

# 4

## Differentiating Four Livestock Production Systems

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### Learning Objectives: Understanding

- The four major livestock production systems
- The characteristics of the four major livestock production systems in developing countries
- The characteristics of the four major livestock production systems in developed countries – with The Netherlands as an example

### Four Basic Livestock Production Systems

This chapter describes the four basic livestock-keeping systems (Fig. 4.1) that exist within both developing and developed countries. With a better understanding of each of these, we can learn to what extent changes can be made to improve each of them. Each of these four systems has its own specific objectives, potentials, limitations and ‘right of being’. At the same time, these livestock-keeping systems influence environment and livelihoods in different ways – and can be optimized in a sustainable way, taking into account economic, social and environmental considerations.

These systems are not divided according to rich or poor countries. Even in the wealthiest countries and regions of the world, there are farm families of limited means and whose farming operations are low-input. Likewise, even in the poorest of nations there are rich landlords with large-scale livestock operations, who can feed

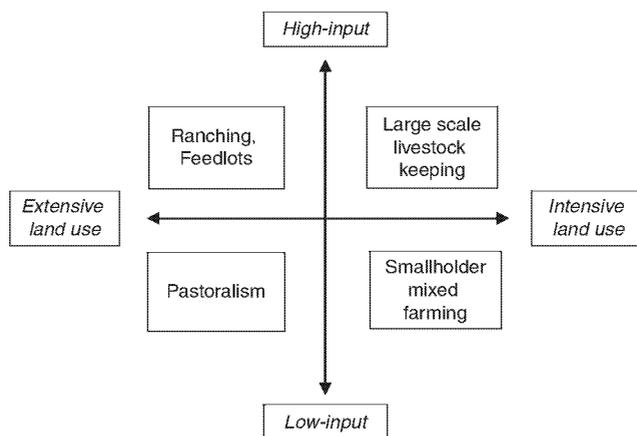
their animals better than the poor can care for their families.

There is, however, a marked difference in the relevance of each of the systems between developing and more developed countries. In most developed countries, high-input and specialized systems cover most of the farm acreage and animal numbers, and provide most of the milk, meat, eggs and other by-products for the urban markets.

In most developing countries, the low-input systems – smallholder farmers and pastoralists – cover most land, engage most people and provide most of the milk, meat and eggs required.

### Livestock-keeping Systems in Developing Countries

Though there are differences between each country and region, most livestock-dependent poor people can be found in the smallholder farming and pastoralism systems. Besides



**Fig. 4.1.** The four major livestock-keeping systems (van't Hooft *et al.*, 2008). On the horizontal axis they differ according to the intensity of land use, varying from extensive land use (left) to intensive land use (right). On the vertical axis, they differ according to the level of inputs within the system, varying from low-input (bottom) to high-input (top).

producing milk, meat and eggs, their animals also provide valuable manure, draft power, banking services and status. A combination of the different systems is often found within one household or farm, e.g. when an intensive dairy cattle farmer also keeps chickens and pigs on a low-input basis or when a smallholder farmer keeps sheep on a semi-pastoralist basis. Meanwhile, in most developing countries, the high-input specialized systems are growing in size and numbers, with large-scale animal farming especially around urban centres.

#### **Intensive land use and low-input: smallholder mixed farming**

The smallholder farming system (Fig. 4.2) with intensive labour practices often involves the whole family. Livestock are combined with low-input, rain-fed crop production and usually some non-farm income. This system requires diverse inputs and labour, and can be found in marginalized and isolated areas as well as periurban locations. Farm families use most inputs from local or natural resources. Here, indigenous knowledge, local

practices, local breeds or crossbreeds are prevalent. Animals have various roles and production purposes, with numerous outputs: milk, meat, manure, draft power, transport, urine – to name but a few. There is a major role for women and often the need for involvement of children. Output is aimed at domestic consumption, local markets and non-monetary exchange. Constraints on land use are often related to population growth.

There is a great potential for poverty alleviation and maintenance of environmental systems by optimizing the smallholder mixed farming systems. At the same time, relatively limited attention is paid to it by policy makers, research or extension education. Improvements can happen when there is effective support to social networks, culturally sensitive approaches, adapted technical support and financial mechanisms designed for low-income borrowers.

#### **Extensive land use and low-input: (agro-)pastoralism**

Pastoralists are known for extensive, low-input livestock-keeping systems, often in

ecologically marginalized dryland areas (Fig. 4.3). Local knowledge and local practices are of extreme importance with diversity of breeds, feeds and roles of animals. Markets are usually local or national. There are constraints related to changes in land-use, climate change as well as



**Fig. 4.2.** Smallholder farmer in Cambodia ploughing a field. Credit: Dorieke Goodijk.

conflicts with settled farmers. Government policies are often aimed at re-settling rather than supporting these pastoralist societies. This system has a direct role in poverty alleviation and maintenance of fragile environmental systems. It generally receives little attention from research and education.

There are various organizations that aim to improve the viability of (agro-)pastoral livelihoods even in the midst of severe challenges from changes in climate, land use and markets. Pastoralists are devising new practices that enhance their business outcome (see Chapter 11). Communication technology – such as mobile phones – is providing additional benefits through greater access to market and meteorological information. To know when the price of cattle, goats, sheep or camels is up or down, combined with weather forecast information, gives the agro-pastoralist the ability to control the time to move into or hold back from the market to sell their stock.

#### **Intensive land use and high input: large-scale animal production**

In most developing countries, the number of large-scale animal production units is increasing in response to surging demand for meat, milk, eggs and other products of animal origin (Fig. 4.4). This is also known



**Fig. 4.3.** Pastoralist market in Afar, Ethiopia. Credit: Ethiopia Pastoralist Forum.



**Fig. 4.4.** Intensive pig production in the Philippines, which is increasingly common in the developing world. Credit: Dorieke Goodijk.

as ‘the Livestock Revolution’ and is based on rapid urbanization and increased purchasing power in many societies. The livestock sector is rapidly moving towards intensive and specialized systems, in which the production environment is controlled and aimed at maximum productivity per animal. Intensification is accompanied by scaling up of production. This is combined with globalized trade of animals and livestock products, like semen, for example.

Specialized pig, poultry and dairy farms around urban areas are mostly large-scale units based on high input of finances and externally derived resources. In these units, only one animal species of a highly specialized exotic breed is raised. Mechanization reduces the labour required with a major role for men. Market targets can be national and international. The single outputs of the system – such as meat, milk, wool or eggs – have the potential to feed vast numbers of people. There is a high use of commercial chemical

products for animal health care, fertilization and crop protection. There is also a great risk of environmental damage if control of inputs and outputs gets lax. Compared with the low-input systems, this livestock-keeping system receives a lot of attention from policy makers, research, extension services and education.

#### **Extensive land use and high input: ranching and feedlots**

Ranches are generally specialized large-scale units to produce meat from cattle, sheep or goats. Ranches rear animals extensively in large pastures and depend on roughage for a significant portion of the nutrition throughout the growth periods. Feedlots are designed to finish the ranch livestock to a desired market weight and meat quality. This is done either in dry lots with grain-based rations or in more extensive, grass-fed growing operations (Fig. 4.5).

Dry lot or grass-fed meat production units normally operate with high inputs in terms of finances and outside resources. There is little diversity in livestock breeds on ranches. Animals are bred for special characteristics, such as size or age at finished weight, meat quality, good mothering ability, hot weather and insect tolerance, and other attributes that fit the locale or market channel. Livestock production is often accompanied by intense farm crop production and high levels of mechanization. As in other high-input and specialized systems, the focus is on maximizing individual animal productivity. The ranching system attracts much attention from research, extension and education, as well as from policy makers.

The ranching system for beef is responsible for a large portion of the forest destruction throughout the world. Sometimes, forests are cleared for crop production and later on cattle grazing. This can lead to serious environmental damage when not carefully managed. Markets are aimed nationally and internationally.



**Fig. 4.5.** Zebu cattle in a ranch for specialized meat production in Cuba. Credit: Dorieke Goodijk.

### Livestock-keeping Systems in Developed Countries

The four livestock-keeping systems shown in Fig. 4.1 can be identified around the world, though with different characteristics in each region. In northern Europe, the following livestock-keeping systems can be found (with an emphasis on The Netherlands).

#### Intensive land use and high input: large-scale animal production

Large-scale and conventional (non-organic) high-input farming is most frequent in The Netherlands, and provides most of the milk, meat and eggs. Agriculture in The Netherlands only 50 years ago was quite similar to agriculture in developing countries: family farms with a diversity of activities, combining low-input crop production with various species of livestock and numerous other activities. Since the 1960s, policies are aimed at highest yields through specialization, mechanization and scale enlargement. Production levels were boosted (Fig. 4.6). This also resulted in large-scale export of dairy products (Fig. 4.6).

After several years, however, the negative side-effects also became clear. The high-input farming system led not only to environmental pollution but also to animal disease, and declined farm income. The number of dairy



**Fig. 4.6.** The high-input dairy system in The Netherlands: this cow has produced over 100,000 l of milk in her life. Experiences with such high-input dairy systems have shown that intensification and scale enlargement have both positive and negative effects.

farmers was reduced by nearly 90% since 1960. The large-scale animal farming sector is also increasingly criticized for reasons of animal well-being, climate change effects, environmental pollution and excessive use of antibiotics, resulting in multi-resistant microbe strains. This has resulted in numerous new (and often farmer-based) initiatives (see also Box 2.10 in Chapter 2).

Besides conventional large-scale farming, a small but growing group of farmers in developed countries are engaged in organic forms of production and management. Some meat, milk and egg producers manage their stock and feeding systems to serve the



**Fig. 4.7.** Ranching in Denmark with specialized beef cattle.

certified and organic markets. Other types of certifications abound in relation to feeding and management, such as all grass-fed, all natural, humane certifications, free-range, quality assurance, cage-free and specific breed certifications. This is growing in popularity amongst consumers (see also Case Study 6, Chapter 12).

#### **Extensive land use and high input: ranching and feedlots**

Meat production is another specialized and high-input sector. Whereas the production of broilers, pigs and calves should be categorized under the large-scale and high-input system, specialized beef production can be

classified under more extensive and high input. More extensive beef production (Fig. 4.7) with grazing during the earlier growing phase is followed by a more confined finishing phase.

Improved breed beef cattle are fast growing and produce large quantities of meat per animal. Beef industries have a variety of improved genetics for different climates and conditions that produce good-quality meat that is flavourful and tender. A finishing period on grass or in a confined feedlot with higher grain rations are options for producers.

#### **Intensive land use and low-input: hobby farming**

Although in The Netherlands the intensive systems produce most of the food, an increasing number of animals are kept by citizens within an intensive but relatively low-input system: hobby farms. A wide variety of species and breeds is used by individual families or small farms, such as children's farms. These farms are usually located in urban areas and have an educational purpose.

Many families also keep animals for hobby purposes in urban, peri-urban and rural settings. Production is not the main objective; it is more for company, recreation and status. There is also a growing number of citizens organized in breeding associations that aim to maintain special traditional breeds, such as the goat breed in Fig. 4.8.



**Fig. 4.8.** In Europe, traditional breeds are often maintained by hobby farmers.



**Fig. 4.9.** Local cattle breeds are kept in low-input systems for the purpose of maintaining natural areas.

### **Extensive land use and low-input: nature management**

Extensive and low-input livestock keeping is a growing phenomenon within The Netherlands, with the special purpose of nature management. Over the past few decades, the traditional sheep and goat pastoralists have vanished, but more recently, a modern form of pastoralism is being developed. Sheep and cattle are

used in natural areas to keep the vegetation low, and to re-create a natural appearance. The animals are supposed to survive by themselves or receive limited extra feeding during the winter. In the process, the profession of sheep herding is being revalued: he (or she!) is being paid for nature management. Modern-style sheep-herding also attracts urban people with burnout or other modern lifestyle-related problems (Fig. 4.9).

### **Reference**

Hooft, K. van't, Millar D., Geerlings, E. and Django S. (2008) *Endogenous Livestock Development in Cameroon – Exploring the Potential of Local Initiatives for Livestock Development*. Agromisa Foundation, Wageningen, The Netherlands.