

LIVESTOCK PRODUCTION SYSTEM-ANIMAL HOLDING AND LAND HOLDING PATTERNS IN DIFFERENT AGRO CLIMATIC ZONE

Domestic animal

An animal that is not wild and is kept as a **pet** or **to produce food**. About 10 000 years ago, sheep were the first food animals to be domesticated.

A tame animal is an animal that is relatively tolerant of human presence. **Tameness** is the quality of an animal being welcoming towards the presence of humans, either naturally or due to human intervention (as the result of animal training).

Livestock

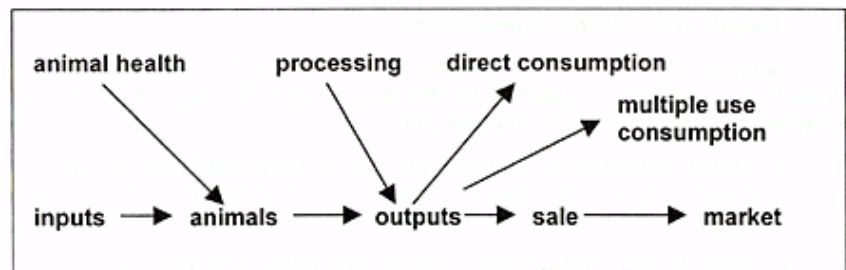
Animals and birds that are kept on a farm, such as cows, sheep, or chickens for economic benefit. Products like milk, meat & eggs (food), wool & hair (fibre), power for agricultural work & transportation (traction), manure & fuel (wastes), biological control of weeds & bushes (weed control), bone meal & blood meal (by-products) have been derived from domestic animals. Besides that they act as companion & pet animals, used as animals required for security, hunting and cultural purposes as well.

Livestock production systems (LPS)

Livestock can be considered as a production system, which divides the system into the following: **inputs**; animal health; animals which are the unit of production; **outputs** which are the products; and the **market** which purchases the products and sets the price to the producer. Each of these categories is examined in the following sections.

Animal health

Animal health inputs into the livestock production system are examined separately as disease prevention methods are put in place to limit the effects of disease which is a negative input on production. The value of animal health measures is therefore in the form of the preventive measures, specifically to avoid production loss.



The animals

The genetic composition of animals in the production system determines the response of the system to the different inputs. Often, local livestock breeds do not produce at a high level as they have been selected for survival under difficult conditions, including under-nutrition and exposure to various diseases. In contrast, highly productive breeds are more susceptible to disease, thereby increasing the need for animal health measures. These animals often require a high level of nutrition to gain the production benefits.

Outputs from livestock production

Outputs from livestock production vary by species.

- *Direct consumption outputs* are those consumed directly by the farmer's family and can only be consumed once such as milk and eggs.
- *Multiple use consumption outputs* are those that can be used as inputs for the production of additional outputs and are therefore made use of several times. For example, manure can

be used to generate biogas, and the residue used as fertilizer which effectively doubles the value of the manure.

- *Sale goods* are those sold by the farmer to generate income. The categories are not mutually exclusive. Wastes are goods that are not used and produce pollution. These are regarded as *negative outputs*.

Livestock statistics generally quantify the products that are eaten and traded such as meat, milk and eggs and do not consider products such as draught and manure.

Processing

In some cases suitable processing is essential for an output to be used. An example is the tanning of leather. The processing of outputs results in an increase in their value, for example, the production of cheese from milk. Processing can also increase the shelf life of the product.

The market

The market is included as part of the livestock production system. Without an available market paying a fair price it is not feasible to consider the expansion of production by increasing inputs in the other parts of the system.

LIVESTOCK PRODUCTION IN DEVELOPING COUNTRIES

Livestock production systems in developing countries are determined by factors such as ecological zones, livestock species, desired products, functions, management, markets and government policy. The classification of livestock production systems can be done based on the relative importance of livestock in the system (animal based, mixed crop-animal, crop based), intensity of resource requirement (intensive versus extensive), scale of operation (large versus small), utilisation of outputs (subsistence versus commercial), level of development (traditional versus modern) and source of feed (uncultivated lands versus cultivated lands). Broadly, the systems can also be classified into **migratory** and **sedentary** systems. The sustainability of many crop and livestock production systems in many countries is threatened by population growth and changes in consumption patterns. Increased cropping, changes in cropping pattern and intensity, and overgrazing of rangelands lead to soil degradation, which endangers food production. Especially the livestock sector is often blamed for this.

Livestock plays an essential role in the agrarian economy of developing countries. More than half of the rural population depends at least in part on livestock for their livelihood, and 12% of the world's population is entirely dependent on livestock production. The largest share of the world's livestock population is found in the developing countries: 61% cattle, 43% sheep, 79% goats and 57% pigs. Latin America and the Far East account for 35% and 42%, respectively, of the bovine population in the developing countries; the greatest population of poultry (33%) is also found in these regions. Most sheep and goats in the developing countries are found in Africa.

Broadly livestock production systems can be classified as **grazing, mixed, and industrial**. **Grazing systems** are characterized by the direct consumption of native or permanent pastures (grasslands), and they depend directly on ecosystem services. For grassland utilization, there is a continuum from total nomadism through to stationary animal husbandry via transhumance:

1. Total nomadism: no permanent place of residence, no regular cultivation.

2. Semi-nomadism: a permanent place of residence exists, supplementary cultivation is practised, but for long periods of time animal owners travel to distant grazing areas.

3. Transhumance: a permanent place of residence exists, their herds are sent to distant grazing areas, usually on seasonal cycles.

4 Partial nomadism: characterized by farmers who live continuously in permanent settlements and have herds at their disposal that graze in the vicinity.

5. Stationary animal husbandry: animals remain on the holding or in the village throughout the year.

Mixed systems integrate cropland and grasslands, where crop products are inputs for livestock, and livestock waste is used as input for crops. Pasture crop rotations have unique positive effects on soil fertility. One of the main problems in mixed systems is nutrient balance, to maintain good plant and animal nutrition while preventing environmental pollution. As in grazing systems, mixed livestock systems require matching of feed requirements and supply over time, which is achieved by making hay or silage.

Industrial livestock systems produce **less than 10 %** of the feed they use, and are currently responsible for more than 40 % of global meat production. More than 50% of the world's pork production currently originates from industrial systems, and over 70% of poultry meat. They are the fastest growing form of animal production. Industrial systems are managed based on animal nutrition and health principles. *One of the major problems of industrial systems is manure management.* Livestock systems have caused negative environmental impacts such as erosion, deforestation, water and air pollution(methane & ammonia), but these impacts are small relative to other food production systems and other human activities.

DIFFERENT TYPES OF LIVESTOCK PRODUCTION SYSTEM

Solely livestock production systems

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.

Landless livestock production systems

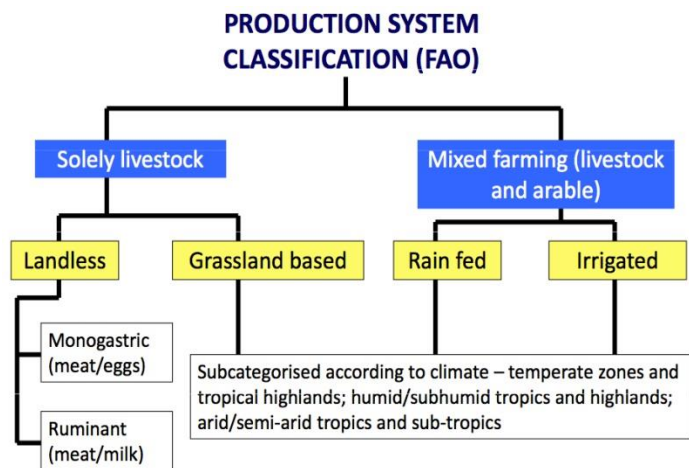
Subset of the solely livestock production systems in which **less than 10 percent** of the dry matter fed to animals is farm-produced and in which annual average stocking rates are above **ten livestock units (LU)** per hectare of agricultural land.

Grassland-based systems

Subset of solely livestock production systems in which **more than 10 percent** of the dry matter fed to animals is farm-produced *and* in which annual average stocking rates are **less than ten LU(livestock unit) per hectare** of agricultural land.

Mixed-farming systems

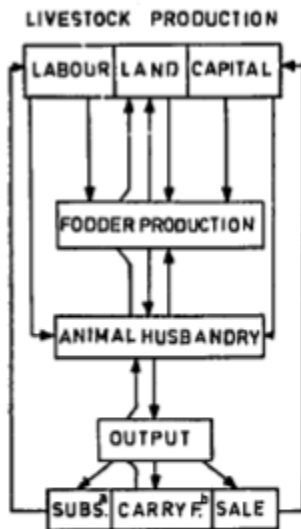
Livestock systems in which **more than 10 percent** of the dry matter fed to animals comes from crop by-products or stubble and **more than 10 percent** of the total value of production comes from non-livestock farming activities.



Rain-fed mixed-farming systems

A subset of the mixed systems in which **more than 90 percent** of the value of non-livestock farm production comes from rain-fed land use.

Irrigated mixed-farming systems A subset of the mixed systems in which **more than 10 percent** of the value of **non-livestock farm production** comes from irrigated land use.



a. Subsistence
b. Carry forward

Strategies to improve small mixed-farming systems

The development strategy for the (resource-poor) subsistence farmer should emphasise the improvement of farm management, and in the long run the incorporation of these groups into the market system. Livestock development plans must take into account the diversity of livestock species and therefore appropriate packages for cattle, buffaloes, sheep, goat, rabbits, poultry, etc. must be developed. These packages include aspects of feeding, health and hygiene, housing and breeding and should be relatively small scale. The income of these subsistent farmers is too low to justify large investments. The challenge of intensification of livestock production of smallholder mixed farms is to improve the efficiency of the production system, by reducing the losses from the system, by improving soil management (i.e. improvement of soil structure and fertility) and by making better

use and management of locally available resources , through low-cost technological improvements and a low/moderate level of external inputs.

The strategy involves a change in cropping pattern through the selection of crops which will maximise biomass production and nitrogen fixation with minimum imported inputs (ley farming, alley cropping, integrated plant nutrient system) supported by remunerative prices. Matching the feed availability with the requirements of the livestock population is important for both the subsistent and the commercial small farmer. This can be achieved through a better use of feeds, (chemical) treatment or supplementation of crop residues, and by making more effort to benefit from agroindustrial by-products, forage production and feed conservation. Strategies for sustainable agricultural and livestock development are needed to meet the increasing demand for food and employment, and to reduce the degradation of the environment **The LPS are considered a subset of farming systems :**

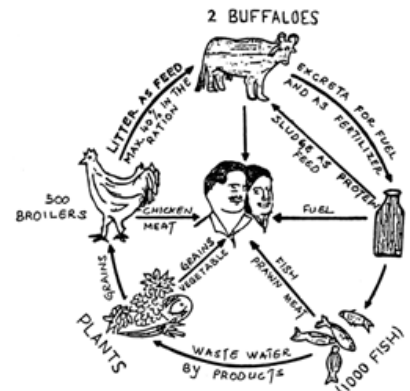
Farming system : according to value of products or income

- 1. Specialized Farming
- 2. Diversified farming
- 3. Mixed farming

1. Specialized farming : specialised farming refers to only one kind of farm business such as raising food crops or rearing sheep or raising dairy cattle

2. Diversified farming :A diversified farming is one that has several production enterprises or sources of income but no source of income equal as much as 50% of the total income.

Diversified Vs Integrated farming system



INTEGRATED FARMING

Diversified farming consists of components as crops and livestock that **coexist independently** from each other. In this case, integrating crops and livestock serves primarily to minimize risk and not to recycle resources.



In an integrated system crops and livestock interact to create synergy, with recycling allowing the maximum use of available resources.



3. Mixed farming : At least 10% of its gross income must be contributed by livestock activity.

| Enterprise | Contribution to gross income | Farming type |
|--------------------------------|-------------------------------------|---------------------|
| Cow & buffalo | 10-49% | Mixed farming |
| Cow, buffalo, fishery, poultry | 10-49% | Diversified |

Along with crop farming one or more component of livestock or poultry maintained. Mixed farming is the economical rearing of different types of livestock & poultry in the farm along with

- Better utilization of farm by products.
 - Utilization of unconventional feed and fodder
 - Recycling : Farm Yard Manure – Dung – Gas – Slurry – Soil fertility
 - Bring constant income to the family throughout the year
 - Indirectly enhances standard of living.
- Integrated farming system – (IFS) IFS defined as integration of more than one different types of agriculture and allied enterprises based on the sound principles of scientific agriculture for optimum utilization and management of available resources, recycling of waste/bi-products, engagement of family labours, decrease the cost of cultivation and increase in input use efficiency to maximum

production, productivity, income generation and provide gainful employment from unit land area over stipulated time period, balanced diet to farmers' family, sustainability,

| Sl.No. | Category | Operated Area |
|---------------|-----------------------------|---------------------------------|
| 1 | Marginal holdings | Below 1.00 hectare |
| 2 | Small holdings | 1.00 – 2.00 hectares |
| 3 | Semi-Medium holdings | 2.00 – 4.00 hectares |
| 4 | Medium holdings | 4.00 – 10.00 hectares |
| 5 | Large holdings | 10.00 hectares and above |

pollution free environment .In the integrated farming system the defects of mixed farming is overcome by proper planning, monitoring and execution of work according to size of the farm, farm resources, agro climatic condition etc. In this type, the type of livestock species or poultry enterprises are selected based on the availability of feed, fodder, water resources of the farm I.

Dairy + Crop+ Poultry II. Crop+ Dairy+ Poultry + Fish III. Crop + Dairy+ Poultry+ Fish+ Duck IV. Crop + Dairy + Poultry + Fish + Duck + Sheep/Goat

1 ha = 2.47 acre

1 acre = 4048.06 sq mt

1 Bigha =0.1338 hectare or 0.3306 acre

Land and livestock holding

- Distribution of livestock is more equitable than that of land.
- Marginal farm households (≤ 1.0 hectare of land) who comprised 48% of the rural households
- But they control
 - More than **50%** of country's cattle and buffalo
 - 2/3rd** of small animals
 - 2/3rd** of poultry and
 - 24%** of land.
- Nearly 70% of the rural household keeps one or other form of livestock

Rearing systems of livestock

Extensive system (migratory, free range, pasture or range grazing) : This is a system whereby animals spend all, or a substantial part, of each day outdoors and obtain most of their nutrients from pasture. The housing (night shelter) should also provide security from predators. Extensive systems are most appropriate where large areas of pasture land can provide grazing and browse for

goats with a minimum of labour or capital investment. Extensive farming is usually large in comparison with the numbers working and money spent on it. i. Oldest method ii. Requires extensive land iii. Availability of fodder varies with season so variation in intake. iv. Cost of feeding is nil or negligible. v. Currently not followed except in place where there is grazing land. Reason : a) Reduction in grazing land b) Tremendous pressure on cultivable land High yielding animal : This system is not suitable due to i) Temperature ii) Loss of energy iii) Average fodder availability Advantages: 1. Less labour per unit areas is required to farm large areas. 2. Mechanization can be used more effectively over large, flat areas. 3. Animal welfare is generally improved because animals are not kept in stifling conditions. 4. Lower requirements of inputs. 5. Local environment and soil are not damaged by overuse of chemicals. Disadvantages 1. Yields tend to be much lower than with intensive farming in the short term. 2. Large land requirements limit.

Intensive (grazing on improved pastures, zero grazing, conserved forage, crop residues and increased use of concentrates: The intensive system is where animals are enclosed in zero-grazing units and provided with feed and water . This method is mainly practised in urban or densely populated areas where grazing land is limited. Forage for the livestock can either be grown on farm or purchased. Animals reared under this system do not waste energy walking in search

of pasture, there is no risk of diseases associated with communal grazing and the system accumulates enough manure for fertilizing crops and biogas production. However, the system is labour intensive and requires high initial costs. In intensive system all the operations are confined in one place and animal movement is restricted. Poultry, pig, rabbit are more suitable for this system. In developed countries dairy also maintained by intensive system. Intensive production systems involve either grazing on crops or cultivated pastures at a very high stocking density or zero-grazing. The control of goats by fencing is both difficult and expensive. Fences need to be at least 1.5m high and made of strong wire netting, closely placed taut wires or wooden rails.

Semi-intensive (pasture or range grazing, use of supplementary feeding mainly on crop residues and conserved roughage) :

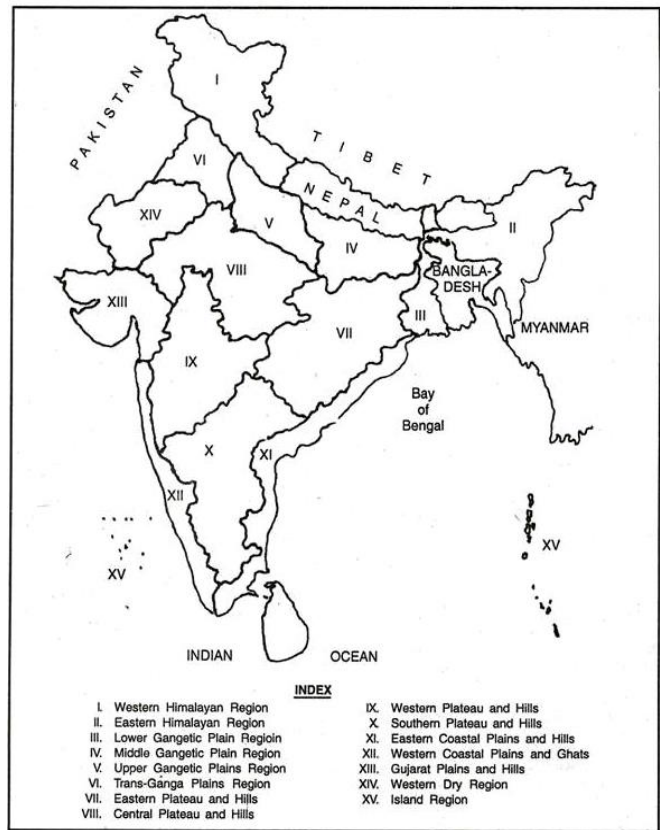
In the semi-intensive system, livestock graze for some time during the day and in the evening they feed on supplements like green grass and concentrate and are provided with an improved shelter.

Tethering (small size flocks of 2-10 animals). This is a subsistence family system and the animals live on kitchen remnants crop residues, grazing near inhabited areas and other supplementary feed. In this system the animals are confined during part of a day under roof and allowed to graze during day time. During confinement, concentrate feeding is done. This system of rearing is more suitable for dairy, goat and some extent sheep. Tethering of goats. Goats are usually tethered singly. Where tethering is used, care must be taken that there is no possibility of strangulation by entanglement with vegetation, etc., or with other goats. It is essential to change the place of tethering every day for obtaining fresh herbage and a variety of different feed plants by the animal.

What is Agro climatic zone ?

An “Agro-climatic zone” is a land unit in terms of major climates, suitable for a certain range of crops and cultivars. The planning aims at scientific management of regional resources to meet the food, fiber, fodder and fuel wood without adversely affecting the status of natural resources and environment. Agro-climatic conditions mainly refer to soil types, rainfall, temperature and water availability which influence the type of vegetations. An **agro-ecological zone** as for example Sundarban is the land unit carved out of agro-climatic zone superimposed on landform which acts as modifier to climate and length of growing period.

There are **15** Agro-Climatic Zones in India Categorised by the **Planning Commission**:



Map showing Agro-Climatic Regions.

Small ruminants play an important role in the rural economy. They are principally maintained by poorer section of the rural community providing them a source of livelihood. The pig farming is an important activity in the north-eastern region especially in the tribal communities. Pork is an important item in the daily food of these people. The local production is not able to meet the demand, which is met through import of pigs from other parts of the country. No serious attempt has been made to take up pig production on a viable basis by developing financially viable production units in the northeastern region. Similarly, no serious attempt has been made to develop Yak and Mithun, which are otherwise important in their home state.

In the Arid and Semi-arid regions of the country, livestock sector is of special importance and main source of family income. In the arid areas, the contribution of livestock to Agriculture GDP is as high as 70 per cent while in Semi-arid areas the contribution is over 40 per cent.

India is rich in agro-ecological diversity, and concurrently one finds a range of unique livestock production systems that have evolved in each region in tune with the naturally available resources

and needs of the people. This diversity begins with the choice of species reared, breeds that have evolved, management and feeding practices, healthcare systems that are closely linked to the natural flora and fauna, and local marketing systems. Mixed crop-livestock farming and pastoralism are the two common production systems found across rain fed agriculture zones. In the former, farmers derive their livelihood somewhat equally from agriculture and livestock; in the latter, people's livelihoods depend primarily upon their livestock, which are exclusively maintained on grazing. Dryland regions also traditionally harbour the 'grasslands' of India, providing pasture/grass for some parts of the year. In these harsh climates with minimal precipitation, sustained agriculture through the year is extremely difficult and it is livestock, which has historically played an important role in people's livelihoods.

The livestock rearing in India is highly segmented. A vast majority of livestock producers come from under-privileged section of rural community and need a Livestock development and research paradigm to achieve sustainable livestock development. This section represents a sizeable population of rural families and contributes substantial livestock produce. Livestock are important in their livelihood culture and they have limited alternative opportunities for employment. Studies have shown that development of small holders' mixed crop - livestock production is one of the most effective methods of poverty alleviation. The under-privileged livestock producers face a number of constraints. Their access to modern livestock services, especially veterinary services are poor. Their access to the marketing support is also poor. The prices received by them for products are low. For example, majority of milk producers get only 50 percent of the price paid by consumer. Credit support for purchase of animals and its maintenance is not easily available to the small holders. Goat, pigs and backyard poultry are most commonly kept by the underprivileged and these get very little development/research support. Improved animals that would 'niche well' with the systems of the underprivileged and adverse agro-ecological conditions in which majority of them live, particularly the ecologically fragile regions, are not available. There are hardly any programmes to assess their needs and produce or make available such animals. Feed, fodder availability is a major constraint and conventional approach to improve the situation does not work with the underprivileged.

In contrast, the resource-rich section of the rural population also utilizes livestock development for optimizing their wealth. This section has the means and ability to obtain the desired variety of livestock and the inputs and services needed to harness them. From the point of view of the national economy as well as exports, output of this resource-rich segment of the population is also important.

The peri-urban production system has developed around cities and towns that have high demand for milk. The peri-urban dairy farmers rely mainly on purchased feed. They are commercially oriented and respond to improved technical input supply and marketing services. Buffalo has been a favored milch animal in the system but these farmers have also improved productivity of their cattle by taking to cross breeding. Milk is often traded directly to the consumers in the city and is the major source of income for the farmers.

Presently, only a very small fraction of the livestock sector exists as industrialized system. Examples include commercial poultry farms, dairy farms and a few commercial goat and pig

farms. While industrial systems permit reduction of costs of production due to economies of scale, their social, environmental and public health costs may prove extremely expensive in the long run. Industrial systems require conversion of good agricultural land that can feed humans to fodder plots to feed animals. They accelerate the conversion of natural forests and grasslands to pasture. They concentrate large numbers of animals in a small area, leading to accumulation of animal waste, which in turn contaminates air, soil and water, while increasing the risk of communicable diseases. Since current trends indicate that increasing share of the supply will be met by industrialised production given economies of scale, increasing labour and capital.

Improvement in livestock production is an important pathway for increasing the income of marginal and small farmers and landless labourers, given the uncertainties of crop production. Market opportunities due to the anticipated rise in demand for livestock products, will provide an avenue for resource-poor farmers to increase production, improve their livelihoods, reduce malnutrition and thereby, contribute to the goal of overall poverty alleviation. However there is need to provide an enabling environment in which small marginal farmers sustain.

The extent to which growth in livestock production can be accelerated would depend on how technology, institutions and policies address constraints facing the livestock sector. In the past, growth in livestock production was largely number-driven. This may not sustain in the long run and may stress the resources. The future growth should come from improvements in productivity. This will require overcoming feed and fodder scarcity and improvements in delivery of animal health and breeding services. Technology will be a key driver of growth and concerted efforts will be needed to generate and disseminate yield-enhancing and yield-saving technologies.

Specimen questions

1. What livestock production system ? Discuss in brief solely livestock production system with special reference to its subsets.
2. How many agroclimatic zones are there in India as per Planning Commission of India ?
3. What is the land holding of small farmers in India ?
4. Write short notes on : 1. Transhumance 2. Industrial livestock farming