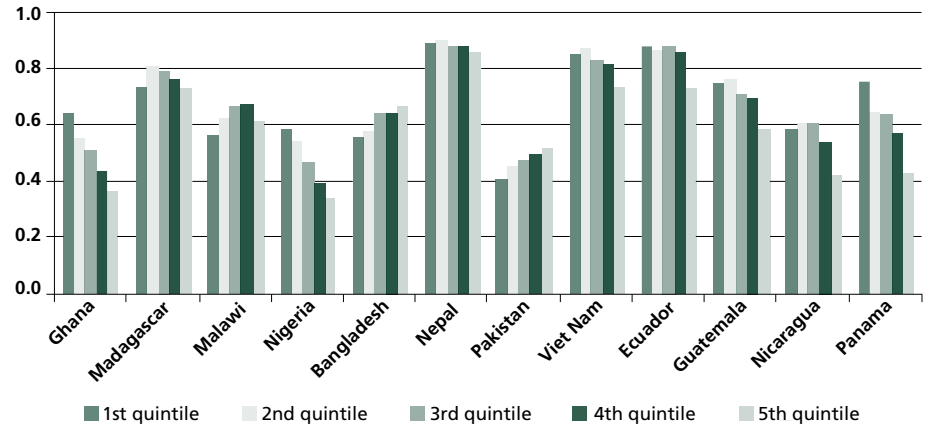
The average herd/flock size expressed in TLUs is relatively small for households in all quintiles in all regions except in the Latin American countries included in the sample. In general, these results correspond to published findings (Bebe *et al*., 2003; Maltsoglou and Rapsomanikis, 2005; Maltosglou 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 curves[10] 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

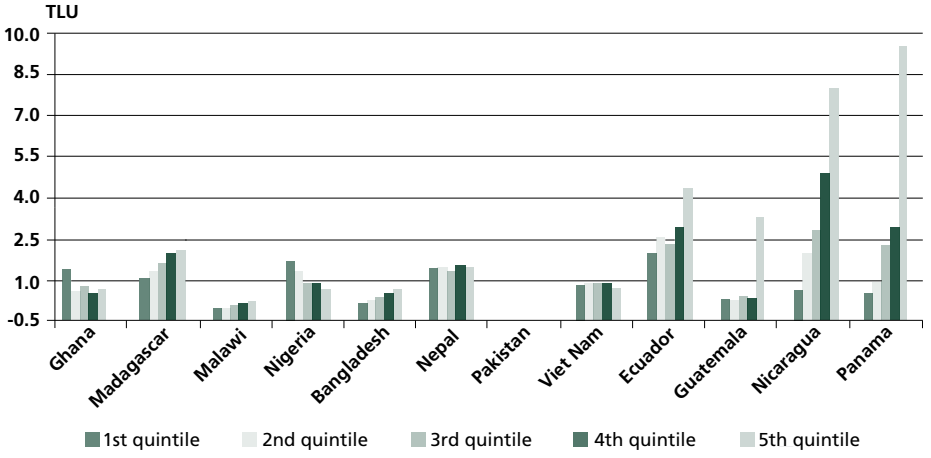
[10] Lorenz curves map the cumulative distribution of rural livestock-keeping households ordered by average herd size on to the corresponding cumulative proportion of livestock kept. If livestock stock were equally distributed, with every household keeping the same number of TLUs, the Lorenz curve would 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

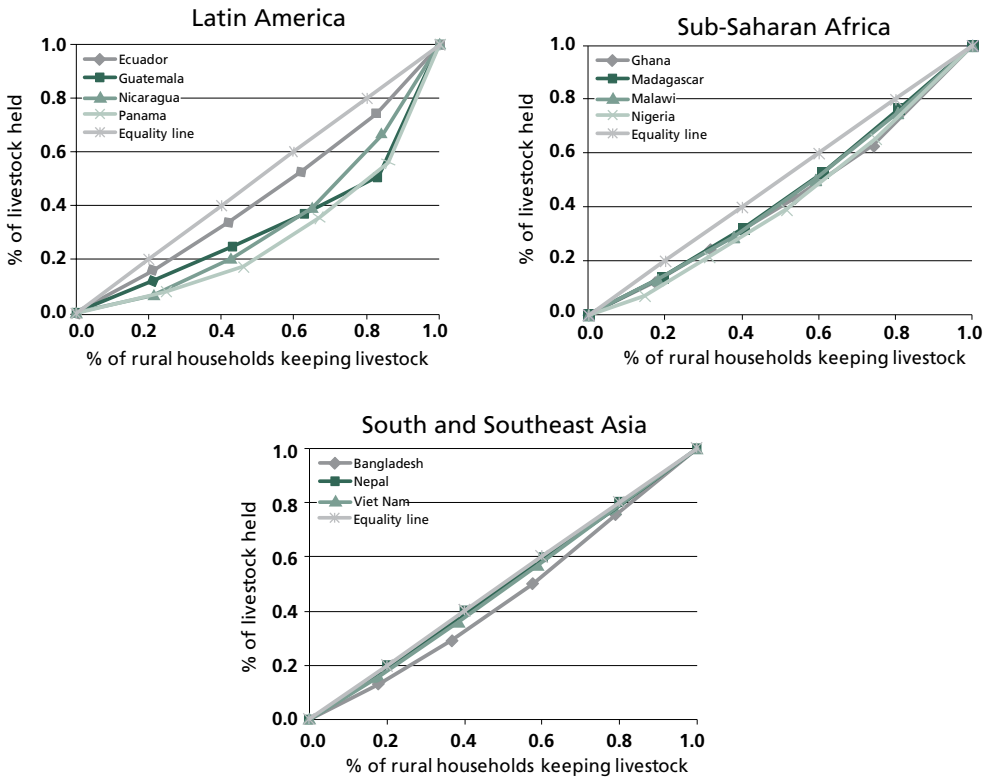


Source: FAO-RIGA database.

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 (Ramaswany, 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 manure[12] 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

	Livestock-keeping households				Non-livestock-keeping households)			
Country	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

	Average herd size (TLU)			Income per TLU (PPP dollars)			Income per adult equivalent (PPP dollars)		
Country	< 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

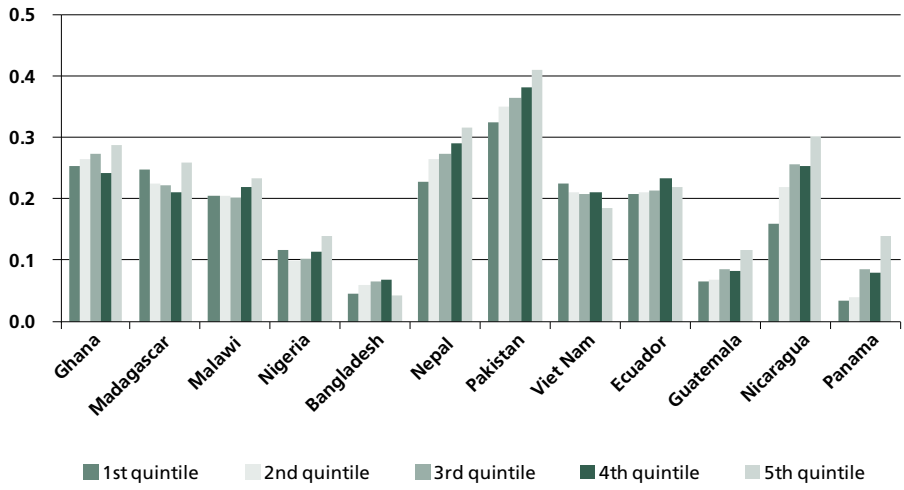
Source: FAO-RIGA database.

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., Maltsoglou 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

	Proportion of HHs selling agricultural products *(%)*		Proportion of livestock production sold *(%)*		Livestock's contribution to total HH income *(%)*	
Country	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

	% of value of total livestock production					% of value of marketed livestock production				
	Expenditure quintile					Expenditure quintile				
Country	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 Chantalakhana, 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-headed[13] 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

	HHs with livestock *(%)*		Mean TLU/HH		TLU ratio female-:male-headed HHs			
Country	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 that 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 asymptomatically – 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.