Section D

Uses and values of animal genetic resources

1 Introduction

This section presents an overview of the importance of AnGR to world agriculture, their contribution to the livelihoods of farmers and herders, and their broader social and cultural importance. The first chapter outlines the significance of livestock production in the various regions of the world in terms of economic output, land use and employment. Regional differences in the importance of livestock (overall and by species) are explored by presenting data on patterns of livestock distribution or "density". This is followed by a discussion of the production of food, fibre, hides and skins. Other uses of livestock such as the supply of inputs to crop production, transport, social and cultural roles, and the provision of environmental services are then considered – these descriptions draw largely on the information provided in the Country Reports. Finally, the particular significance of livestock in the livelihoods of the poor is discussed.

2 Contribution to national economies

In all regions, livestock contribute significantly to food production and economic output. The relative importance of agriculture in total GDP is greatest in developing regions, with the highest proportion being in Africa (Figure 29). Within the agricultural sector, the contribution of livestock also varies from region to region, with rather higher proportions being found in the developed regions (and the Southwest Pacific region where figures are dominated by Australia and New Zealand). It is, however, interesting to note the historical trends with regard to the contribution of livestock to agricultural GDP. As shown in Figure 28, the trend for the developed regions has been slightly downwards over the past 30 years. Conversely, in most developing regions (Asia, Latin America and the Caribbean, and the Near and Middle East) there has been a rise in the importance of livestock. The exception is the Africa region, where the contribution of livestock production declined after having reached a peak in the 1980s.

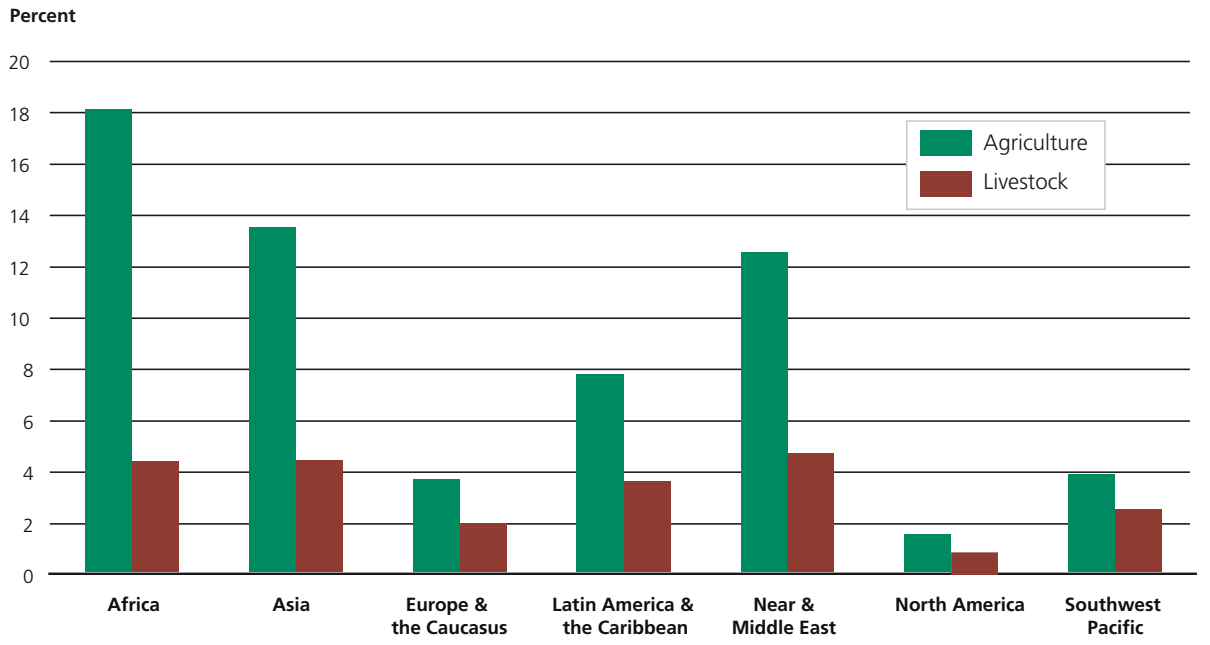
The raw figures for livestock production's contribution to the economy do not provide a complete picture of the socio-economic significance of livestock keeping. In many parts of the world it is an important element in the livelihoods of very large numbers of people, and contributes more than the marketable products that are considered in economic statistics. Data on the total numbers of livestock keepers are not available at global or regional levels. Figures are available at community, district or country levels, but at a larger scale, gaps in the data mean that accurate estimations are difficult to make – see Thornton *et al.* (2002) for a discussion of mapping livestock and poverty in the developing world. The proportion of the population employed in agriculture, as shown in Table 24, is a means of indicating the relative importance of farming as a livelihood activity in the different regions of the world. In both Africa and Asia, the majority of the population continues to make a living from

agriculture. The livelihoods of a majority of these people will depend to a greater or lesser extent on livestock. In India for example it has been estimated that at least 70 percent of the rural population keep livestock of some kind (Arya *et al.*, 2002), and in the state of Assam, the figure is put at almost 90 percent (Sarkar, 2001).

The farming system and the types of livestock kept are inevitably influenced by the amount of agricultural land available relative to the size of the agricultural workforce – the latter being strongly influenced by the degree of industrialization and economic development. As Table 24 shows, there is considerable variation between regions in terms of the amount of land per person working in agriculture – with Asia being the region where land is most scarce in this respect. The most striking contrast to the figures for Asia is presented by Australia – an industrialized country where climatic conditions result in a low rural population density. This country, along with the less extreme case of New Zealand, makes the Southwest Pacific the region with the largest amount of land per agricultural worker. The second region in this respect is North America, where the concentration process that has taken place in agriculture in recent decades has resulted in very low levels of employment in farming.

Besides its socio-economic importance, livestock production also plays a very significant role in terms

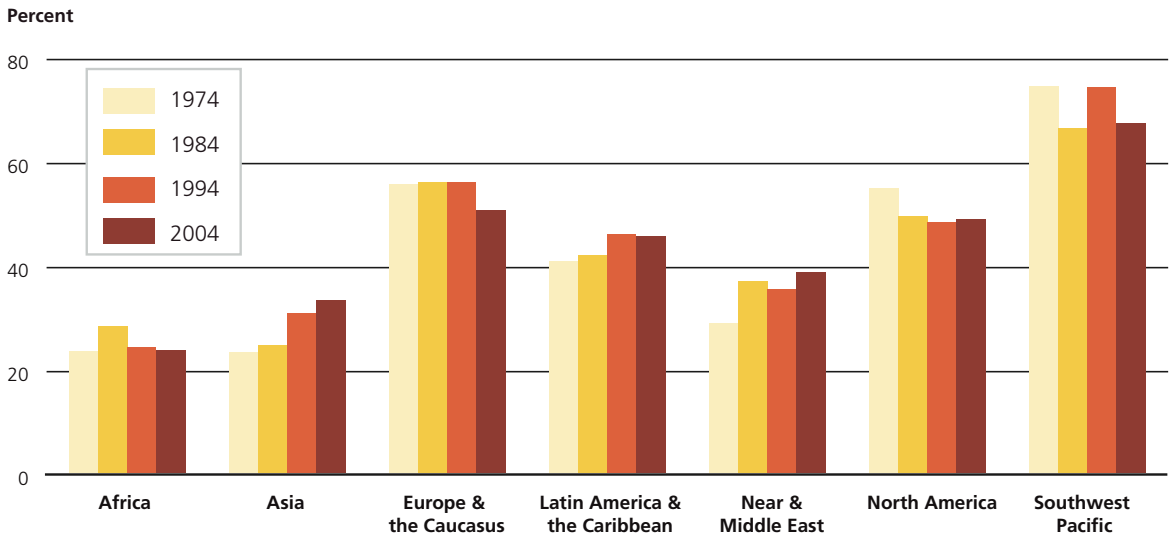
FIGURE 28
Contribution of agriculture and livestock to total GDP by region



Source: World Bank, figures for 2001.
Proportional contribution of agriculture and livestock based on current international dollar (Int.$)[4].

[4] International dollar (Int.$) is a value which corrects for disparities in purchasing power between national economies. The conversion factors to achieve purchasing power parity (PPP) take into account differences in the relative prices of goods and services – particularly non-tradables – and therefore provide a better overall measure of the real value of output produced by an economy compared to other economies.

FIGURE 29
Contribution of livestock to agricultural GDP



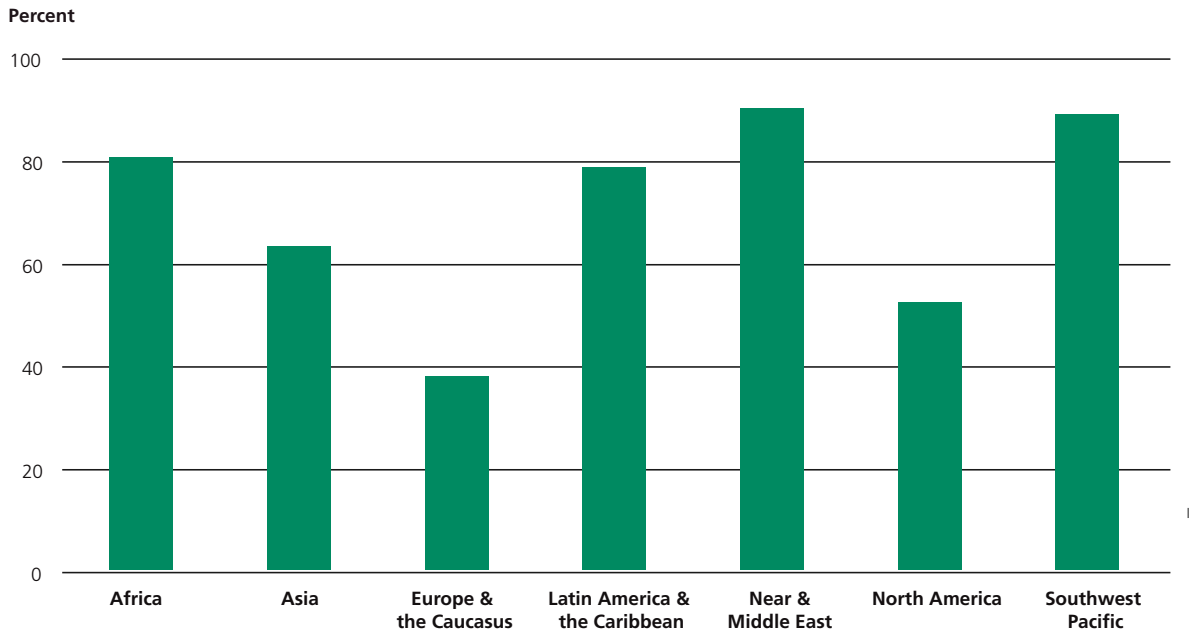
Source: FAOSTAT.

TABLE 24
Workforce employed in agriculture and land area per agricultural worker

	Proportion of workforce employed in agriculture (%)	Agricultural land area per economically active person in agriculture (ha)
Africa	59	5.1
Asia	56	1.4
Europe & the Caucasus	11	11.8
Latin American & the Caribbean	19	18.0
Near & Middle East	30	16.2
North America	2	143.4
Southwest Pacific	8	456.2
- Southwest Pacific excl. Australia & New Zealand	44	2.6
- Australia and New Zealand	5	761.0
World	42	3.8

Source: FAOSTAT – figures for 2002.

FIGURE 30
Percentage of permanent pasture in total agricultural land



Source: FAOSTAT figures for 2002.
The following countries are excluded due to a lack of figures for pasture area: American Samoa, Aruba, Bermuda, Taiwan Province of China, Cook Islands, Egypt, Faeroe Islands, Kiribati, Malta, Netherlands Antilles, Saint Pierre and Miquelon, San Marino, Seychelles, Singapore, Turks and Caicos Islands, Wallis and Futuna Islands.

of land use. Vast areas of land in all regions of the world are used for raising animals, particularly where natural conditions do not allow crop cultivation. This is illustrated by the fact that in all regions except Europe and the Caucasus, more than 50 percent of agricultural land is permanent pasture (Figure 30).

3 Patterns of livestock distribution

In this chapter the distribution of livestock biomass in tropical livestock units (TLU), and the number of livestock by species are considered in relation to the human populations that they support and the land area that is available. This provides a rough proxy for regional variation in the socio-economic significance of livestock and in their potential impact on natural resources. A fuller picture of the socio-economic importance of livestock could be provided if more complete data were available on patterns of livestock ownership, and the relative significance of different livestock species to the livelihoods of different sections of the population.

Overall, the global map (Figure 31) shows that the two American regions and the Southwest Pacific have large numbers of livestock units per person. Conversely, the figures are low in the Near and Middle East. The situation in the other regions is more varied. In Europe and the Caucasus, it is generally the more western countries that have the highest figures. African and Asian countries also show a great deal of variation, with large numbers of animals per person being found in some countries such as the Central African

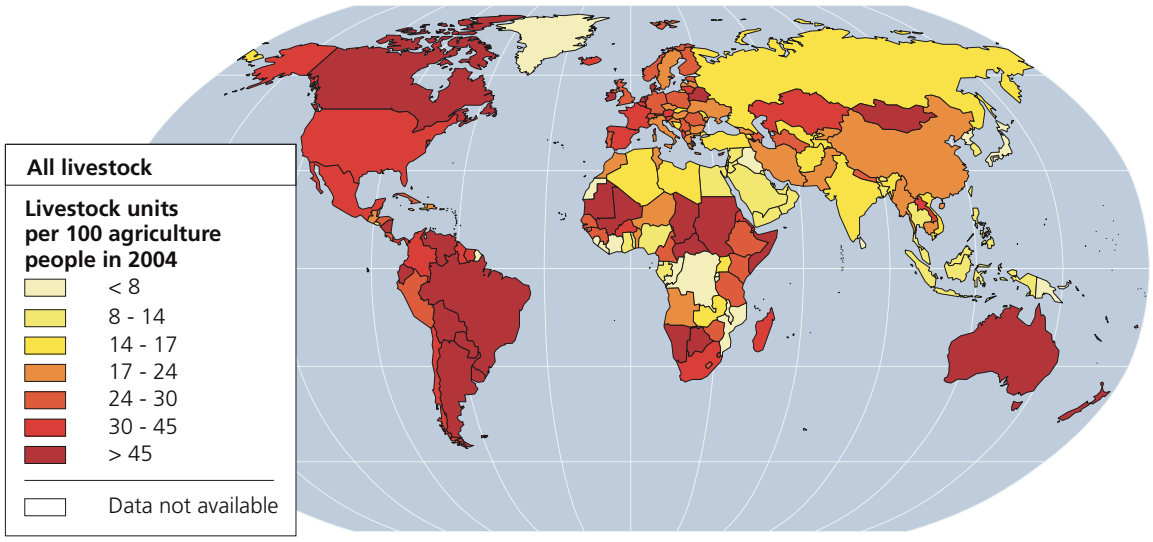
Republic, Chad, Mali, Mauritania, the Sudan and Mongolia.

The overall numbers of livestock units per hectare to a large extent mirror patterns of land use and the productivity of grazing land, but at the national level are also influenced by the growth of intensive and landless production systems and the import of feed. Most regions show large variation from country to country (Figure 32). In the Asia region, Japan, most of South Asia and several countries in Southeast Asia, have high livestock densities compared to Central Asia and China. Africa and the countries of the Near and Middle East generally have low densities, but Egypt is an exception. In Europe and the Caucasus, the western countries generally have high densities, but the figures are low for eastern parts of the region, particularly the Russian Federation. Latin America and the Caribbean also shows considerable variation from country to country. The map does not, of course, reveal the great diversity which also exists within countries in the distribution of livestock. Livestock density varies by agro-ecological zone, for example; and in many countries there is an increasing tendency for livestock populations to be concentrated close to urban centres. High livestock densities often present major challenges to the environment and the natural resource base (see Part 2 for a further discussion).

The importance of the various livestock species is far from even across the regions of the world – being affected by a range of agro-ecological, socio-economic, religious and cultural factors. Some species are largely restricted to a single region, while others are found throughout the world (see Section B: 3 for a discussion of species diversity).

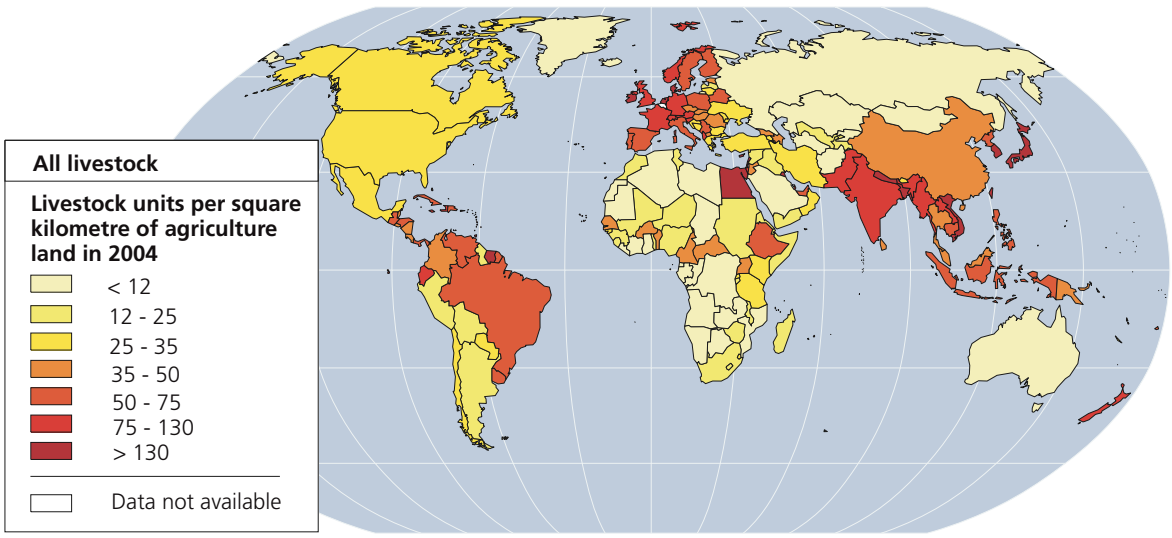
Sheep and cattle are widely kept in all regions of the world, but the Southwest Pacific far outstrips other regions in terms of the number of animals per person (Table 25). The figures for the region are dominated by Australia and New Zealand, with their large areas of grazing land and low

FIGURE 31
Livestock density in relation to human population



Source: FAOSTAT – figures for 2004.

FIGURE 32
Livestock density per square kilometre of agricultural land



Source: FAOSTAT – figures for 2004.

human population density. In the case of goats, Table 25 indicates their importance in the Near and Middle East region. The species is generally of greater importance in developing regions – the number of goats per person is particularly low in North America. The ass is another species that is of greatest significance to the inhabitants of the less-developed regions; the highest numbers per person are, again, found in the Near and Middle East, with Africa, and Latin America and the Caribbean also having relatively high numbers. The pattern is rather different for horses. North America, the Southwest Pacific, and Europe and the Caucasus have more horses per person than do most developing regions – horses in the developed world are now largely used for leisure activities. However, by far the highest figures are in Latin America and the Caribbean. In the case of pigs, the developed regions of North America, and Europe and the Caucasus (where monogastric production is dominated by landless systems) have the highest densities per inhabitant. Among the developing regions, Asia has the highest figures. Other mammalian species such as buffaloes and camelids have narrower distributions and are largely restricted to a few regions. The largest number of chickens per inhabitant is found in North America, followed by Latin America and the Caribbean, and the Southwest Pacific.

From the perspective of the number of animals per hectare of agricultural land (Table 26), a rather different pattern of species distribution can be discerned. In the case of cattle, for example, the Southwest Pacific has the lowest numbers per hectare – contrasting with its position as the region with the highest numbers of cattle per person. The arid and semi-arid rangelands of Australia are vast, but support a low livestock density. Europe and the Caucasus is the region with the highest sheep density, while in the case of goats, chickens and pigs, Asia supports the largest number of animals per hectare of agricultural land. For monogastric species, landless production is increasingly significant in many parts of Asia. The

TABLE 25
Number of animals by species/1000 human population

Species	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific
Asses	14	4	2	14	23	0	0
Buffaloes	0	46	1	2	18	0	0
Camels	7	1	0	0	22	0	0
Cattle	251	116	181	693	228	330	1 409
Chickens	1 597	2 115	2 591	4 653	2 425	6 430	4 488
Ducks	9	260	82	29	46	24	32
Geese	4	72	23	1	46	1	3
Goats	231	128	32	60	308	4	32
Horses	5	4	8	44	1	17	14
Mules	1	1	0	12	0	0	0
Other Camelids	0	0	0	12	0	0	0
Other Rodents	0	0	0	30	0	0	0
Pigs	28	159	235	140	0	226	143
Rabbits	4	105	148	9	47	0	0
Sheep	250	98	210	145	456	21	5 195
Turkeys	9	1	144	92	11	282	59

Source: FAOSTAT – figures for 2004.

TABLE 26
Number of animals by species/1000 ha agricultural land

Species	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific
Asses	11	11	2	10	13	0	0
Buffaloes	0	121	1	2	10	0	0
Camels	5	2	0	0	12	0	0
Cattle	205	307	276	483	126	229	78
Chickens	1 301	5 597	3 954	3 242	1 342	4 464	250
Ducks	7	688	126	20	26	17	2
Geese	3	191	35	0	25	1	0
Goats	188	339	49	42	170	3	2
Horses	4	10	13	31	0	12	1
Mules	1	3	1	8	0	0	0
Other Camelids	0	0	0	8	0	0	0
Other Rodents	0	0	0	21	0	0	0
Pigs	23	420	359	98	0	157	8
Rabbits	3	277	226	6	26	0	0
Sheep	204	260	320	101	252	15	289
Turkeys	7	3	221	64	6	196	3

Source: FAOSTAT – production figures for 2004, land-use figures for 2002.

highest densities of cattle and horses are found in Latin America and the Caribbean.

4 Food production

In terms of the overall economic value of food production from livestock, Asia is the leading region, reflecting its large livestock population. However, when considering the importance of livestock to the economy and to the supply of food, it is useful to examine production levels relative to the human population of the region (Table 27). In terms of milk and meat per person, the Southwest Pacific region has the highest production figures. Thanks to the contributions of Australia and New Zealand, the region has very high production levels for sheep and cattle meat, and milk from cows. Outside the Southwest Pacific, the highest milk production per person is found in the developed countries of Europe and the Caucasus, and North America; Latin America and the Caribbean has considerably higher levels of production than the other developing regions. Buffaloes make a major contribution to milk production in the Asia region, and are also quite significant in the Near and Middle East. The latter region also has the highest levels of sheep and goat milk production per inhabitant. Camel milk production is significant on a regional scale only in the Near and Middle East. Even in this region, the production levels are quite low relative to production from other species. North America is second to the Southwest Pacific in terms of meat production, and is the leader in terms of pig and poultry meat. Latin America and the Caribbean is also a major producer of meat. The livestock sector in this region produces slightly more meat per person than does that of Europe and the Caucasus, although the situation is reversed in the case of small ruminant meat. North America, and Europe and the Caucasus are the leading regions in terms of the number of eggs produced per person, followed by Asia, and Latin America and the Caribbean.

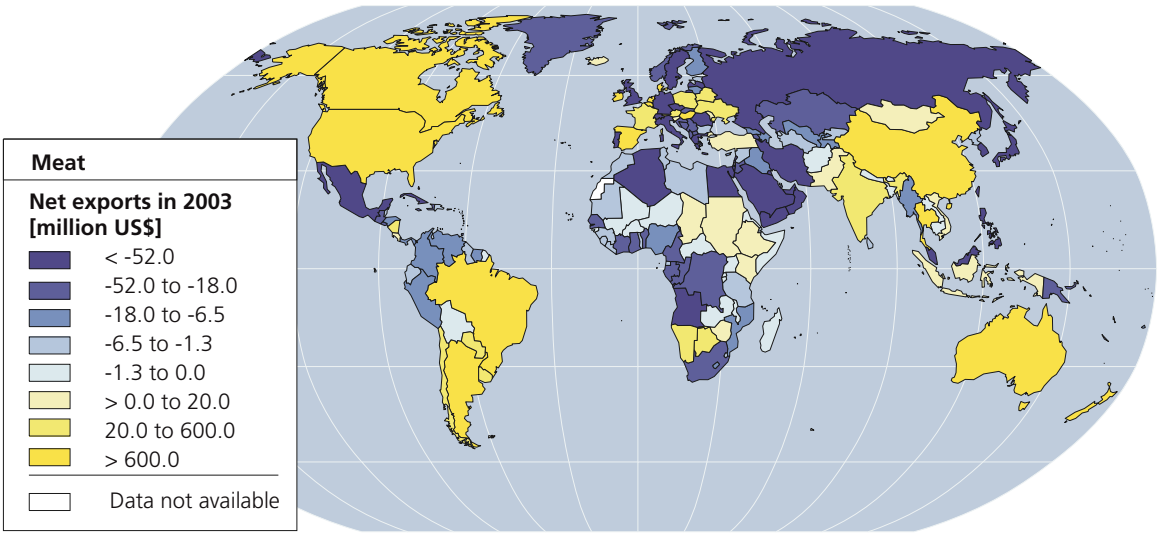
As well as providing for consumption at the national level, livestock products are important

TABLE 27
Production of food of animal origin (kg/person/year)

Food products	Africa	Asia	Europe & the Caucasus	Latin America & the Caribbean	Near & Middle East	North America	Southwest Pacific
Meat, Total	13	28	67	69	21	131	203
Beef and Buffalo Meat	5	4	15	28	5	38	107
Sheep & Goat Meat	2	2	2	1	4	0	42
Pig Meat	1	16	31	11	0	34	18
Poultry Meat	3	7	17	29	9	58	34
Meat of Camels	0	0	0	0	1	0	0
Milk, Total	23	49	279	114	75	258	974
Cow Milk	21	27	271	113	45	258	974
Buffalo Milk	0	20	0	0	13	0	0
Goat Milk	1	2	3	1	8	0	0
Sheep Milk	1	0	5	0	7	0	0
Camel Milk	0	0	0	0	1	0	0
Eggs	2	10	13	10	4	17	8

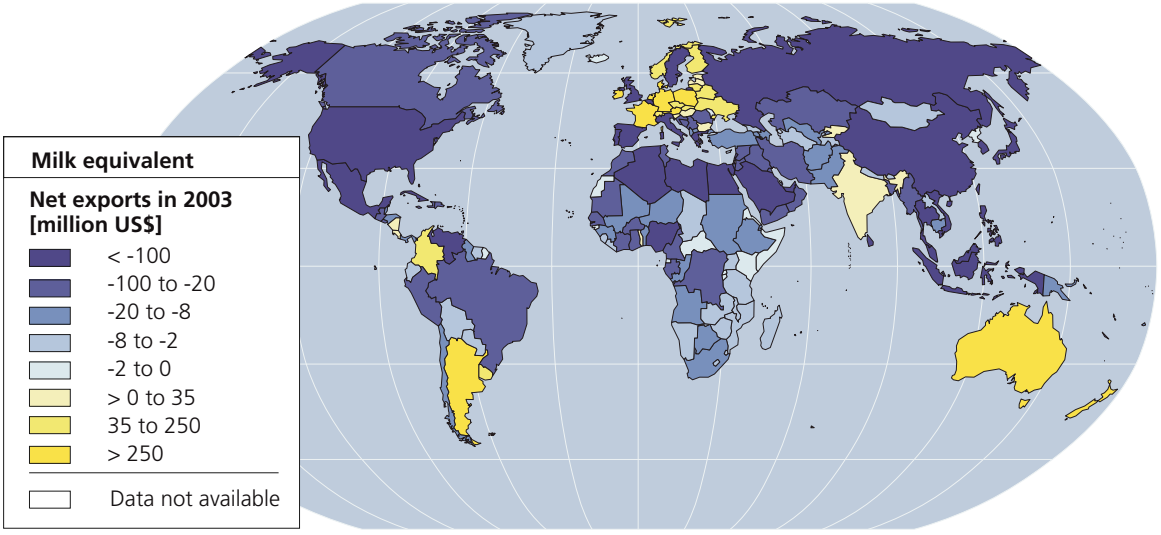
Source: FAOSTAT – figures for 2004.

FIGURE 33
Net exports – meat



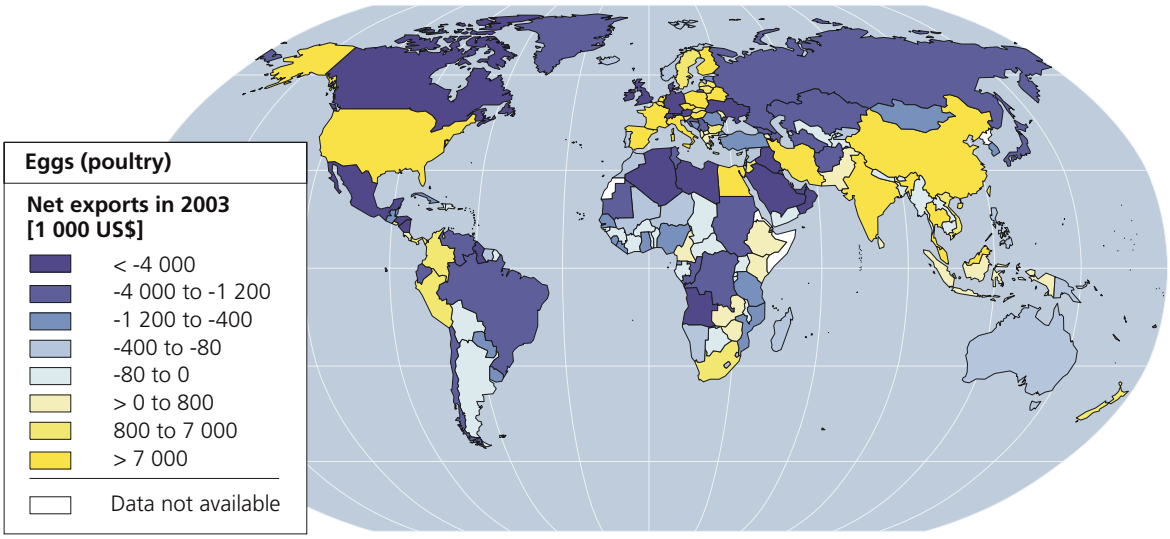
Source: FAOSTAT.

FIGURE 34
Net exports – milk equivalent



Source: FAOSTAT.

FIGURE 35
Net exports – eggs



Source: FAOSTAT.

export commodities in many countries. Trade in livestock products is growing, but faces a number of constraints – particularly associated with animal health. The countries of the world can be distinguished according to whether they are net exporters or net importers of particular animal products. Figures 33, 34 and 35 show the export/import status of countries for meat, milk and eggs respectively.

Brazil and the southern countries of South America are net exporters of meat, as are the countries of North America; Australia and New Zealand; a number African countries (most notably Botswana and Namibia); China, India and several other Asian countries; as well as many European countries. In the case of milk, long-standing net exporters such as Argentina, Australia and New Zealand, have been joined in recent years by new exporting countries such as Colombia, India and Kyrgyzstan. Net exporters of eggs can be found in all regions of the world. In Asia, for example, major net exporters include China, India, the Islamic Republic of Iran and Malaysia. The largest net exporter of eggs in the Africa region is South Africa, but there are a number of other such countries including Ethiopia, Zambia and Zimbabwe. In Latin America and the Caribbean, Colombia and Peru have in recent years become net exporters of eggs, as has Egypt in the Near and Middle East.

5 Production of fibre, skins, hides and pelts

Livestock fibres, hides, skins and pelts are also important products. Although the world's sheep industry has over recent years seen a shift in orientation away from wool production and towards meat, wool remains an important product in many countries. The Southwest Pacific is the region of the world that produces the most wool (Table 28). China, the Islamic Republic of Iran, the United Kingdom and other countries with large sheep populations are also major producers of wool, but it is often of secondary importance to

TABLE 28
Production of fibres, skins and hides (1000 tonnes/year)

Products	Africa	Asia	Europe & the Caucasus	Latin American & the Caribbean	Near & Middle East	North America	Southwest Pacific
Cattle Hides, Fresh	515.5	2 576.7	1 377.8	1 809.0	119.7	1 157.7	304.1
Goatskins, Fresh	112.2	727.9	30.6	23.2	64.9	0.01	5.4
Sheepskins, Fresh	0.05	0.03	0.06	0.03	0.01	<0.01	<0.01
Buffalo Hides, Fresh		796.7	0.7		23.3		
Wool, Greasy	137.5	663.7	325.8	151.9	118.6	18.6	726.5
Coarse Goat Hair	0	21.6	2.7	0	0		
Fine Goat Hair[1]	0	56.9	0.3	0	0		
Hair Fine Animal[2]	5.3	25.0	1.6	3.7	0.1		
Hair of Horses					0		0.1

Source: FAOSTAT – figures for 2004.
[1]Hair from Cashmere, Angora (mohair) and similar goats; [2]mainly from alpacas, llamas, vicuñas, camels and Angora rabbits.

meat or milk. Demand for wool in China remains high, and the country is the world's largest importer of wool (much of which is used for the production of textiles and garments for export). In a number of countries, wool has traditionally been the most important product of the sheep sector – examples include Lesotho and Uruguay. In the latter country, the wool industry has been a major source of employment, employing 14 percent of the labour force in manufacturing (CR Uruguay, 2003). Many sheep breeds have been developed for their wool. The fine-wool Merino breed from Spain has spread to all regions of the world; and in many countries there are indigenous breeds noted for the particular qualities of their wool. In India, for example, the Chokla and Pattanwadi sheep are known for producing good carpet wool, the Magra breed produces lustrous wool, and the Chanthangi breed is noted for fine wool (CR India, 2004).

Goats are also important producers of fibre. Fine hair is provided by breeds such as the Cashmere and Angora. Coarse hair is also a significant by-product of goat keeping. The production of goat hair is concentrated in the Asia region, with significant production also in Europe and the Caucasus. Fibre from South American camelids is increasingly in demand in international markets because of its unique qualities, and also provides inputs to local craft production. Angora rabbits are another source of fine hair; China is by far the world's largest producer. Hair is also a by-product in camel production. The soft undercoat of Bactrian camels, in particular, is a source of fine fibre; China is again the main producer. Hair from the undercoat of yaks is of very high quality. It is used domestically and sold on a small scale by the herders; it has become an increasingly important by-product in China where the textile industry has started to utilize yak fibre (FAO, 2003a). The coarse outer hair of yaks is used for a variety of purposes such as rope making. Among avian species, feathers may be an important by-product – used industrially in the manufacture of bedding, or for small-scale handicrafts.

Cattle hides and the skins of sheep and goats are produced in all regions of the world, while other products such as buffalo hides are more regional. Asia is the region that has the largest production of cattle hides and goatskins, while Europe and the Caucasus produces most sheepskins (Table 28). Hides and skins provide raw materials to local leather and tanning industries, often at the artisanal scale. In a number of countries,

TABLE 29
Trends in the use of animals for draught power

Region	Year	Area cultivated by different power sources (%)		
		Draught animal	Hand	Tractor
All developing countries	1997-99	30	35	35
	2030	20	25	55
Sub-Saharan Africa	1997-99	25	65	10
	2030	30	45	25
Near East/North Africa	1997-99	20	20	60
	2030	15	10	75
Latin America & the Caribbean	1997-99	25	25	50
	2030	15	15	70
South Asia	1997-99	35	30	35
	2030	15	15	70
East Asia	1997-99	40	40	20
	2030	25	25	50

Source: FAO (2003b).
Note that the regional classifications used in this table do not correspond exactly to the classification used elsewhere in the report.

they are also significant export products. At the subsistence level, skins are used in the production of clothing, rugs and other household items. In most cases, hides and skins are by-products of livestock production. An exemption is the Karakul sheep, from which lamb pelts are the major product. This breed is kept in many Asian countries, but has also spread to other parts of the world such as Australia, Botswana and the United States of America. Other breeds noted for the quality of their skins include the Jining Grey goat of China which is famous for the colour and pattern of its kid skins, the Chèvre Rousse de Maradi of Niger, the Mubende goat of Uganda and the Black Bengal goat of Bangladesh (CR Bangladesh, 2004; CR China, 2003; CR Niger, 2003; CR Uganda, 2004).

Other useable livestock by-products include horns, hooves and bones – used on a small scale for the production of various decorative items, tools and household goods, and in the production of glue and gelatine. Meat and bone meal was an important source of feed protein in livestock production before the rise of concerns over BSE.

6 Agricultural inputs, transport and fuel

Draught power provided by animals contributes greatly to crop production in the developing world. Animal traction has traditionally been particularly important in Asia (Table 29), and relatively unimportant in sub-Saharan Africa where its use has been restricted by heavy soils and the presence of tsetse flies. Nonetheless, animal traction is of great importance in parts of Africa. In the Gambia, for example, 73.4 percent of crop fields are cultivated using animal power (CR Gambia, 2003). In Latin America and the Caribbean, and in the Near and Middle East, animal power is, again, vital to the livelihoods of many small-scale farmers.

In many parts of the world, the use of animal traction is declining as a result of increased mechanization. The trend is most pronounced in Asia (Table 29). CR Malaysia (2003), for example, reports that the country's agriculture is now highly mechanized and that animal power is of little significance. The trend, however, is not universal. Some factors continue to favour livestock as a source of power. Where farmers find fuel prices unaffordable, the use of draught animals remains popular and may even increase. Table 29 shows that animal traction is increasing in importance in sub-Saharan Africa.

Animal power is used for many agricultural purposes. CR Ethiopia (2004), for example, notes that the uses of draught cattle, horses or donkeys include weeding, ploughing, threshing, and levelling fields before and after sowing. Among households that own draught animals, hiring them out is frequently a source of income. Conversely, households lacking draught animals (or mechanized power) tend to be at a marked disadvantage with regard to the efficient utilization of their land.

In addition to working in the fields, livestock are often used for transport purposes – pulling carts or serving as pack animals. Several Country Reports note that motorized vehicles are replacing animals as a means of transporting people and goods. However, in parts of the world where rural infrastructure is poor and the terrain is harsh, transport continues to be an important role of livestock. Ethiopia, for example, is a country with a large equine population. It is estimated that 75 percent of farms in the country are located more than a day and a half's walk from all-weather roads (ibid.), and animals are therefore vital for the transportation of farm produce to the market.

A range of livestock species are utilized for draught purposes. In the above-mentioned case of the Gambia, horses are the most significant species – being used to cultivate 36 percent of the cropland (CR Gambia, 2003). Cattle (33 percent), donkeys (30 percent) and mules (1 percent) are the other species used (ibid.). In contrast, CR United Republic of Tanzania (2004) indicates that 70 percent of the country's animal draught power comes from cattle and 30 percent from donkeys. Some livestock breeds are particularly noted for their suitability as draught animals. CR Chad (2003), for example, describes the calm and docile nature of the Zébu Arabe, which makes it easy to train for draught purposes. The results of a survey presented in CR Gambia (2003) indicate that 97 percent of farmers interviewed stated that they preferred N'Dama cattle to exotic breeds for draught purposes. The significance of donkeys as draught animals is reported to be on the increase in some African countries. CR Zimbabwe (2004), for example, notes that the use of the species for draught purposes has increased in the smallholder sector, particularly in the drier parts of the country.

Buffaloes are also important draught animals, mainly in Asia, and are particularly suited to working in swampy conditions. In semi-arid areas of Africa, Asia, and the Near and Middle East, camels are used for ploughing, drawing water and for transport. Yaks are important pack animals in the high mountain ranges of Asia, where sheep and goats are also sometimes used for this purpose. CR Nepal (2004), for example, mentions transport as a function of the Chyangra and Sinhal goat breeds, and also the Baruwal sheep, which can carry loads of up to 13 kg on its back. In China, local horse breeds such as the Yuta, Merak Saktenta and Boeta are noted for their ability to cross rough mountain tracks. It is, however, reported that an increasing popularity of mules has led to a decline among many indigenous Chinese horse breeds, which are also threatened by excessive cross-breeding with the exotic Haflinger breed (CR China, 2003).

In Latin America and the Caribbean, horses, donkeys, mules and cattle provide draught power for cultivation, and are used to transport agricultural products. Buffaloes also contribute draught power in some countries of the region (CR Brazil, 2003; CR Costa Rica, 2004; CR Cuba, 2003). CR Ecuador (2003) and CR Peru (2004) report the use of llamas for transport purposes at high altitudes. The merits of the Criollo horse for transport and draught functions at high altitudes are noted in CR Bolivarian Republic of Venezuela (2004). CR Peru (2004) reports that among Criollo cattle there are various "ecotypes" specialized for different roles – the Ancash type being noted as a draught animal. The important role of horses in extensive cattle production systems is noted in CR Bolivarian Republic of Venezuela (2004) and CR Brazil (2003).

In the eastern parts of the Europe and the Caucasus region, horses are still used for draught by some small-scale farmers. Indeed, in some places the number of draught horses has increased in recent years as a result of the fragmentation of land holdings (CR Romania, 2003). However, CR Latvia (2003) notes that the breeding of horses for draught has increasingly been replaced by breeding for meat. In these circumstances, there is little motivation to conserve draught-related genetic traits. CR Albania (2002) reports the risk of extinction faced by the local buffalo breed, formerly used for draught in bog-land areas, which has lost its role as a result of land reclamation measures. Horses and donkeys continue to serve as

pack animals in parts of Europe and the Caucasus. The Bosnian Mountain horse, for example, is still used to transport fuelwood in the mountains (CR Bosnia and Herzegovina, 2003).

The supply of agricultural manure is another important function of livestock. With greater use of inorganic fertilizers, the importance of manure has tended to decline in many parts of the world. However, CR Sri Lanka (2003) reports a trend towards the greater use of livestock manure for fertilizer, and notes that the product is traded to supply vegetable farmers who lack their own animals. In parts of Africa, demographic pressure and subsequent effects on soil fertility is necessitating a greater integration between crop and animal production, including an increased use of manure, particularly where inorganic fertilizers are difficult to obtain (CR Burundi 2003; CR Rwanda 2004). In other places, crop and livestock production is integrated through the grazing of pastoralists' livestock on crop farmers' fields after the harvest – the cropland benefiting from the manure and the livestock feeding on the crop residues (CR Cameroon, 2003). In some peri-urban areas, manure from pig and poultry enterprises facilitates the development of market gardening (CR Côte d'Ivoire, 2003; CR Democratic Republic of the Congo, 2005). CR Malaysia (2003) mentions systems that integrate fish farming with the keeping of livestock such as cattle, buffaloes and ducks. The significance of manure as a source of fertilizer is not confined to developing regions – it continues to be an important input in Europe and the Caucasus (CR Belarus, 2003; CR Hungary, 2003; CR Romania, 2003; CR Serbia and Montenegro, 2003; CR Slovenia, 2003). It is a key element of the organic production systems which are becoming increasingly popular in developed countries.

Dried dung cakes are widely used for fuel in the developing regions of the world, particularly where fuelwood is in short supply (CR Ethiopia,2004). Alternatively, manure can be used in the production of biogas (CR Barbados, 2005; CR Jamaica, 2005). Other uses of livestock dung include burning to ward off insects (CR Sudan, 2005) and as a building material (CR Ethiopia, 2004).

7 Other uses and values

If it is difficult to fully quantify the value of livestock as a source of agricultural inputs, this is even more clearly the case for intangible benefits related to asset, insurance, social and cultural functions, and for environmental services. These roles are, therefore, illustrated below using examples from different regions as provided in the Country Reports.

7.1 Savings and risk management

While livestock often provide their owners with a regular supply of products that can be consumed or sold to obtain cash income, for many livestock keepers functions such as savings, insurance and the management of risk are extremely important. In many parts of the developing world, and particularly for poorer people, the institutions which could otherwise provide these services are largely inaccessible. Conversely, these functions are of negligible importance in industrialized regions such as North America, and western parts of Europe and the Caucasus.

Savings and insurance functions are widely acknowledged in the Country Reports. Livestock keeping offers a means of livelihood diversification, enabling households to cope with fluctuations in income from wage labour or crop production, which may be affected by ill-health or unemployment, droughts, floods or pests. For many small-scale farmers and herders, production is largely for subsistence. However, the need for a source of cash to meet expenses arises from time to time. Livestock sales are frequently a means of meeting these requirements. The goods and services in question range from household items such as soap, salt and petrol, to school fees, building materials, agricultural inputs, health expenses, taxes, and meeting the costs of marriages, funerals and other cultural

Box 12
Linguistic links between cattle and wealth

The significance of the role of livestock as a form of wealth is highlighted by the fact that in many unrelated languages there are etymological links between the words for cattle and the words for wealth, capital, money or savings:

Cho-Chiku (Japanese: saving money) consists of two characters, of which the first *Cho* means saving. The second word is also used for livestock though the character is (only partly) different, *Chiku*. The Chinese etymology is very similar.

Råjåkåyå in Javanese literally means rich king, but it has the meaning of wealth and cattle.

Ente means cattle in Lunyomkole (a Bantu language from Uganda), and *sente* means money in the same language.

Mikne (Hebrew) means cows, goats, camels etc. It consists of the root word *kne* or *kana*, that means to buy, and an affix *mi* that makes the root into a noun.

Byoto (Polish) means cattle and originates from a Slavic root-word *byd_o* which relates to the meanings of "being, standing, living, the house, possession". This root meaning still survives in Czech and Slovakian but it has disappeared in Polish. The change of meaning from possession to livestock is typical for many Slavic languages.

Da (Welsh) means wealth or goods; good or goodness; as well as cattle or livestock (*da byw*). In the same language, *cyfalaf* the word for capital, is related to the word *alaf* – meaning a herd of cattle.

Vee (Dutch), ***Vieh*** (German) meaning livestock are related to *fee* (English) and originate from *fehu* (Old Saksish) which means both livestock and wealth or money. Compare *fia* (Old Frisian), *faihu* (Gothic), *fe* (Norwegian) and *fä* (Swedish).

Cattle is related to *capital* via *caput* (Latin: head, number of e.g. animals); the word *chattel* seems to be an intermediate.

Ganado (Spanish: livestock) is related to *ganar* (Spanish: to earn, to win, to gain).

Pecunia (Latin: wealth, money) is linked with *pecu* (livestock) and also used in the Spanish word for animal husbandry (*pecuaria*).

Provided by Hans Schiere.
See also Schiere (1995).

events and ceremonies (CR Madagascar, 2003; CR Mozambique, 2004; CR Niger, 2003; CR Sao Tome and Principe, 2003; CR Senegal, 2003; CR Togo, 2003). Local breeds are well adapted to being used as a form of savings because their hardy characteristics reduce the risk that they die from disease or lack of feed.

From another perspective, livestock can be regarded as a means of capital accumulation. CR Mali (2002) notes that larger herds are often the result of the capitalization of surplus from crop production. The use of livestock as a method of savings or investment is not, however, always limited to farmers and rural people. CR Congo (2003) mentions that traders and employees in the public and private sector often hold their savings in the form of livestock. These individuals are generally absentee owners whose animals are kept by paid herders, relatives or other rural connections.

7.2 Sociocultural roles

In addition to the economic importance of farm animals, most Country Reports, from all regions of the world, recognize the sociocultural roles of livestock. Cultural motivations influence the utilization of AnGR, and there are often strong links between communities and their local breeds. This has contributed to the development and maintenance of animal genetic diversity in many parts of the world. In some societies the slaughter or sale of livestock tends to be associated with social and cultural factors rather than to result from strictly commercial motivations. In the Southwest Pacific region, for example, the importance of pigs in social obligations and for consumption at the time of ceremonies and feasts is emphasized in the Country Reports (CR Palau, 2003; CR Samoa, 2003; CR Tonga, 2005; CR Tuvalu, 2004). CR the Cook Islands (2005) reports that more animals are slaughtered for cultural, religious, recreational or social functions than are marketed.

The roles of livestock in religious and cultural life are highly varied, and it is only possible here to give some indication of the diversity mentioned in the Country Reports. In Guinea-Bissau, for example, small ruminants are important for feeding guests at events such as funerals, baptisms, birthdays, marriages and religious festivals (CR Guinea-Bissau, 2002). Similarly, CR Burundi (2003) describes the importance of sheep in ceremonies to mark the birth of twins. CR Nigeria (2004) indicates that Muturu cattle and rams play a part in title-taking and chieftaincy festivals, while in the north of the country, camels serve as ceremonial animals carrying drums and other regalia at Sallah day processions. Animals with specific colours or other characteristics are often favoured for particular cultural roles. In Chad, for example, pure black or white chickens are preferred for religious ceremonies (CR Chad, 2004). Similarly, in Zimbabwe, black Mashona and red and white Nguni cattle are preferred for ceremonial purposes (CR Zimbabwe, 2004).

CR Bangladesh (2004) reports that large numbers of goats and cattle are sacrificed during the Eid-ul-Azha festival. CR Sri Lanka (2003) mentions that cattle and buffaloes intended for slaughter are sometimes released as an appeasement to ensure the recovery of friends or relatives from illness. In parts of Bhutan, the first yak calf of the year is sacrificed, while in other parts of the country yak skulls are inscribed with Buddhist prayers; a yak may also be released into the wild as an appeasement to local deities (CR Bhutan, 2002). In parts of Indonesia it is a traditional practice to slaughter buffalo before work commences on the construction of a building (CR Indonesia, 2003). Specific breeds such as the Kalang and the Spotted buffalo are noted for their uses in traditional rituals (ibid.). In India, religious institutions such as Gaushalas contribute to the conservation of indigenous breeds (CR India, 2005).

In rural areas of Peru, cattle, horses and donkeys play a part in cultural festivals such as the Yawar Fiesta and the Jalapato (CR Peru, 2004). CR Vanuatu (2004) describes the traditional practice of breeding pigs in order to increase the incidence of pseudohermaphroditism or "Narave" in males. The intersex pigs were at one time extremely significant to the local culture, and breeding for this purpose is still practised on a very limited scale (ibid.).

Livestock by-products also have significance to cultural life. Skins and horns of sheep, goats and cattle as well as poultry feathers have diverse roles in religious ceremonies and as gifts (CR Togo, 2003). Similarly in Cameroon, the feathers of guinea fowl are used in the production of artistic and ceremonial objects (CR Cameroon, 2003).

In many societies, the exchange of livestock has traditionally played a role in the maintenance of social ties. CR Congo (2003) notes that loans and gifts of livestock, inheritance, and the transfer of animals at the time of marriage serve to maintain networks of obligation and dependence within family and social groups, and can also be a manifestation of hierarchical relationships between social strata. Similarly, CR Cameroon (2003) reports that several poultry species are important in the maintenance of social ties, and it is noted that cultural considerations are important

factors influencing breed choice. CR Uganda (2004) mentions the role of Ankole and Zebu cattle breeds in traditional obligations associated with marriage. In parts of Malaysia, buffaloes are used as dowry (CR Malaysia, 2003). CR Philippines (2003) also reports the use of buffaloes as a "bride gift".

Traditional healing practices also sometimes involve livestock. CR Uganda (2004) mentions the belief that goats' milk is a cure for measles. In Zimbabwe, some communities feed donkey milk to children, as it is considered to have therapeutic benefits (CR Zimbabwe, 2004). Traditional ceremonies and healing practices have some influence on the choice of livestock breeds or varieties. CR Mozambique (2004), for example, describes a type of chicken, which has curled feathers and is popular with traditional healers. The birds therefore command a higher price than the regular chickens. In Uganda, black and white sheep are particularly prized by traditional healers (CR Uganda, 2004). In Peru, guinea pigs, particularly those with black coats, are used in traditional medicine (CR Peru, 2004). CR Republic of Korea (2004) reports that native goats and Yeonsan Ogol chickens, along with a number of other species such as deer, are kept to supply products for use in traditional medicine. Particular breeds of chickens are also valued for medicinal purposes in Viet Nam (Ac and Tre breeds) and in China (Silkies) (CR China, 2003; CR Viet Nam, 2005). CR Sri Lanka (2003) mentions that some animal products such as ghee, curd, whey, dung and urine are used in indigenous and ayurvedic treatments.

In many industrialized countries livestock and livestock products continue to have a significant cultural role. Numerous traditional religious events in Japan, for example, involve live farm animals (CR Japan, 2003), but there is no tendency to use indigenous rather than exotic breeds on these occasions (ibid.). In Latvia, white eggs are in demand at Easter time for egg dying, roasted geese are traditionally eaten at Martinmass and roasted cocks at Christmas (CR Latvia, 2003). Many rural people in Romania continue to fatten pigs for consumption at Christmas (CR Romania, 2003).

In many cases, however, rural customs, along with traditional crafts and farming practices, have lost their role in everyday life and are now regarded as "heritage" products to be marketed to the tourist or day tripper. There is often a great need for new income-generating activities and livelihood diversification in rural areas, and the potential of traditional livestock breeds to appeal to the visitor is widely recognized. On the one hand, the rare or traditional breeds may be kept in specific attractions such as farm parks or rural museums; on the other, they may be an element of a "cultural landscape" which helps attract the tourist to a particular area. CR Japan (2003) mentions institutions such as the Cattle Museum in Maesawa, which contribute to raising awareness of the history of livestock keeping. CR Serbia and Montenegro (2002) notes the re-introduction of indigenous breeds in areas surrounding spas and monasteries in order to increase the attraction of the landscape to tourists. Such developments are not, however, limited to industrialized countries or more developed regions. CR Nepal (2004), for example, mentions the potential of eco-tourism and farm parks, and CR China (2003) notes the role of horses in the tourist industry. Similarly in South America, camelids are kept as attractions in parks and at tourist sites (CR Peru, 2004).

In many countries, the cultural roles of livestock are not merely valued for their potential role in income generation, but are regarded as an element of the "national heritage". In the Republic of Korea, for example, the Jeju horse and the Yeonsan Ogol chicken (noted for the black colour of its beak, claws, skin and internal organs) have been designated national monuments (CR Republic of Korea, 2004). In Japan, several varieties of chicken along with Mishima cattle and the Misaki Horse have been designated "national treasures" and are included in special conservation efforts (CR Japan, 2003). Similar sentiments are expressed in several Country Reports form

Europe and the Caucasus. CR Hungary (2003), for example, notes that the conservation of AnGR is related to the preservation of other aspects of the country's culture – ranging from architecture and clothing to gastronomy and folk songs.

In all regions of the world, livestock are used in a variety of sports and entertainments. In the Near and Middle East, for example, the horse is of great cultural importance and there is much enthusiasm for horse breeding and racing (CR Islamic Republic of Iran, 2004; CR Jordan, 2003; CR Kyrgyzstan, 2004). Horses are also used for leisure riding and feature in various shows, festivals, circuses and exhibitions (CR Islamic Republic of Iran, 2004; CR Tunisia, 2003). Horses are also widely used for sporting purposes in the Europe and the Caucasus region. CR Ireland (2003), for example, mentions activities such as point-to-point racing, show jumping and eventing. Harness racing and trotting are popular in parts of Europe (CR Norway, 2003; CR Slovenia, 2003). In some cases, sporting roles are recognized as a means of sustaining the use of threatened breeds. For example, CR Republic of Korea (2004) reports that a horse racing track has been built for the purpose of racing the protected Jeju breed.

Several other species are also kept for sporting purposes. On the island of Madura in Indonesia, for example, the local cattle breed is used for racing and dancing (CR Indonesia, 2003). The CRs from the Philippines (2003) and Malaysia (2003) mention buffalo racing. CR Sri Lanka (2003) notes that cattle are used in cart racing. The local breeds are admired for their running ability in these events (ibid.). Ducks are another species that is sometimes used for racing (CR Indonesia, 2003). In Bhutan, yak dancing is of great cultural importance (CR Bhutan, 2002). In Viet Nam, Ho and Choi (fighting) chickens are used for entertainment at religious festivals (CR Viet Nam, 2005). CR Indonesia (2003) also mentions cock fighting as a cultural activity, as well as the breeding of the Garut breed as a fighting sheep. Similarly, bullfighting is popular in a number of countries (CR Peru, 2004).

Livestock raising may, in itself, be a leisure activity. This function is most prominent in developed regions such as Europe and the Caucasus. According to CR Denmark (2003) "beef cattle, horses, sheep, goats, rabbits, ducks, geese, turkeys, ostriches and deer are mainly kept by part-time, leisure-time and hobby breeders." As these livestock keepers are less influenced by commercial motivations, their contribution to the conservation of less-profitable breeds is important. In the United Kingdom, the conservation of horse and pony breeds is largely dependent on small-scale and part-time enthusiasts (CR United Kingdom, 2002). Small species such as rabbits, and particularly poultry, are often popular among "hobby" breeders. For example, CR Turkey (2004) notes that Denizli and Gerze, native poultry breeds, are popular with this group of livestock keepers. Similar motivations operate elsewhere in the world – CR Sri Lanka (2003) notes that ducks, turkeys and guinea fowl are kept for leisure purposes, and CR Pakistan (2003) mentions that peacocks and partridges are kept as pets.

In some places, long standing preferences for particular breeds also influence the actions of traditional small-scale farmers. CR Romania (2003), for example, reports that the preferences of the peasants have helped to conserve a number of sheep breeds and varieties, such as the Tsurcana, the Blackhead Ruda and the Corkscrew Walachian.

Particular food products are also culturally important in many countries. Examples include the popularity of mutton from Dhamari sheep, and cheese from Taez Red goats in Yemen (CR Yemen, 2002). Meat from the Kampong chicken is considered by consumers in Malaysia to be better tasting than that from commercial breeds (CR Malaysia, 2003). Similarly, CR Philippines (2003) notes that native pig breeds are favoured, and command a high price, in the country's specialized roast pig or "lechon" market. Examples from Europe and the Caucasus include the preference of local consumers in Albania for traditionally produced meat and cheese from

indigenous sheep and goat breeds such as the Dukati; demand for quality halloumi cheese, which has led to increased numbers of native and cross-bred goats in hilly areas of Cyprus; and the potential use of two endangered local Croatian pig breeds, the Black Slavonian and the Turopolje, in cross-breeding programmes aimed at producing high-quality traditional products such as paprika-flavoured sausage and ham (CR Albania, 2002; CR, Croatia, 2003; CR Cyprus, 2003).

Affluent consumers who are seeking quality and variety in their diets are increasingly a source of demand for "niche market" products. Sales to tourists are also an important part of the market for distinctive local food products. The potential importance of local breeds in meeting this demand is widely recognized, particularly in Europe and the Caucasus. However, in many countries, livestock breeds with the potential to meet the demands of niche markets still show declining populations. In Nepal, for example, the Bampudke pig, which is noted for its excellent meat is reported to be on the verge of extinction (CR Nepal, 2004). Similarly, yak cheese is reported to be very popular in Nepal, but yak populations continue to decline (ibid.).

7.3 Environmental services

Livestock can make a positive contribution to landscape and environmental management. This function is particularly recognized in developed regions such as Europe and the Caucasus. Grazing animals such as cattle, horses and small ruminants play a role in the maintenance and regeneration of pastures, heaths and moorlands. CR Serbia and Montenegro (2003), for example, notes that the biodiversity of pastures is endangered by the absence of grazing in depopulated mountain areas. CR Slovenia (2003) reports that small ruminants can serve to clear areas which have become overgrown with shrubs and, therefore prone to fires. Grazing donkeys can play a similar role in landscape management and fire prevention (CR Croatia, 2003). CR United Kingdom (2002) notes the role of the New Forest pony in scrub clearance.

Elsewhere in the world, mobile pastoralist production systems are an efficient means of producing food in a sustainable manner from land where grazing resources are meagre and fluctuating (CR Mali, 2002). CR Côte d'Ivoire (2003) notes that the use of livestock in crop production reduces the need for herbicides. Moreover, a consequence of the use of manure as a source of fertilizer is an increase in the diversity of soil microflora and microfauna (CR Mali, 2002). On tree crop plantations, particularly in Asia, cattle have a role in controlling weeds and shrubs, and in facilitating the harvesting of coconuts. In Malaysia, for example, the Kedah-Kelantin cattle breed is noted for its suitability for use on tree crop plantations (CR Malaysia, 2003). Although the breed shows slow growth, it is hardy and well adapted to the challenging environment. Meeting the demand for this breed has proved to be a problem, and the gap has had to be filled by imports such as Brahman cattle from Australia (ibid.).

From the point of view of conserving rare or non-commercial breeds, livestock's role in environmental management potentially has positive implications. Two factors can be discerned. On the one hand, a desire for conservation of the environment may go together with a wish to preserve other cultural and historic aspects of rural life including traditional livestock. On the other hand, breeds adapted to the local environment may be particularly suitable for grazing on rough pastures. CR Germany (2004), for example, mentions sheep breeds such as the Heidschnucken, Skudden and Bergschaf, and also breeds of cattle such as Hinterwälder and Rotvieh Zuchtrichtung Höhenvieh, in this respect. However, there is not necessarily a complete overlap between the two objectives in terms of breed choice. The best breeds for environmental management may not be indigenous to the country in question. In the Netherlands, for example, the animals used for landscape

management are often Heck or Scottish Highland cattle, and Iceland or Konik ponies rather than local breeds (CR Netherlands, 2004).

Consumer disquiet regarding environmental impact is a factor that is increasingly motivating change in livestock production systems. Organic farming has expanded markedly in countries such as Sweden under strong promotion by government policy (CR Sweden, 2002), and its potential is recognized in a number of countries where livestock keeping is largely conducted under low external input conditions. The expansion of organic production potentially promotes the keeping of well-adapted local livestock breeds – particularly in the case of pigs and poultry kept under outdoor conditions.

A further characteristic of livestock is their capacity to convert "waste" (agro-industrial by-products, left-over food) into useful products. If such waste would otherwise require costly or environmentally damaging methods of disposal (e.g. burning or dumping in landfill sites), then

Box 13
The history of Hungarian Grey cattle – changing uses over time

The genetic origin of Hungarian Grey cattle has not been definitively elucidated. Ancestral animals may have come from Asia or from Mediterranean areas, and a genetic contribution from the wild aurochs has been suggested. The character of the breed developed slowly under the husbandry of the Hungarian breeders of the Carpathian Basin. Between the fourteenth and seventeenth centuries cattle were exported on a large scale, with herds covering several hundred kilometres on foot to Nürnberg, Strasburg or Venice. Demand emerged for a "trade-mark" appearance which guaranteed the quality of Hungarian beef. The long-horn animals with handsome conformation, hardy, healthy character, and excellent meat quality were greatly valued by contemporary buyers.

The early eighteenth century began a new period in the breed's history, as urban populations expanded and required supplies of agricultural products. As the demand was mainly for cereals, extensive animal husbandry declined. During this period, the function of the breed shifted to the production of working oxen. Czech sugar factories valued them for their fast movement, their simple dietary requirements, and their exceptional longevity. With the introduction of tractors after the First World War many farms disposed of their Hungarian Greys.

In 1931, the Hungarian Grey Cattle Breeders' National Association was founded and breeding activity was stimulated. However the Second World War severely disrupted these endeavours and many herds were destroyed. During the post-war period, low levels of milk production meant that the breed's numbers declined rapidly. Official policy favoured cross-breeding with Soviet Kostroma cattle. By the early 1960s, the only remaining herds were found on three state farms, with a total stock of six bulls and about 160 cows. However, at about this time, the idea of preserving rare breeds took hold in Hungary, and the Directory of State Farms allowed two more herds to be established. Because of a certain patriotic attachment to the breed, and the provision of small but permanent subsidies by the state, the population started to increase. By 2002, the number of cows had reached 4 263.

Today, functions of the breed include conservation grazing in National Parks, hobby breeding and a role as a tourist attraction. With respect to meat production, the breeders and the Hungarian Grey Cattle Breeders' Association aim to organize meat processing and develop high-value products such as speciality sausages.

For further information see: Hungarian Grey Workshop (2000); Bodó (2005).

this role is in itself a service additional to the other benefits (milk, meat, etc.) that the animals supply. Livestock's role as converters of waste may operate at the household level – in the disposal of kitchen wastes and crop residues; within a neighbourhood – for example, the collection of leftovers from markets or other businesses by small-scale pig keepers; or involve the large-scale, organized, use of by-products from food processing industries. The potential of livestock to utilize a range of "alternative" sources of feed is recognized in a number of Country Reports (CR Lao People's Democratic Republic, 2005; CR Malaysia, 2003; CR Mauritius, 2004). These feedstuffs are diverse in their nature, and their efficient utilization tends to require a degree of diversity in the livestock population. CR Mauritius (2004) notes that the local AnGR are able to make better use of the by-products that are available in the country than are exotic breeds.

In the case of some by-products there are, of course, alternative uses (e.g. biofuels); and there may be obstacles to their utilization as livestock feed. For example, beyond the subsistence level, the recycling of waste food is greatly restricted by hygiene concerns. Other problems include the difficulty of transporting bulky materials, the costs of processing, and the seasonal nature of supplies (CR Malaysia, 2003). Nonetheless, with improved processing methods and better awareness of the nutritional value of such feeds, there is potential to enhance the contribution of livestock to the productive use of the by-products of other activities (ibid.).

8 Roles of livestock for the poor

As described in the preceding chapters, livestock have diverse roles and functions, and can contribute in many ways to the well-being of their keepers. Richer sections of the population tend to have access to alternative means of meeting these needs (financial services, motorized transport, etc.). Goods and services of this kind are frequently unaffordable or inaccessible to the poor. Livestock, as multifunctional assets, are therefore often important to many aspects of poor people's livelihood strategies. Moreover, they provide the poor with opportunities to benefit from resources that would otherwise be difficult to put to productive use, such as crop residues, waste food, and common grazing land. Accurate data on the numbers of poor livestock keepers in the world are hard to come by (and there are of course numerous ways in which "poverty" and "livestock keepers" could be defined). Recent approximations have put the figure at around 550 to 600 million (Thornton *et al.*, 2002; IFAD, 2004).

Subsistence consumption of home-produced milk, eggs or meat can make a very important contribution to the nutrition of poor households (providing essential vitamins and micronutrients, for example). Livestock manure and animal traction are vital inputs for many poor farmers in mixed farming systems, who would otherwise have to invest in more expensive alternatives. The savings and risk-management functions outlined above are also frequently of great significance to the poor, reducing their vulnerability to fluctuations in levels of income from other activities, and providing a ready source of cash to meet expenses. For those households that are able to look beyond mere subsistence, expanding their livestock keeping activities and engaging in more market-oriented production is a potential pathway to increased income and improved livelihoods. Moreover, accumulating capital in the form of livestock may, in time, provide the opportunity to embark on new livelihood activities. The three "strategies" have been termed "hanging in", "stepping up" and "stepping out" (Table 30) (Dorward *et al.*, 2004).

As well as their financial roles, and the physical inputs that they provide to the livelihoods of the poor, livestock also have important social functions. Ownership of livestock may enable participation in the social and cultural life of the community, and the exchange of animals through

TABLE 30
Roles of livestock by livelihood strategy

Livelihood strategy	Principle roles of livestock
"Hanging in"	Subsistence
	Complementary production (inputs to cropping)
	Buffering (against income fluctuations)
	Insurance
"Stepping up"	Accumulation
	Complementary production (inputs to cropping)
	Market production/income
"Stepping out"	Accumulation

Source: adapted from Dorward *et al.* (2004).

gifts and loans can be a means of reinforcing social networks that can be drawn upon in times of need (FAO, 2002; IFAD, 2004; Riethmuller, 2003).

A number of Country Reports recognize the potential role of livestock in poverty reduction. It is noted that some classes of livestock tend to be more associated with the poor than others. CR Botswana (2003), for example, indicates that the distribution of goats is more equal than that of cattle among the country's rural households. In some countries, however, cattle and buffaloes are also very important to the livelihoods of the poor – CR Bangladesh (2004) notes that 62.5 percent of the large ruminants in the country are kept by small farmers and the landless. Several Country Reports mention the strong potential of indigenous livestock breeds for improving the livelihoods of the poor. The CRs from the Lao People's Democratic Republic (2005) and Indonesia (2003), for example, note the significance of indigenous poultry keeping as an activity for the poor, which should be supported through development programmes and further research. CR Ethiopia (2004) mentions a recent study, which revealed the strong potential of the scavenging Fayoumi chicken as a tool for poverty reduction. Similar findings related to scavenging chicken breeds are reported in CR Ghana (2003).

Conversely, other Country Reports describe the positive role of well-planned cross-breeding activities. CR Bangladesh (2004), for example, mentions semi-scavenging poultry production programmes supported by NGOs and the Department of Livestock Services, which provide a source of income to poor women and youths in rural areas. Exotic and cross-bred birds are kept and supported with supplementary feeding, improved management and healthcare (ibid.). Similarly, CR United Republic of Tanzania (2004) reports the contribution of imported goat breeds to a gradual increase in milk consumption among low-income groups.

The importance of home consumption of animal products to nutrition, particularly for children, pregnant women and nursing mothers is also recognized (CR Sri Lanka, 2003). CR Uganda (2004) notes that the milk of the Kigezi goat breed is used to provide milk to sick children in very poor households.

Women make up an estimated 70 percent of the world's poor (UNDP, 1995). Development strategies that contribute to the livelihoods of women are, therefore, particularly important from the perspective of poverty reduction. A number of Country Reports identify particular classes of livestock, products or activities where women have particular roles or access to resources and decision-making. Women tend to be associated with smaller species such as poultry, goats or sheep (CR Botswana, 2003; CR Central African Republic, 2003; CR Comoros, 2005; CR Guinea, 2003; CR Ghana, 2003; CR Kenya, 2004; CR Nigeria 2004; CR United Republic of Tanzania, 2004). CR Mozambique (2004) reports that women generally keep poultry and pigs, while men keep cattle and small ruminants. Alternatively, women may be closely involved in the care of calves (CR Mali, 2002). In terms of breeds, CR Niger (2003) mentions the Chèvre Rousse de Maradi goat as being particularly associated with women. In some countries, women have particular roles in the processing and/or

sale of milk (CR Guinea, 2003; CR Ghana, 2003; CR Mali, 2002; CR Nigeria, 2004). CR Mauritania (2005) mentions that selling hides and skins is an important source of income for women from the most deprived sections of society. Gender roles are, however, not necessarily stable. CR Lesotho (2005) reports that pig rearing in the country was traditionally practised mainly by women, but an increased demand for pig meat has led to men involving themselves in keeping the species.

Despite the significant contribution of women to livestock production, as CR Niger (2003) notes, training and extension activities are often directed towards men. Policies advocated to promote the role of women in livestock keeping include the development of relevant technologies such as labour-saving devices for processing livestock products (CR Nigeria, 2004), training, organization and credit provision (CR Guinea, 2003; CR Mali, 2002). Low levels of literacy are, however, recognized as a constraint to the promotion of women's role in livestock keeping (CR Guinea, 2003).

9 Conclusions

The information provided in the Country Reports illustrates that the uses of AnGR are very diverse. This is particularly the case for the smallholder production systems of the developing world. Many farmers rely on animals to provide inputs to crop production, and insurance and asset functions are of great importance where modern financial services are unavailable or unstable. In urbanized societies, livestock functions tend to be reduced – focusing on market-oriented production of food, fibre, skins and hides. Nevertheless, some cultural functions remain important – including roles in sports and leisure (mainly horses) and the supply of food products for particular festivals. New roles are also emerging (often for traditional breeds) in the heritage and tourism industries and in the provision of environmental services. However, there remains a large knowledge gap regarding the current roles of specific breeds, and whether they have characteristics that make them especially suited to particular functions or production conditions. There is a need for more complete data to be collected and made available through existing information systems.

Multiple roles of livestock and multiple combinations of interdependent roles require diversity within the livestock population – including both specialized and multifunctional breeds. However, decision-making in the field of AnGR management is often characterized by a lack of attention to multiple functions, particularly non-marketed outputs and benefits that are difficult to quantify. In these circumstances there is a danger that the value of local multifunctional breeds is underestimated, and that only a partial picture of livestock's contribution to human well-being is obtained.

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