

Subregional Report on  
Animal Genetic Resources:  
**East Asia**

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# Introduction

**T**his document is one of a set of subregional and regional reports prepared as part of the Annex to *The State of the World's Animal Genetic Resources for Food and Agriculture*. It consists of two sections:

- a factsheet; and
- a synthesis of priorities.

The factsheet is a compilation of background material on the significance of livestock to the subregion's economy and food security; the characteristics, distribution, and relative significance of the various livestock production systems; and the characteristics of animal genetic resources.

The priorities presented in this report are based on the outcome of consultations held at the subregional level to review a draft report on strategic priorities for action, which had been prepared by FAO as a global-level synthesis of priorities identified in the Country Reports submitted as part of State of the World process. The consultations, which were held during the final quarter of 2005, took the form of e-mail conferences and/or physical meetings, and provided an opportunity for country representatives, from both technical and policy backgrounds, to identify priorities and to further strategies for cooperation.





# Subregional factsheet: East Asia

## 1 Importance of livestock to subregion's economy and food security

The countries of the East Asia subregion, as defined for the purposes of this report, include the China, the Democratic People's Republic of Korea, Japan, Mongolia and the Republic of Korea. Climates in this region range from upland temperate to subtropical/tropical and there are huge diversities in population numbers and land use. The subregion contains about 8 percent of the world's total land area, 24 percent of the world's total human population and 34 percent of the agricultural population. A summary of general information for this subregion is shown in Tables 1 to 3.

**TABLE 1**  
Land area and population

	Land area <sup>1</sup> (× 1 000 km <sup>2</sup> )	Population <sup>1</sup> 2002 (million)	Population density (km <sup>-2</sup> )	Population growth rate (%) <sup>1</sup>	
				1975–2002	2002–2015
China	9 326	1 294.9	139	1.2	0.6
Japan	375	127.5	340	0.5	n.a.
Democratic People's Republic of Korea	120	22.5	188	1.3	0.4
Mongolia	1 565	2.6	2	2.1	1.4
Republic of Korea	98	47.4	484	1.1	0.4

Data from UN and FAO statistics.

**TABLE 2**  
GDP and economic contribution of agriculture

	GDP <sup>1</sup> 2003 (US\$ billions)	Value added in agriculture <sup>2</sup> 2003 (% of GDP)	Agricultural population <sup>1</sup> 2000 (%)
China	1 417.0	14.6	66
Japan	4 300.9	n.a.	4
Democratic People's Republic of Korea	n.a.	n.a.	30
Mongolia	1.3	28.1	23
Republic of Korea	605.3	3.2	9

<sup>1</sup> Data from UN and FAO statistics.

<sup>2</sup> Data from World Bank statistics.

## EAST ASIA

**TABLE 3**  
Land use

	Arable (%)		Permanent pasture (%)		Forest/woodland (%)	
	1992	2002	1992	2002	1992	2002
China	13	15	43	43	14	..
Japan	13	12	1	1	68	..
Democratic People's Republic of Korea	19	21	<1	<1	61	..
Mongolia	1	1	78	83	9	..
Republic of Korea	19	17	1	1	65	..

Data from UN and FAO statistics.

China is the largest country in the subregion, occupying more than 80 percent of the land area. The Republic of Korea has the highest population density followed by Japan, the Democratic People's Republic of Korea and China. Mongolia has one of the highest population growth rates in Asia, but the population density is very low.

The importance of agriculture differs considerably among the countries of the East Asia subregion. Japan is one of the most powerful economies of the world; the contribution of agriculture to its GDP and the proportion of labour force engaged in agriculture are very low. In contrast, agriculture is the main occupation of the labour force in China. Nearly 80 percent of Mongolia's land area is used for grazing purposes.

The contribution of the livestock sector to the economy in the region differs considerably and the contribution of livestock to agricultural GDP varies from around 25 percent in Japan and the Republic of Korea to almost 90 percent in Mongolia (CR Mongolia, 2002). In China, the contribution of animal production to the total value of the output of agriculture, forestry, animal husbandry and fisheries reached 30 percent in 2000, increasing from 18 percent at the beginning of the 1980s (UNDP, 2002).

In 2002 the total human population of the East Asia subregion was estimated to be 1 495 million, an increase of more than one hundred million people since 1993. As a result of rapid growth of the human population, expanding economies and increased urbanization, Asia in general, but especially South, East and Southeast Asia, has the fastest developing livestock sector among developing countries. Increased livestock production is accompanied by a shift to intensive production systems (Gerber *et al.*, 2005). The process is referred to as the "livestock revolution".

### 1.1 Production and consumption

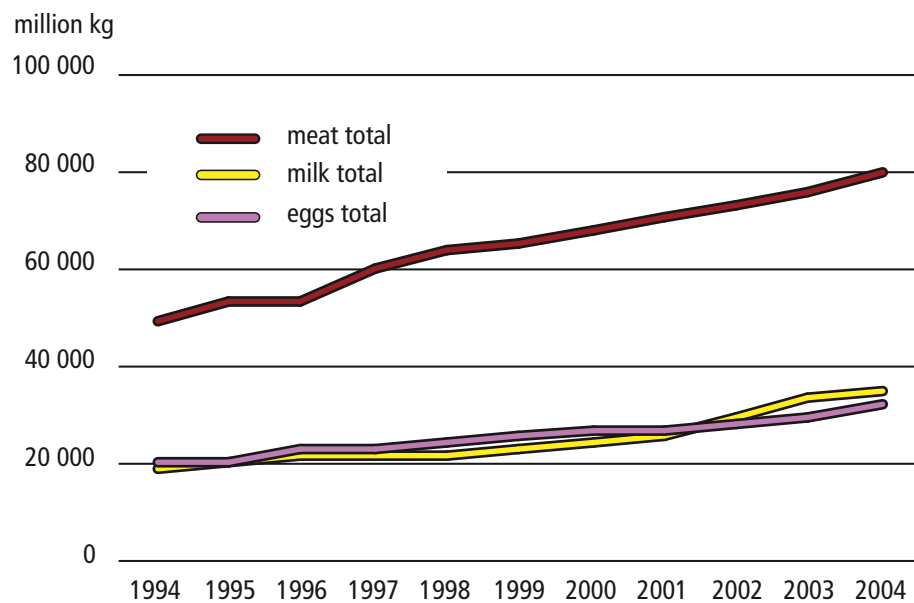
The importance of livestock keeping varies from country to country depending on the environment and the culture. Production and consumption figures reflect region-specific livestock species and products. In Mongolia, milk production has always been a part of traditional agriculture. Japan and the Republic of Korea also give high priority to dairy production, whereas China used to place more emphasis on pig production (FAO/UNEP, 2000). In East Asia overall, there is a steady increase in the contribution of animal products to the diet. This increase is a result of the contribution of meat, predominantly pork and poultry meat (FAO, 2003a).

China is a major livestock producer on a world scale and heavily influences the statistics for East Asia. Livestock production in China has tripled since reforms started at the beginning of the 1980s – faster than almost any other country. The strong growth in production and implied apparent consumption of pig meat in China in the 1980s and 1990s has shifted world meat consumption averages upwards rather significantly, from 30.7 kg in the mid-1980s to 36.4 kg at present. Without China, the average for the rest of the world would actually have stagnated in the same period (FAO, 2003a). During the period 1979 to 1995, the demand for animal products in China changed significantly, from being restricted to pork, to encompassing diversified animal products such as poultry, beef, mutton, eggs and milk (CR China, 2003). Pork still accounts for more than 50 percent of consumption, but shows the lowest growth (UNDP, 2002). At present, China has become a major global producer of animal products, with both meat and egg output ranking first in the world, meat output per capita exceeding the world average level, and egg output per capita approaching or reaching the level of developed countries. However, the dairy output per capita is only 1/13 of the world average (UNDP, 2002), so for milk and dairy products, there has been no "China effect" on world totals (FAO, 2003a).

Other East Asian countries have also contributed to raising the global consumption of meat. The Republic of Korea has attained mid- to high consumption per capita. Worldwide, per capita consumption of ruminant meat declined a little, but in the Republic of Korea and Japan significant increases in beef consumption occurred from the mid-1960s to the present (FAO, 2003a). However, in the Republic of Korea the process of rapid growth in meat consumption came to an abrupt end, in the late 1990s because of the economic crisis that affected the region. Food crises in the Democratic People's Republic of Korea accentuated the regional slowdown (FAO, 2003a).

Growth in poultry production has been spectacular in East Asia with increases of 11.7 percent per annum, which reflects the rapid intensification of the poultry industry in this subregion. Annual growth rates in egg production in East Asia were 10.7 percent. Especially in China, egg consumption is very high; more than double the average for developing countries and even above the industrial country average (15 kg/person/year in 1997-99) (FAO, 2003a). Figure 1 shows trends in the production of meat, milk and eggs in East Asia.

**FIGURE 1**  
Total meat, milk and egg production in East Asia: 1994–2004



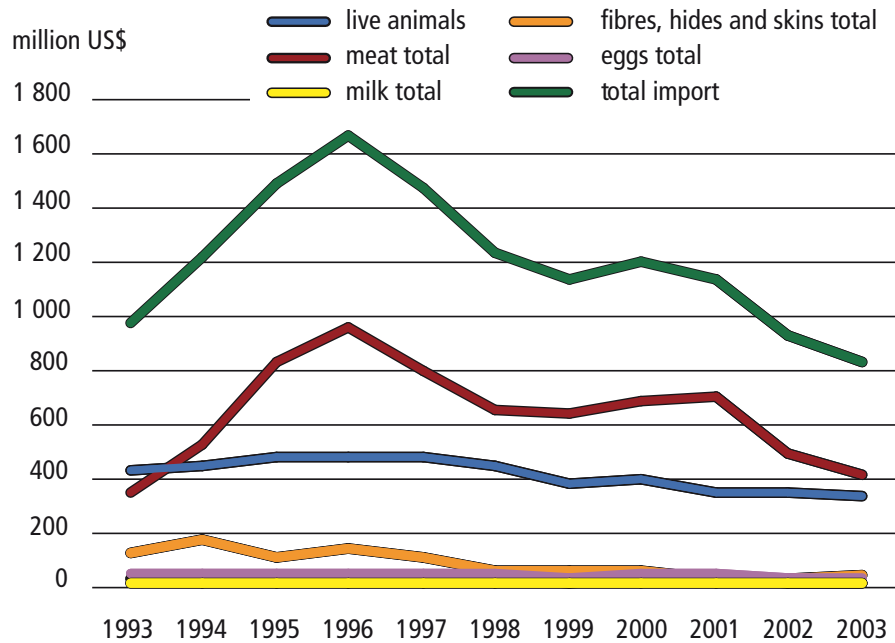
Source: FAOSTAT.

## 1.2 Imports and exports

Total export of live animals and animal products (Figure 2) grew until 1996 and decreased thereafter, coinciding with the financial crash which occurred that year in East Asia. Prior to 1996, the export-oriented economies of East Asia had been booming for some years, and this is reflected in the export figures for animal products, especially meat. Poultry meat made up the largest share of total meat exports in East Asia, increasing from 61 percent in 1993 to 80 percent in 2003, with an absolute difference of US\$121 million. China continued to be the largest net exporter of pig meat among developing countries, although this dominance has declined in recent years. After the end of economic crisis in East Asia, in around 1999, the export of live animals and animal products stabilized, but decreased again in 2002. This was mainly as a result of a decrease in the export of meat, particularly poultry meat.

## EAST ASIA

**FIGURE 2**  
Export of live animals and animal products in East Asia

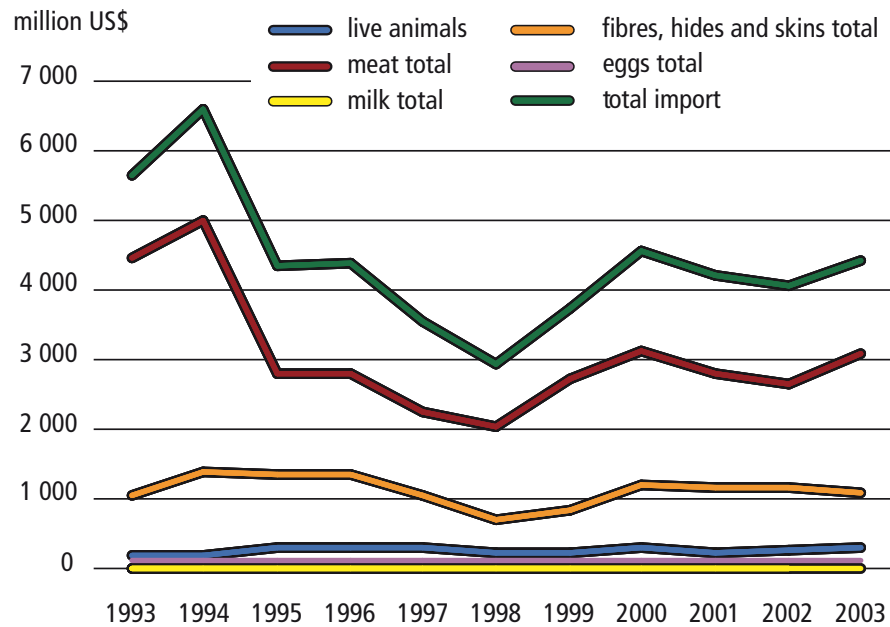


Source: FAOSTAT.

Figure 3 shows imports of live animals and animal products in East Asia. East Asia is a net importer of meats, with Japan dominating this trade. The rapid growth in meat consumption in Japan – per capita meat consumption increased from 32.6 kg in 1984-86 to 41.5 kg in 1997-99 – was paralleled by even faster growth in trade. In the same period, Japan's net imports quadrupled and self-sufficiency fell from 84 to 56 percent (FAO, 2003a).

The share of poultry, and beef and buffalo meat imports in total meat imports in East Asia both increased significantly. The share of poultry meat imports in total meat imports in East Asia increased from 19 percent in 1993 to 46 percent in 2003, with an absolute difference of US\$556 million. The import share of beef and buffalo increased from 17 percent in 1993 to 42 percent in 2003, with an absolute difference of US\$539 million. The Republic of Korea became the largest developing-country net importer of bovine meat (FAO, 2003a). Conversely, the share of pig meat imports in total meat imports in East Asia decreased significantly from 58 percent in 1993 to 5 percent in 2003, an absolute difference of US\$2.4 billion (FAO, 2003a).

**FIGURE 3**  
Imports of live animals and animal products in East Asia



Source: FAOSTAT.

East Asia is an important manufacturer of leather and leather products. Hides and skins are imported in large quantities because domestic supplies are generally of low quality. The United States of America is the world's largest producer and a leading exporter of hides and skins. East Asia is the key market for these exports. The Republic of Korea, Japan, and China markets took almost 80 percent of all bovine hides and skins exported from the United States of America in the mid 1990s. Many finished leather goods are then imported back in the United States of America (Orozco and Bean, 1996). Japan imports a large quantity of high-quality leather for the production of upholstery for cars, many of which are then exported to the United States of America (ibid.). Trade in dairy products and eggs in East Asia is of minor importance.

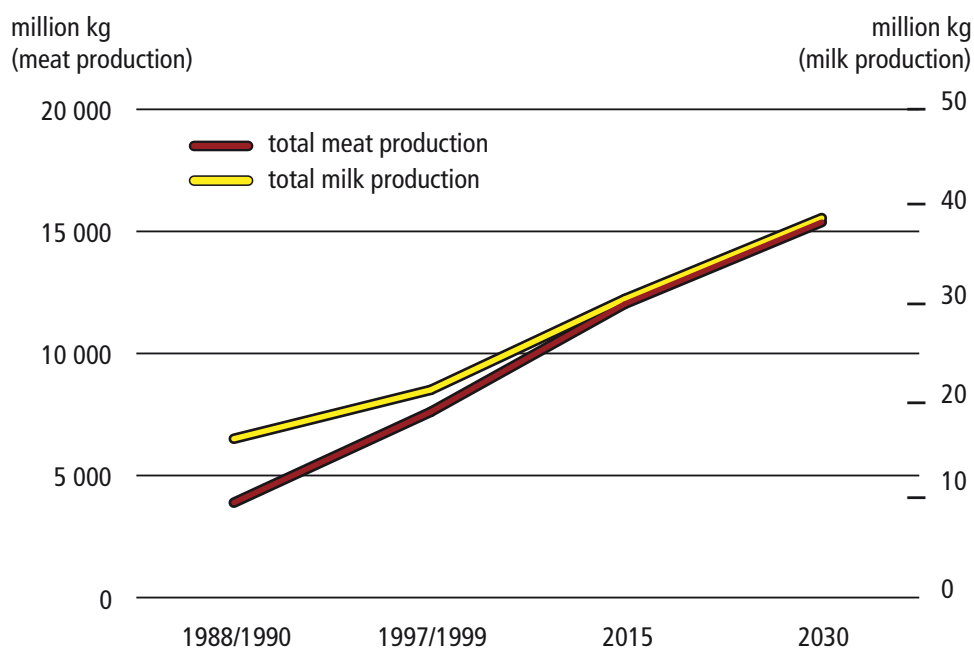
## EAST ASIA

### 1.3 Projected demand for livestock products

Figure 4 shows the total past and projected milk and meat production for East Asia; both are predicted to increase up to 2030.

**FIGURE 4**

Total meat and milk production East Asia: past and projected



Source: FAO (2003b).

Annual growth rates are given in Table 4 and were high between 1989 and 1998, but are projected to slow down over the period 1998 to 2015. Total livestock numbers in East Asia are predicted to more than double from 1988-90 to 2015 – from 3.3 billion to 7 billion.

**TABLE 4**

Annual growth rates for East Asia

	Annual growth rate (%)	
	1989–1998	1998–2015
Total livestock numbers	5.52	1.56
Total meat production (kg)	7.93	2.75
Total milk production (kg)	3.06	2.11

Source: FAO (2003b).

China experienced fast growth in livestock production in the past, but a slowdown is expected (FAO, 2003a). If China were to continue with the same rate of growth in meat consumption levels it would soon surpass industrial countries in terms of per capita consumption of meat. The projected rapid rise in the contribution of animal products to dietary energy, from 15 to 20 percent between 1997-99 and 2030, will be mainly as a result of a substantial increase in the contribution of pork and poultry. Egg consumption in China is very high and will rise from 15 kg/person/year in 1997-99 to 20 kg in 2030 (FAO, 2003a).

Currently, average dairy consumption per capita in East Asia is not high because food consumption preferences in most countries do not favour milk and dairy products. Per capita consumption of milk in China, for example, is very low and projected to remain so (rising from 7 kg/year in 1997/99 to 14 kg in 2030). However, there remains potential for growth in the context of increasing urbanization (FAO 2003a).

#### 1.4 Poverty

Poverty rates can be quantified on the basis of a poverty line, which provides a threshold in income or consumption below which a household can be classified as poor. Some poverty lines aim to be internationally comparable and, thus, are useful for producing continental and global totals. Widely cited examples are the US\$1 day<sup>-1</sup> and US\$2 day<sup>-1</sup> lines published by the World Bank. Data based on an international poverty line show the number of people who cannot purchase a roughly similar basket of commodities (World Bank, 2001). National poverty lines often reflect a country's economic and social status and can be used to assess progress on a national scale. The figures presented in Table 5, utilize three different poverty lines: US\$ 1 day<sup>-1</sup>, and US\$ 2 day<sup>-1</sup> and national poverty lines based on Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research (CGIAR) data.

**TABLE 5**  
Poverty rate by country

Country	TAC Definition	Less than 1US\$/day	Less than 2US\$/day
China	9.0	18.5	53.7
Democratic People's Republic of Korea	*	*	*
Mongolia	26.5	13.9	50.0

Sources: FAO (1997) and World Bank (2001) as presented by Thornton *et al.* (2002).

\* Data unavailable.

## 2 Description of production systems

### 2.1 Overview

In this report, the different types of livestock systems are described according to the classification developed by Seré and Steinfeld (FAO, 1996) (for details of the classification system, see the annex to this factsheet). Table 6 presents data on production and productivity based on this classification but utilizing updated figures (FAO, 2004) (the figures are for Asia as a whole).

All classes of livestock production system are found in Asia, including both temperate and tropical zones. Grassland-based production systems are most important in terms of total land area; 48 percent of the total land area in the region is categorized as belonging to grassland-based systems (FAO, 2004). The grassland-based systems of Asia are predominantly in the temperate zone; almost one-third of the total land area of Asia is allocated to this system. Examples include the Chinese Merino wool sheep production on communal grazing in Jilin Province, and Mongolia's steppe system (FAO, 1996). In Central Asia, Mongolia and neighbouring parts of China, economic transformations have refocused attention on the pastoral cultures of those areas (Devendra *et al.*, 2005): in Mongolia, after years of collectivization, when herders were employed in specialist single-species production teams, livestock were redistributed to herding households, who generally tried to return to the tradition of mobile multispecies herding of cattle (or yak at higher altitudes), horses, sheep, goats, and Bactrian camels in desert areas. New forms of communal rangeland management are slowly emerging to suit greater mobility (*ibid.*).

Mixed farming systems contribute more than any other systems to the output of animal products in Asia. Mixed farming (rainfed and irrigated together) provides 97 percent of the milk, 85 percent of the ruminant meat, 74 percent of pork and poultry meat and 70 percent of the eggs in Asia (FAO, 2004).

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In northeastern Asia, the mixed rainfed system of the temperate zone is the dominant system; the smallholder peasant farmers of northern China are typical examples. The mixed irrigated system is important in most East Asian countries (the Democratic People's Republic of Korea, Japan, the Republic of Korea and parts of China). Mixed family farms in these countries are mainly based on irrigated rice and dairy cattle and buffaloes (FAO, 1996).

Landless systems are growing in many parts of Asia, with a high concentration being found in China. Increased demand generated by higher human population density and income, has led to the growth of this system, which now plays an important role in providing livestock products in Asia. Twelve percent of the world's total pig meat production and 10 percent of the world's total poultry meat production is produced in Asian landless systems (FAO, 2004). In China, landless rural households often keep poultry and pigs (Thornton *et al.*, 2002).

**TABLE 6**  
Resource base, production and productivity data by production system in in Asia

	Grassland-based			Mixed rainfed			Mixed irrigated			Landless	TOTAL
	Temperate/ Highlands	Humid/ Sub- humid	Arid/ Semi- arid	Temperate/ Highlands	Humid/ Subhumid	Arid/ Semi- arid	Temperate/ Highlands	Humid/ Subhumid	Arid/ Semi- arid		
Parameters:											
Human population (millions)	59.2	198.3	4.0	242.2	594.3	338.6	294.5	962.2	562.0		3 255.3
a. Resource base											
a1. Grazing land (million ha)	318.5	92.9	79.7	19.3	22.8	6.3	5.8	13.6	7.1		566.0
a2. Arable land (million ha)	17.0	19.1	0.6	39.3	65.5	74.5	26.2	86.5	78.3		407.0
a3. Irrigated land (million ha)	6.3	5.7	0.2	11.5	15.4	19.1	13.9	36.4	47.3		155.82
a4. Livestock numbers											
cattle (million head)	9.9	18.5	2.7	28.7	76.8	67.4	24.7	91.0	106.2		425.9
dairy cows (million head)	3.0	0.7	0.1	1.5	9.2	10.6	1.7	11.6	21.0		59.4
buffalo (million head)	-	-	-	-	21.6	-	-	30.8	109.3		161.8
sheep and goats (million head)	103.8	36.0	16.7	64.0	58.3	59.9	64.4	114.6	141.8		659.5
b) Major outputs (million kg)											
beef and veal meat	567	459	79	1 727	1 104	445	2 003	1 722	994		9 100
buffalo meat	-	-	-	-	341	-	-	652	1 792		2 785
sheep and goat meat	984	294	76	617	330	231	786	844	788		4 949
pig meat	-	-	-	-	813	-	9 436	23 728	5 737	11 115	50 828
poultry meat	-	-	-	-	1 312	-	2 456	6 646	2 616	7 101	20 131
eggs	-	-	-	-	1 113	-	4 808	11 820	4 380	9 268	31 389
dairy milk	2 852	1 117	196	4 001	8 156	9 967	5 802	9 011	21 383		62 485
other milk	65	29	-	-	2 157	796	1 159	6 668	63 490		74 363
milk production total	2 917	1 146	196	4 001	10 313	10 763	6 961	15 679	84 873		136 849
c) Productivity and density indicators											
beef and buffalo meat kg/head	57.5	24.8	29.0	60.2	13.8	6.6	81.0	19.5	12.9		
sheep and goat meat kg/head	9.5	8.2	4.5	9.6	5.7	3.9	12.2	7.4	5.6	1.5	
milk yield kg/cow	960	1 612	2 650	2 724	885	940	3 373	776	1 018		1 053
ruminant meat kg/inhabitant	26.2	3.8	39.2	9.7	2.8	2.0	9.5	3.3	6.4		
agricultural land ha/inhabitant	5.7	0.6	20.3	0.2	0.1	0.2	0.1	0.1	0.2		
monogastric meat kg/inhabitant					3.6		40.4	31.6	14.9		
eggs kg/inhabitant					1.9		16.3	12.3	7.8	9.6	

Sources: FAO (1996); FAO (2004).

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The amount of agricultural land per inhabitant in Asia is significantly higher in grassland-based systems than in the other systems, because of the large amount of land and relatively low human population. In the grassland-based systems in Asia, no buffalo, pork or poultry are kept; at least, no significant outputs are produced. However, the amount of beef in terms of kg per head in grassland-based systems in Asia is about twice that found in the other systems. This could relate to the importance of functions other than meat production (e.g. draught) in mixed systems. The total output of beef and buffalo meat is much higher in the mixed systems, but so is the animal population. Mixed rainfed and mixed irrigated systems are comparable with respect to most productivity indicators; however the amount of monogastric meat per inhabitant and the amount of eggs per inhabitant is significantly higher in mixed irrigated systems than in mixed rainfed systems.

## 2.2 Roles and functions of livestock in Asia

Roles and functions of livestock in grassland-based systems in East Asia include, for example, wool production. Horses form a large part of Mongolia's livestock population, and are used for milk and meat, as well as for transport. In the grassland-based system of the temperate zones and tropical highlands of Asia, smallholders are particularly concerned with producing for local markets and their own subsistence.

In Asia, more than 95 percent of the total population of large and small ruminants, and a sizeable number of pigs and poultry, are reared in mixed crop–livestock systems, where crops and animals are integrated on the same farm (Devendra *et al.*, 2005). There are many benefits from integrating crop and livestock production. Roles and functions of livestock in this system are summarized in Table 7.

**TABLE 7**

Roles and functions of livestock in mixed crop–livestock systems in Asia

• Large ruminants provide power for operations such as land preparation and for soil conservation practices
• Both ruminants and non-ruminants provide manure for the maintenance and improvement of soil fertility.
• The sale of animal products and the hiring out of draught animals provides cash for the purchase of fertilizers and pesticides used in crop production.
• Animals grazing vegetation under the tree crops control weeds and reduce the use of herbicides in farming systems.
• Animals provide entry-points for the introduction of improved forages into cropping systems. Herbaceous forages can be undersown in annual and perennial crops, and shrubs or trees established as hedgerows in agroforestry-based cropping systems.

Source: Devendra *et al.* (2005).

It is suggested that crop–livestock systems will see important growth in the future and will remain the dominant systems in Asia (Devendra *et al.*, 2005). However, in many Asian countries pig and poultry production is increasingly based in advanced large-scale production units (Devendra and Thomas, 2002). This type of production is driven by the private sector because of high capital and resource inputs and economies of scale. It will contribute the major share of animal protein production in the future.

The ruminant sector (buffaloes, cattle, goats and sheep) in Asia also presents major opportunities for expanding production through improvements in priority agro-ecological zones. In this context, the less-favoured rainfed areas, with a total of about 268 million ha in the arid, semi-arid, subhumid and humid zones, have enormous potential (Devendra *et al.*, 2005).

## 2.3 Projected changes in production systems

The rapidly increasing demand for livestock products in Asia, together with changes in international trade, is placing pressure on Asia's livestock sector both to expand and adapt. This adaptation involves a shift in livestock functions and species, and a shift in agro-ecological and geographical zones. The non-food functions of livestock are generally in decline and are being replaced by cheaper and more convenient substitutes. The asset, petty cash, and insurance functions of livestock are being replaced by financial institutions, as even remote rural areas enter the monetary economy. In most parts of Asia, the use of animals for draught power is declining as more farmers mechanize, partly attracted by government subsidies. Manure continues to be important in mixed farming, but its role in overall nutrient supply is diminishing because of the competitive price and ease of management of inorganic fertilizer. The same applies to animal fibres, although the demand for natural fibres is still high and in

many places even increasing, there are a growing number of synthetic substitutes for wool and leather (FAO, 1999).

Grazing systems have limited scope for expansion. To some extent, in countries such as China, these systems can intensify by incorporating new technologies, especially in the higher-potential areas. Where this is not facilitated by strong institutions, local empowerment and regulation of access to resources, and where population pressure persists, grazing systems are threatened with resource degradation through overgrazing (Steinfeld, 1998). Overgrazing is widely held to contribute to destruction of grassland ecosystems in China, which in turn leads to reduced capacity to raise livestock in the future. Estimates of the level of overgrazing range from about 30 percent above carrying capacity in northern China as a whole (UNDP, 2002) to 60 percent in Inner Mongolia (*ibid.*). Additionally, good pastureland is being converted into cropland, leaving increasingly poorer land for grazing and mixed farming (Steinfeld, 1998). Thornton et al. (2002) consider that in 2050 western China and northern Mongolia will be among the parts of the world with the largest contiguous areas of land lying within the grassland-based production system category.

Partly contributing to grassland degradation in China is the shift of pastoralism from traditional mobile systems to more settled operations. This has resulted from government policy aimed at improving the living standards of nomadic herders. Over the short term, stationary herders tend to have more livestock and thus exert more grazing pressure. Moreover, mobile herding practices give grasslands time to rejuvenate. The damage to the grasslands as a result of settled herding has been evident in parts of China (Inner Mongolia) and other parts of Central Asia (UNDP, 2002).

Mixed farming systems will see continued intensification and growth, with livestock production based on crop by-products and surpluses. Some productivity gains can be achieved by further enhancing nutrient and energy flows between the crop and livestock components. Involvement of the mixed farming system may occur – a process in which the stability and sometimes the very existence of mixed farming is threatened by a decline in soil fertility triggered by population pressure, fragmentation of arable land, poverty and lack of market access (Steinfeld, 1998).

Landless systems in Asia are mainly established in peri-urban areas around large and medium-sized cities and in the coastal developed areas. This results in excessive animal densities, nutrient surpluses, and other environmental and human health problems. Landless systems in urban or peri-urban environments are often profitable in the short run, but in the longer term present serious sustainability problems. A solution may be to allow specialized commercial production to operate in an “area-wide” integration with crop production, in which nutrient balances are maintained and the land’s capacity to absorb animal waste is respected (*ibid.*).

Two important structural changes apply across production systems: a general growth in scale and a trend from horizontal to vertical integration. Levels of livestock production and processing are increasing in response to technological development and market requirements. However, next to this modern, demand-driven and capital-intensive sector, producing poultry meat, eggs, pork and milk, the traditional, resource-driven and labour-intensive sector will continue to provide a multitude of services to subsistence-oriented farms (FAO, 1999).

## 2.4 Impact of production system trends on animal genetic resources

In Asia the major trend is from multipurpose to single-purpose animals, with the production of animal protein being the over-riding objective. This is also reflected in the choice and manipulation of genotypes to favour specialization over product diversity. Another trend is the growing importance of monogastrics as economic converters of concentrate feed (*ibid.*).

- Grazing systems disappear because of land degradation and conversion into cropland. Breeds sustained in these systems will be threatened. However, in some areas, extensive herding seems to be the only practical way of earning a living from the land. For example, it is likely that Mongolia’s pastures will be exploited by livestock, under extensive grazing systems, for a long time to come (FAO, 2003c), and that breeds held in these systems will be maintained.
- Mixed systems will see continued intensification and growth. As these systems adopt new technologies which allow for the intensification of production, existing animal genetic resources are replaced with what are perceived to be improved genotypes (Blackburn *et al.*, 1998). More emphasis will be placed on monogastrics. Native breeds sustained in mixed farming systems will be threatened.
- Landless systems in East Asia will further increase. Particularly in East Asia, large-scale and vertically-integrated intensive industrial poultry and pig production systems have increased

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significantly in recent years and continue to do so. The introduction of high-yielding breeds and specialized modes of production especially in landless monogastric systems will lead to losses in between-breed genetic diversity. Cross-breeds with various degrees of exotic genotype may be an opportunity to preserve alleles from local breeds.

### 3 Animal genetic resources

#### 3.1 Status

Table 8 illustrates the number of animals of each major species in the East Asia subregion, and also gives an estimate of the number of breeds. The relative importance of poultry and pigs in the subregion is reflected by the large population sizes recorded for these species. The size of the yak population is unknown, but around half of all the breed populations in the world are found in East Asia. Tables 9 and 10 show the transboundary mammalian and avian breeds found in East Asia.

**TABLE 8**

Total population size and number of breeds of the major livestock species in East Asia and their share of the world total

	Population size (1 000)	Number of national breed populations	Share of world total	
			Population (%)	Number of breed populations (%)
Buffalo	22 287	27	13	16
Cattle	115 880	111	9	4
Yak	n/a	13	n/a	48
Goat	195 563	82	25	7
Sheep	167 914	94	16	4
Pig	494 928	178	52	14
Ass	8 208	22	20	12
Horse	10 092	75	18	6
Camel <sup>1</sup>	537	5	3	4
Chicken	4 618 127	147	28	6
Duck <sup>2</sup>	724 050	38	69	9
Turkey	204	5	0	3
Goose (domestic)	260 886	34	88	13

<sup>1</sup> Dromedary and Bactrian camel.

<sup>2</sup> Domestic duck and Muscovy duck.

Source for population figures: FAOSTAT estimates of 2004 live animal populations.

**TABLE 9**  
Transboundary mammalian breeds in East Asia

Ass	Bactrian Camel	Buffalo	Cattle	Deer
Khulan	Mongolian Bactrian	Murrah	Aberdeen-Angus	Chinese water deer
Tibetan		Nili-Ravi	Ayrshire	Fallow Deer
			Brown Swiss	Formosan sika deer
			Charolais	Red Deer
			Guernsey	Reindeer/Caribou
			Hereford	Sambar deer
			Holstein (black and white)	Sika deer
			Jersey	
			Kazakh	
			Kazakh Whiteheaded	
			Limousin	
			Mithun	
			Mongolian	
			Piedmont	
			Red Dane	
			Red Steppe	
			Shorthorn	
			Simmental	
			South Devon	
Goat	Horse	Pig	Rabbit	Sheep
Alpine	Akhal-Teke	Berkshire	Angora	Argali
Angora	Arab	Chester White	Angora German	Australian Merino
Australian feral	Belgian Draft	Duroc	Belgian Hare	Charollais
Boer	Breton	Hampshire	California	Corriedale
Mongolian Cashmere Goat	Chummarti	Large Black	Chinchilla	German Mutton Merino
Saanen	Don	Large White	French Lop	Karakul
Tibetan	Kabarda	Meishan	Japanese	Kazakh Fat-Rumped
	Kazakh	Middle White	New Zealand	Khangai
	Mongolian	Pietrain	New Zealand White	Lincoln Longwool
	Orlov Trotter	Spotted	Rex	Merino
	Percheron	Landrace		Mongolian
	Przewalski Horse			Poll Dorset
	Soviet Heavy Draft			Romney
	Thoroughbred			Suffolk
	Tibetan Pony			Texel
				Tibetan
				Tsigai

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**TABLE 10**  
Transboundary avian breeds in East Asia

Chicken	Duck	Emu	Goose	Guinea fowl
Cochin	Khaki Campbell	Emu	African Goose	Helmeted Guineafowl
Commercial strain, broiler, Avian	Pekin		Canadian	
Commercial strain, layer, Leghorn			Emden	
Commercial strain, layer, Lohmann			Lion Head	
Commercial strain, layer, Shaver			White Chinese	
Cornish				
Japanese Game Bantam				
Langshan				
New Hampshire				
Onagadori				
Plymouth Rock Barred				
Plymouth Rock White				
Rhode Island Red				
Satsuma-Dori				
Shamo				
Silkie				
Taiwan Country Breed				
White Cornish				
Muscovy duck	Ostrich	Pigeon	Turkey	
Muscovy	African Black	White King	Bronze	
	Australian		Commercial strain, Nicholas	
	Kenyan Red		Dutch White	
			Mammoth Bronze	

Figures 5 and 6 illustrate the structure of the data recorded in the Global Databank for Farm Animal Genetic Resources, showing the risk status of the mammalian and avian breeds recorded for each species in the East Asia subregion up to 2005. Only nine percent (76 of 881) of extant mammalian and avian breeds in East Asia are categorized as at risk. However, this is probably an underestimate of the actual situation, primarily due to a lack of information. Population data are available for only 69 percent of mammalian and avian breeds, and those that are most at risk of extinction are usually those for which it is most difficult to obtain accurate census information.

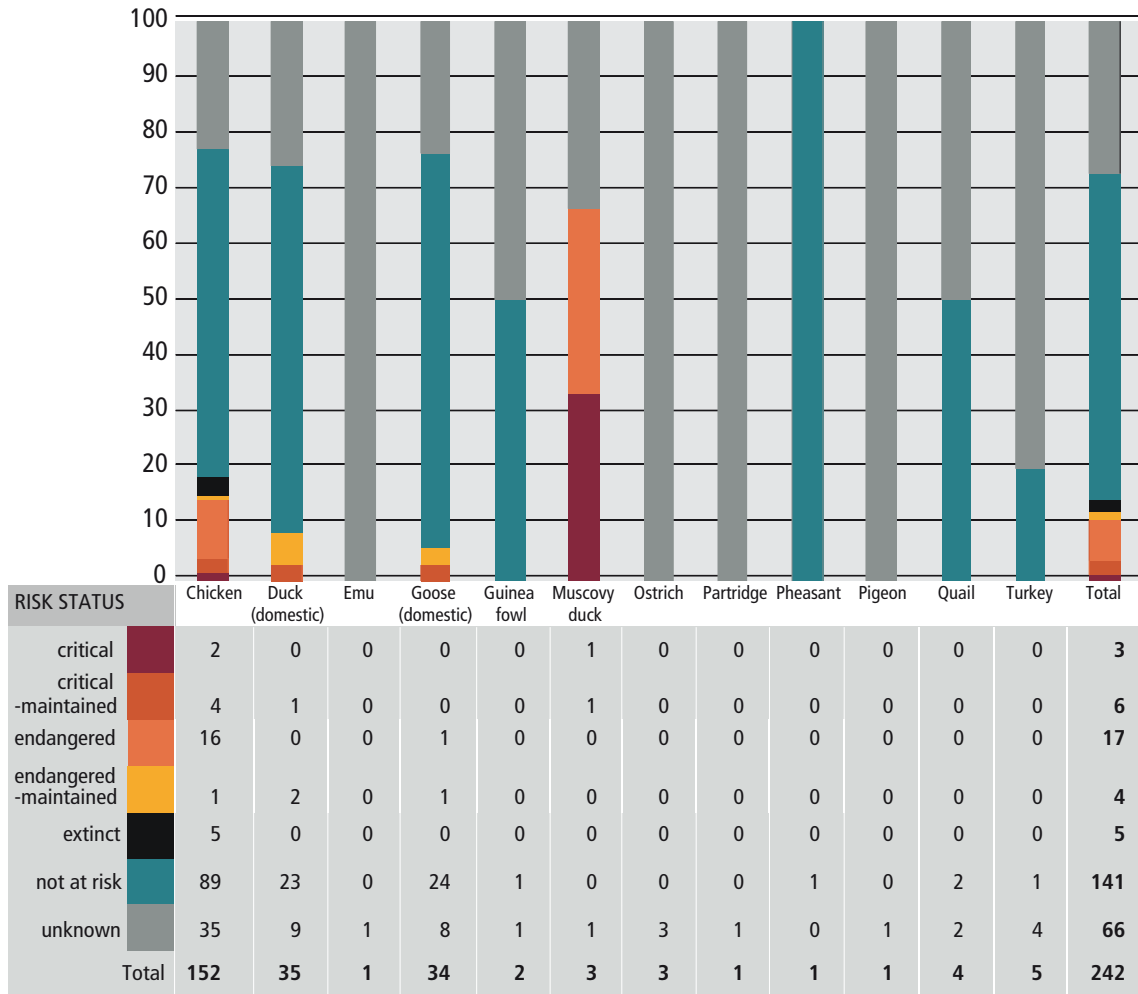
**FIGURE 5**  
Risk status of mammalian breeds recorded in East Asia\* up to December 2005: absolute (table) and percentage (chart) figures.



\* Breeds that are also recorded in countries outside Asia are excluded from the analysis

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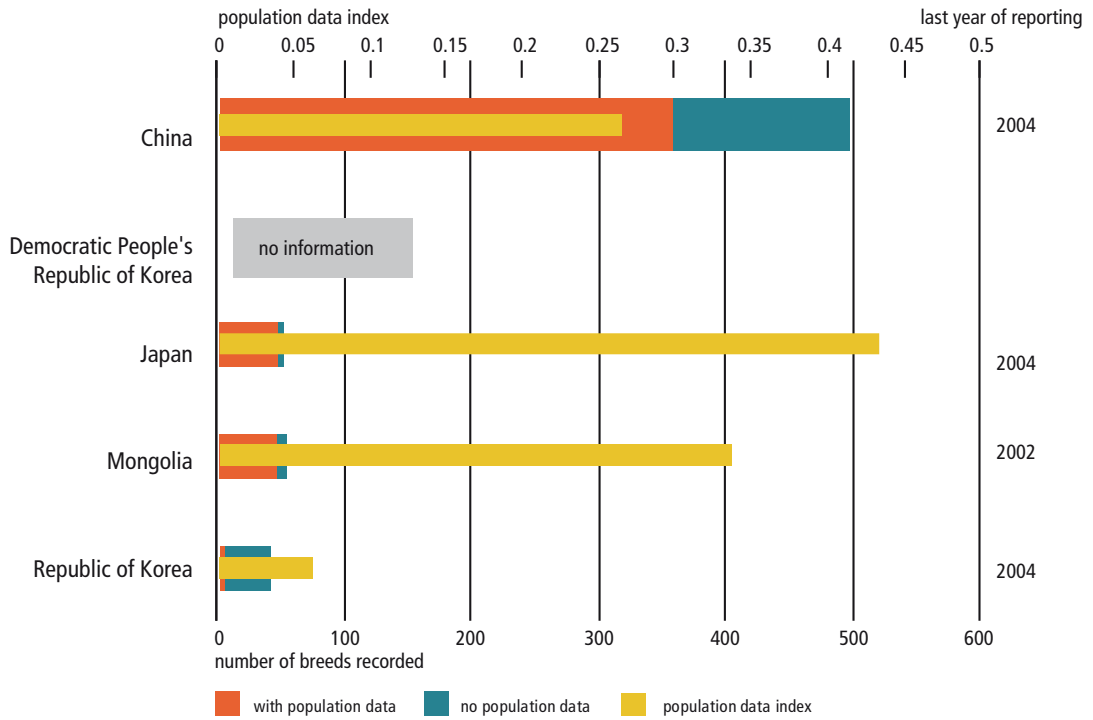
**FIGURE 6**  
Risk status of avian breeds recorded in East Asia\* up to December 2005: absolute (table) and percentage (chart) figures



\* Breeds that are also recorded in countries outside Asia are excluded from the analysis.

Figures 7 and 8 provide general overviews of the quantity and quality of the population data provided by each country for their animal genetic resources. The total number of breeds recorded by each country is shown. No information is displayed for those countries for which no breeds are recorded in the Global Databank for Farm Animal Genetic Resources. For all other countries, breeds are split into those with population data and those with no population data (risk status unknown). When one or more population data-related fields in the Global Databank for Farm Animal Genetic Resources are completed, then the breed is identified as having population data. For those breeds recorded as having population data, a population data index (PDI) is calculated, which provides an indication of the completeness of the data provided by the country. Selected basic population data fields, regarded to be the most important and used in the calculation of risk status, are considered – population size (absolute or range), number of breeding females, number of breeding males and the percentage of females bred to males of the same breed (FAO/UNEP, 2000).

**FIGURE 7**  
Population data status and index for mammalian breeds recorded by the countries of the East Asia subregion up to December 2005



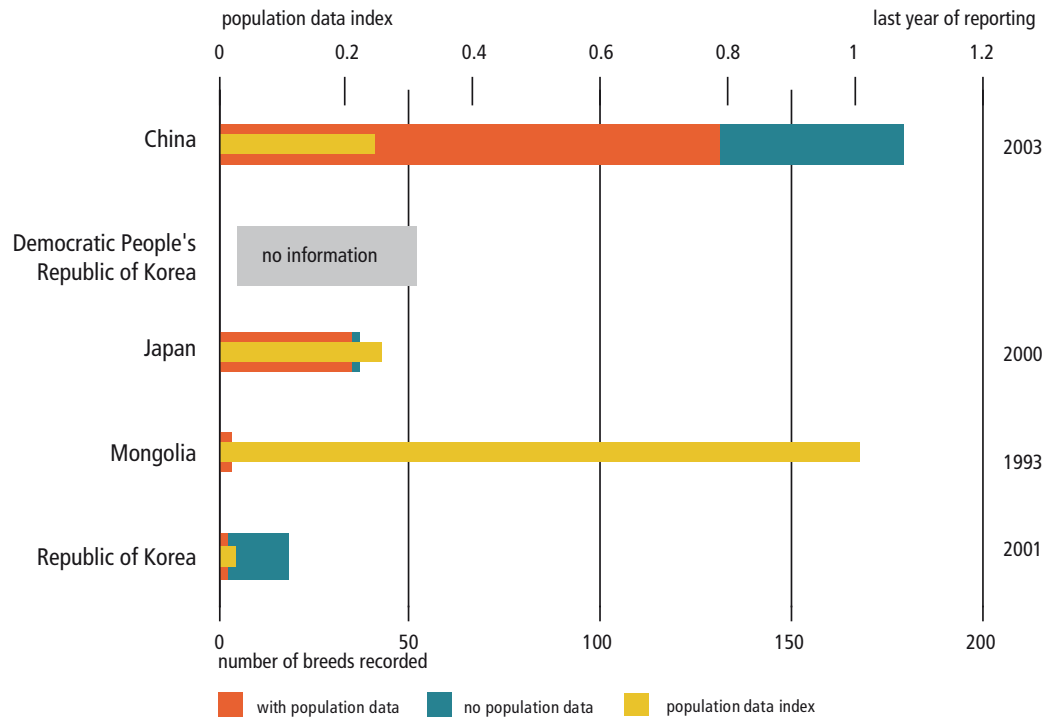
**With population data:** Those breeds with information recorded in one or more of the 16 population data fields.

**No population data:** Those breeds with no information recorded in any of the 16 population data fields.

**Population Data Index (PDI):** For each country the PDI was calculated only for those breeds recorded with population data. The PDI is the fraction of selected population data fields (population size, number of breeding females, number of breeding males and the percentage of females bred to males of the same breed) that contain information, averaged across breeds.

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**FIGURE 8**  
Population data status and index for avian breeds recorded by the countries of the East Asia subregion up to December 2005



**With population data:** Those breeds with information recorded in one or more of the 16 population data fields.

**No population data:** Those breeds with no information recorded in any of the 16 population data fields.

**Population Data Index (PDI):** For each country the PDI was calculated only for those breeds recorded with population data. The PDI is the fraction of selected population data fields (population size, number of breeding females, number of breeding males and the percentage of females bred to males of the same breed) that contain information, averaged across breeds.

### 3.2 Threats to animal genetic resources in East Asia

In East Asian production systems there is a need to improve the overall efficiency of resource use, to improve breeding systems and local breeds, to provide adequate feed for these breeds and to tackle the various endemic diseases that have a debilitating effect on animals. Future needs of the subregion will probably only be met by intensification, and this could result in a considerable reduction of the subregion's animal genetic resource diversity. Economic support is often inadequate to implement active conservation programmes in most countries. Moreover, current development pressures often fail to consider efficiency in the context of available resources and tend to be guided by developed-country definitions and views (FAO/UNEP, 2000).

The most important threats to animal genetic resources in East Asia are intensification of production systems, changes in consumer demands and market trends, rapid political and economic change and instability, and lack of appropriate livestock policies. Recently, epidemic diseases and their control measures have become a serious threat, as avian influenza outbreaks have occurred, especially in China, but also in Mongolia, Japan and the Republic of Korea.

The implementation of the reform and open policy in China has resulted, in the development of large-scale industrialized livestock production. In order to increase production performance, exotic breeds have been imported because the production performance of some native breeds could not meet market demand, and there was an inadequate awareness of the value of some native genetic resources. As a result, the population size of some native breeds has declined, and some breeds are endangered (CR China, 2003). In Mongolia, high-output breeds have been imported since 1924, for the purpose of increasing livestock production. State-owned farms initiated cross-breeding between local animals and imported genetic resources (CR Mongolia, 2004). In the Republic of Korea there were no cattle breeds that could meet the increasing demand for milk and milk products during the 1960 to 1970 period. Many Holstein dairy cattle were therefore imported and distributed to farmers (CR Republic of Korea, 2004).

Threats arising as a result of changes in consumer demands and market trends have occurred, for example, in Japan and Mongolia. In Japan, a largely fish-eating culture, the traditional roles of livestock were as draught animals or pets. The keeping of livestock for food was not a part of the traditional agricultural system. Specialized meat breeds were developed from the late nineteenth century onwards, often through cross-breeding with exotic breeds. After 1960, the traditional role of livestock as beasts of burden gradually disappeared, and growing demand for meat and milk led to increased use of high-output exotic breeds. These trends have meant that many traditional breeds can now be classified as either "critical" or "endangered" (CR Japan, 2003). Nonetheless, there is now a growing market demand for high-quality specialized products from traditional Japanese breeds. This development is greatly facilitating the ongoing utilization of these breeds. A decline in the camel population of Mongolia has been caused by the fact that their traditional role in transporting families from one place to another has been taken by trucks and tractors (CR Mongolia, 2004).

### 3.3 Unique resources highlighted

A number of distinctive species can be found in the East Asia subregion, including yaks, Zebu cattle and water buffaloes. The primary purpose of water buffalo in rice producing areas in the southern provinces of China is for draught, followed by milk and beef production (CR China, 2003). The yak is particularly found in China and Mongolia. At the present time, the total yak population is estimated to number around 14.2 million, of which 13.3 million are in China, about 0.6 million in Mongolia and the rest in other countries, notably those bordering the Himalayas (FAO, 2003d). Almost everything from the yak is used, either directly or sold to provide income. Yaks can be used for milk production (butter), meat production, hides and skins, but also for specific raw materials such as blood to produce high quality plasma and insulin; horns, hooves and internal organs are used to produce medicines (Jianlin *et al.*, 2002). The yak is also widely used for draught purposes (FAO, 2003d), and is of great cultural importance, being closely linked to cultural and ritual activities among herding societies (Chunhui and Ruiqiong, 2004).

Examples of other special genetic resources in the East Asia subregion include the Min pig of China, which is a highly prolific breed, equipped to tolerate temperature extremes of both heat and cold such as those encountered in the northeast region of China (FAO/UNEP, 2000), and horses such as the Yushu breed which are important to the tourist industry.

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## Annex

## Import and export figures for the subregion

TABLE A1

Export of livestock and livestock products in East Asia

Product	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Live animals	442 982	454 778	484 470	491 080	490 742	454 113	394 936	396 165	354 686	350 666	334 538
Meat, total	353 722	537 675	838 371	970 445	806 775	659 109	639 749	688 617	708 028	500 687	418 899
Beef and buffalo	15 194	10 729	10 554	17 645	16 629	17 692	19 682	17 037	14 200	14 973	10 840
Mutton and goat	30 267	18 374	17 901	15 972	10 967	12 971	10 497	7 195	5 468	8 206	20 626
Pig	34 453	36 174	71 392	101 814	63 327	53 499	19 860	13 175	16 326	29 149	31 930
Poultry	215 294	403 671	644 967	711 491	630 596	533 025	546 569	594 693	606 706	422 252	336 186
Other	58 514	68 727	93 557	123 523	85 256	41 922	43 141	56 517	65 328	26 107	19 317
Milk, total	17 048	16 763	16 934	19 768	19 178	17 893	18 289	20 317	19 256	20 633	18 560
Eggs, total	31 086	34 033	34 525	43 617	43 410	34 498	25 711	31 779	32 872	37 146	44 100
Fibres, hides and skins	135 262	176 756	114 087	141 414	119 689	69 850	61 197	64 953	28 928	25 768	26 925
TOTAL	980 100	1 220 005	1 488 387	1 666 324	1 479 794	1 235 463	1 139 882	1 201 831	1 143 770	934 900	843 022

Source: FAOSTAT.

Note: value in US\$1 000.

TABLE A2

Import of livestock and livestock products in East Asia

Product	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Live animals	165 484	168 644	290 791	301 361	251 549	211 093	217 756	254 255	215 791	227 156	266 211
Meat, total	4 445 271	5 010 424	2 753 131	2 770 618	2 229 400	2 017 000	2 691 915	3 107 612	2 804 520	2 652 255	3 056 727
Beef and buffalo	755 157	724 597	1 009 050	970 890	748 842	696 411	960 222	1 353 440	1 108 664	870 870	1 293 738
Mutton and goat	166 650	161 489	175 352	172 609	165 804	136 870	130 553	123 436	138 727	169 836	185 215
Pig	2 597 073	2 949 368	47 268	52 701	41 033	46 223	74 976	127 183	97 338	95 794	150 258
Poultry	843 699	1 103 515	1 448 142	1 510 414	1 223 812	1 091 933	1 481 229	1 464 435	1 424 388	1 487 691	1 399 681
Other	82 692	71 455	73 319	64 004	49 909	45 563	44 935	39 118	35 403	28 064	27 835
Milk, total	1 679	1 730	1 198	1 143	1 996	1 617	2 550	2 482	3 276	5 220	6 033
Eggs, total	4 144	7 065	5 424	7 553	5 158	3 704	3 919	4 867	4 941	5 917	5 960
Fibres, hides and skins	1 034 884	1 376 514	1 311 569	1 315 949	1 044 955	678 727	833 424	1 179 626	1 161 055	1 161 002	1 073 885
TOTAL	5 651 462	6 564 377	4 362 113	4 396 624	3 533 058	2 912 141	3 749 564	4 548 842	4 189 583	4 051 550	4 408 816

Source: FAOSTAT.

Note: value in US\$1 000.

### Classification of livestock production systems

FAO (1996)<sup>1</sup> used the agro-ecological zones (AEZ) described by the Technical Advisory Committee (TAC, 1994)<sup>2</sup> and provided a comprehensive description of global livestock production systems using quantitative statistical methods. In this system the distinction is based upon grassland-based systems (LG), mixed-rainfed systems (MR), mixed irrigated systems (MI) and landless systems (LL). The landless livestock production systems are not linked to agro-ecological zones.

- Grassland-based systems (LG) are livestock systems in which more than 90 percent of dry matter fed to animals comes from rangelands, pastures, annual forages and purchased feeds and less than 10 percent of the total value of production comes from non-livestock farming activities. Annual stocking rates are less than 10 livestock units per hectare of agricultural land. A further distinction is made between Temperate Zones and Tropical Highlands (LGT), Humid and Subhumid Tropics and Subtropics (LGH) and Arid and Semi-arid Tropics and Subtropics (LGA).
- Mixed-rainfed systems (MR) are defined as rainfed systems in which more than 10 percent of the dry matter fed to livestock comes from crop by-products and/or stubble or more than 10 percent of the value of production comes from non-livestock farming activities. A further distinction is made between Temperate Zones and Tropical Highlands (MRT), Humid and Subhumid Tropics and Subtropics (MRH) and Arid and Semi-arid Tropics and Subtropics (MRA).
- Mixed-irrigated systems (MI) are defined as irrigated systems in which more than 10 percent of the dry matter fed to livestock comes from crop by-products and/or stubble or more than 10 percent of the value of production comes from non-livestock farming activities. A further distinction is made between Temperate Zones and Tropical Highlands (MIT), Humid and Subhumid Tropics and Subtropics (MIH) and Arid and Semi-arid Tropics and Sub-tropics (MIA).
- Landless systems are defined as those where less than 10 percent of the dry matter consumed is produced on the farm where the livestock are located, and where annual average stocking rates are above 10 livestock units (1 LU = 1 cattle or buffalo or 8 sheep or goats) per hectare of agricultural land. Furthermore, landless monogastric (LLM) and landless ruminant systems (LLR) are distinguished. The former are mainly industrial, intensive and vertically-integrated pig and poultry enterprises whose economic outputs are higher than those of ruminant enterprises. In landless ruminant systems, the value of production of the ruminant enterprises is lower than that of the pig and poultry enterprises.

<sup>1</sup> FAO. 1996. *World livestock production systems. Current status, issues and trends*, by C. Seré, H. Steinfeld & J. Groenewold. FAO Animal Production and Health Paper No. 127. Rome.

<sup>2</sup> TAC. 1994. *Animal agriculture in developing countries: technology dimensions*. Development Studies Paper Series. Morrilton, Arkansas. Winrock International.





# Subregional priorities: East Asia

## 1 Inventory and characterization

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East Asian countries (China, Japan and the Republic of Korea) have developed monitoring systems with the main objective of obtaining information on which to base an early warning system for breeds potentially at risk, and for the present and future use of indigenous breeds. Breed characterization is considered to be a priority, but not necessarily the first priority. Problems range from lack of breed identification and names, to the possibility of there being many names for one breed. Japan has already prepared a manual for characterization. With regard to improvements, China has recently embarked on a national survey and, in an attempt to overcome human resource limitations, is using senior experts to assist and to guide the younger staff. Japan is attempting to secure links with the organization best suited to assist and cooperate with the keepers of local poultry breeds, and already prepares annual reports on all other breed resources. The Republic of Korea is developing standardized protocols for breed characterization, and is cooperating with Japan in molecular work.

## 2 Policies, institutions and capacity building

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In East Asia, the priority area of policy development for animal genetic resources (AnGR) is to increase public awareness, because if this awareness is high, then most other matters can be achieved.

The countries commented on the differences between public attitudes towards wild animals and those towards farm animals. The Republic of Korea mentioned legal issues related to the management of AnGR, as these had not been dealt with to date (Japan and China have already dealt with this matter). The effect of acute disease problems on AnGR was raised by Japan, and the example of avian influenza slaughter policy was mentioned. All countries have a National Focal Point and National Consultative Committee (NCC), although the Republic of Korea may not yet have notified FAO of recent changes. China reported that its NCC is functional and active in many fields, but declined to evaluate the National Focal Point (NFP) as the delegate was a member of that body. Japan considered that the two bodies were not fully functional as the present NFP had little influence on policy and, in addition, privatization of the institute will occur shortly.

In the Republic of Korea, at present there is no obvious link between research and application, although further efforts to obtain government assistance are being made. In China, there is also a lack of formal linkage. The Institute of Animal Science is under the Chinese Academy of Agricultural Sciences (CAAS) and receives much support from the Ministry of Science and Technology, but fails to provide information to the government's support system and its extension services. Japan has an effective linkage with a free flow of information to local agencies and farmers through print and the Internet.

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Regional cooperation exists, is successful and likely to expand. Funds usually come from the regular budget although the Republic of Korea/China cooperation is sponsored by the Republic of Korea. In relation to raising awareness, China attempts to influence policy-makers by every means possible. Societal awareness is being addressed and, in addition to articles in the press, a series of postage stamps and a calendar have been produced specifically covering AnGR. Japan attempts to promote AnGR with branded products and niche market products. The Republic of Korea has held a series of conferences and seminars for stakeholders and these have been widely reported in the press. Niche market development using breed pictures has great potential.

Countries agreed on the need to ensure coordinated actions at the regional level, and considered that a network would be the most appropriate form, which would also include the functions of the Regional Focal Point.