FACULTY OF AGRICULTURE SCIENCES AND ALLIED INDUSTRIES

ALLIED ENTERPRISES AND THEIR MANAGEMENT

A large number of allied enterprises like cattle, buffalo, goat, sheep and poultry rearing are taken up along with the major component of crop production for increasing the farm productivity.

1. Crop production

Crop production is an integral part of farm activities in the country. The cropping system should provide enough food for the family, fodder to the cattle and generate sufficient cash for domestic and cultivation expenses. These objectives could be achieved by adopting intensive cropping.

Detailed to this is discussed earlier in cropping systems.

2. Dairy farming

Dairy farming is an important source of income to farmers. Besides producing milk and/or draft power, the dairy animals are also good source of farm yard manure, which is good source of organic matter for improving soil fertility. The farm byproducts in turn are gainfully utilized for feeding the animals.

(a) Cattle Rearing: Cattle‘s rearing in India is carried out under a variety of adverse climatic and environmental conditions. The cattle are broadly classified into three groups.

- **Draft breeds:** The bullocks of these breeds are good draft animals, but the cows are poor milkers, e.g. Khillari, Nagore, Hallikar,, Mali.
- **Dairy breeds:** The cows are high milk yielders, but the bullocks are of poor draft quality, e.g., Sahiwal, Red Sindhi, Gir.
- **Dual purpose:** The cows are fairly good milkers and the bullocks are with good draft work capacity, e.g., Tharparkar, Hariana, Ongole, Kankrej and Deoni.

(b) Exotic breeds: The exotic breeds are high milk yielder e.g., Jersey, Holstein-Friesian, Aryshire, Brown Swiss and Guernsey.

3. Goat and sheep rearing

(I) Goat rearing:

- In India, Goat is mainly reared for meat, milk, hair and skin.
- Goat meat is the preferred meat in the country.
- A goat on hoof (live goat) fetches a better price than a sheep on hoof.

Goat Breeds

- Milk & Meat – Jamnapari, Osmanabadi, Barbari , Beetal
- Meat and skin – Black Bengal, Kanni adu
- Meat, skin and milk – Barvari, Malabari (Tellicherry), Sirohi, Surti
- Meat, hair and skin – Gaddi, Kutchi, Marwari

- **Jamnapari** : is the most popular breed for commercial goat farming in India. It is mostly found in Uttar Pradesh. This goat is reared mainly for milk.
- **Boer Goat:** breed was developed in South Africa and it is the most popular breed in the world for meat.
- **Surti :** Surti Goat is one of the best breed in India for dairy. This breed is very small and is native of Surat in Gujarat. They are most economical to the rear. Surti female goats are bigger than male goats.

(II) Sheep rearing:

- Sheep are well adapted to many areas.
- They are excellent gleaners and make use of much of the waste feed.
- They consume large quantities of roughage, converting a relatively cheap food into a good cash product.
- Housing need not be elaborate or expensive.
- However, to protect the flock from predatory animals, the height of the fencing should be raised to two meters.

Breeds of Indian Sheep:

- Karanah, Bhakarwal, Bikaneri, Marwari, Kutchi, Kathiawari, Deccani, Nellore, Bellary etc.

4. Piggery

Pigs are maintained for the production of pork.

Breeds:

Imported breeds of Large White Yorkshire and Landrace are being used widely.

Yorkshire is the most extensively used exotic breed in India. It is a prolific breed having good carcass quality, growth rate and feed conversion ability.

5. Poultry

Poultry is one of the fastest growing food industries in the world. Poultry meat accounts for

about 27% of the total meat consumed worldwide and its consumption is growing at an average of 5% annually. Poultry industry in India is relatively a new agricultural industry.

Breeds:

Specific poultry stocks for egg and broiler production are available. A majority of the stocks used for egg production are crosses involving the strains or inbred lines of white Leghorn. To a limited extent, other breeds like Rhode Island Red, California Grey and Australop are used.

Cage system:

The cage system of rearing birds has been considered as a super intensive system providing floor area of 450-525 sq.cm. (0.6-0.75 sq.feet) per bird.

Advantages

1. Greater number of birds is reared per unit of area
2. Facilitates correct maintenance of records
3. Helps in identifying poor producers and prompt culling
4. Control of vices of poultry cannibalism and egg eating
5. It helps in production of clean eggs
6. Removal of stress factors
7. Easy control of parasitic disease like coccidiosis and worm infestation
8. Prompt steps to control feed wastage.
9. The cage method of housing is ideal for the area of moderated climate conditions where the day temperature in summer does not high and temperature does not fall too low.
10. Egg production of caged layer was reported to be more than those kept in deep litter system.
11. Feed efficiency and egg weight were better in caged birds than the laying flock under deep litter system

Disadvantages

1. Difficulties in ensuring proper ventilation to birds especially in summer season and under very high densed conditions.
2. Incidence of leg problem, cage layer fatigue, fatty liver syndrome, flies and obnoxious gases in the house will be on increases
3. Hysteriosis of chicks

Deep litter system: Deep litter system is commonly used in all over the world.

Advantages:

1. It is an economical
2. Hygienic, comfortable and safe to birds
3. Built up litter supplies vitamin B12 and Riboflavin to the birds
4. Controls diseases and vices
5. It increases the efficiency of production
6. Materials such as paddy husks saw dust, dried leaf, chopped straw and groundnut kernels depending upon the availability can be used as litter materials

Disadvantages

1. The deep litter system should always keep dry.
2. Only right numbers of birds should be housed
3. The house should be well ventilated
4. The litter should be stirred at least once in a week-wet litter if any should be replaced immediately with new dry litter and birds must be fed a balanced ratio.
5. The time starting deep litter system should be in the dry period of the year as it allows sufficient time (At least two months) for bacterial action.
6. Placing of water should be given due attention to keep litter dry.

6. Duck rearing

Ducks account for about 7% of the poultry population in India.

Breeds:

The important Indian breeds are Sylhet Mete and Nageswari, which are mostly found in the Eastern region of the country. Their annual production of 150 eggs/bird/year. Khaki Campbell and Indian Runner are the most popular breeds for egg laying.

Housing:

Ducks prefer to stay outside day and night even during winter or rains. In mild climate, it is possible to raise ducks without artificial shelter.

7. Apiculture

Apiculture is the science and culture of honeybees and their management. Apiculture is a subsidiary occupation and it is a additional source of income for farm families. It requires low investments and so can be taken up by small, marginal and landless farmers and educated

unemployed youth. Honey is a sweet viscous fluid produced by honeybees mainly from the nectar of the flowers. Honey should have good quality to meet the national and international standards. Qualities such as aroma, colour, consistency and floral sources are important.

Species:

There are two bee species, which are most commonly grown in India. They are *Apis cerana indica* and *A. mellifera*, are complementary to each other but have different adaptations. A. *cerana* is known as Indian bees, while *A. mellifera* is known as European/western bee.

8. Fishery

Ponds serve various useful purposes, viz., domestic requirement of water, supplementary irrigation source to adjoining crop fields and pissiculture.

Species of fish:

Catla, Rohu, Calbasu Mrigal, Common carp, Silver carp, Grass carp

Management:

For higher productivity fish are to be provided with supplementary feeding with rice bran and oilseed cakes.

9. Sericulture

Sericulture is defined as a practice of combining mulberry cultivation, silkworm rearing and silk reeling. Sericulture is a recognized practice in India. India occupies second position among silk producing countries in the world, next to China.

Moriculture: Cultivation of mulberry plants is called as 'Moriculture'. There are about 20 species of mulberry, of which four are commonly cultivated. They are *Morus alba, M. indica, M. serrata* and *M. latifolia*.

Silk worm rearing: There are four types of silk worm viz.

(i) Mulberry silk worm – *Bombyx mori* (ii) Eri silk worm – *Philosamia ricini*

(iii) Tassar silk worm – *Antheraea mylitta* (iv) Muga silk worm

10. Mushroom cultivation

Mushroom is an edible fungus with great diversity in shape, size and colour. Essentially mushroom is a vegetable that is cultivated in protected farms in a highly sanitized atmosphere. Just like other vegetables, mushroom contains 90% moisture with high in quality protein.

Species*:* There are three types of mushrooms popularly cultivated in India.

(i) Oyster mushroom – *Pleurotus sp*.

(ii) Paddy straw mushroom – *Volvariella volvacea*

(iii) White bottom mushroom – *Agaricus bisporus*

Method of production

(i) Oyster mushroom: Take fresh paddy straw and cut into small pieces of 3-5 cm length. Soak them in water for 4-6 hours and then boil for half an hour. Drain the water and dry the straw in shade till it is neither too dry nor wet. Take polythene bags of 60 × 30 cm size and make two holes of one cm diameter in the center of the bag such that they face opposite sides. Tie the bottom of the bag with a thread to make a flat bottom. Fill the bag with paddy straw to 10 cm height. Then inoculate with the spawn. Likewise prepare 4-5 layers of straw and spawn alternatively. The last layer ends up in straw of 10 cm height. Keep this in a spawn running room maintained at a temperature of about 22-28 ^{0}C and with RH 85-90%. After 15-20 days when the spawn running is completed, cut open the polythene bag and take it to cropping room and allow it to grow for 7 days and harvest the mushroom. Mushroom yield is around 0.5-1.0 kg/bag.

(ii) Paddy straw mushroom: Cut the straw into long pieces of 60-90 cm and soak in water for 12 hours and sterilize 15 minutes. Arrange the straw in bundles. Lay the moistened straw bundles on the slightly raised concrete floor or on wooden platform in layers of four bundles width. Spawn or seed the beds simultaneously in each layer either by broadcasting or placing the grain spawn at different spots. Sprinkle grain dhal over each layer on the spawn. Don't spawn below the topmost layer. Maintain it at 30-35 ^{0}C. Harvesting is ready after 25-30 days. Yield is around 1-1.5 kg/bed.

(iii) Button mushroom: It requires a complex method of preparing compost, which is used as a substrate for mushroom production. Spawning is done by three methods, *viz.*, surface spawning, layer spawning and trough spawning. Fill the trays with compost and do spawning. After spawning, compost is pressed hard to make it compact. The trays are arranged in the cropping room in tiers and cover with newspaper sheet sprayed with 2% formalin. The temperature of 20-25 ^{0}C and RH of 90-95% should be maintained. After spawn running is completed in 15-20 days and do casing. Pin heads appear within 10-15 days after casing. Cropping continues for 60-75 days. Mushrooms can be harvested at button stage. Yield ranges from 6-7 kg/m^2.

11. Agroforestry

Agroforestry is a collective name for land use systems and technologies, in which woody perennials (trees, shrubs, palms, bamboos etc) are deliberately combined on the same land-management unit as agricultural crops and/or animals, either in some form of spatial arrangement or in a temporal sequence.

In agroforestry systems, there are ecological and economical interactions among different components. That implies that: (i) agroforestry normally involves two or more species of plants (or plants and animals) at least one of which is woody perennials; (ii) an agroforestry system always has two or more outputs; (iii) the cycle of an agroforestry system is always more than one year; and (iv) even the simplest agroforestry system is structurally, functionally, and socioeconomically more complex than a monocropping system. Agroforestry is important for meeting fodder, fuel wood and small timber of farmers, conserving soil and water, maintenance of soil fertility, controlling salinity and water logging, positive environment impact and alternate land use for marginal and degraded lands. Selection of proper land use systems conserve biophysical resources of non-arable land besides providing day-to-day needs of farmer and livestock within the farming system.

Different commonly followed agro-forestry systems in India are:

(1) Agri-silviculture (crops + trees), which is popularly known as farm forestry

(2) Agri-horti-silviculture (crops + fruit trees + MPTS + pasture);
(3) Silvi-pasture (Trees + pasture + animals);
(4) Horti-silvi-pasture (fruit trees + MPTs+ Pasture);
(5) Agri-silvi-pasture (crops + trees + Pasture);
(6) Pastoral silvicultural system
(7) Agri-horticulture (crops + fruit trees)
(8) Homestead agroforestry (multiple combination of various components);
(9) Silvi-apiculture (trees + honey bees);
(10) Agri-pisci-silviculture (crops + fish + MPTS);
(11) Pisci-silviculture (Fish + MPTs) etc.

(1) Agri-silviculture systems: This system emphasizes raising of trees and cultivation of field crops and/or fodder crops in the available space between the trees. In arid and semi-arid regions hardy trees like *Prosopis cineraria* (*Khejri*), *Eucalyptus sp.*, *Acacia tortilis*, *Hardwickia binata* (Anjan), *Azadirachta indica (*Neem), *Ailanthes excelsa*, *Ziziphus jujuba* etc. could be grown along with dry land crops such as pulses (pigeonpea, blackgram), millets (finger millet, sorghum) etc. This is practiced mostly on arable lands, wherein multipurpose trees used for fuel and fodder can be grown with crops in the fields as alley farming. The hedges follow contour and compromise trees and shrubs like *Leucaena* or pigeonpea. Leguminous perennials are more suitable due to fixation of nitrogen.

(2) Agri-horti-silviculture: In this system fruit trees are grown along with crops and multipurpose trees (MPTs). Under rainfed situation hardy fruit trees like ber, aonla, pomegranate, guava could be grown along with dryland crops like pigeonpea, til, mothbean, mustard etc. Grafted ber (Var., Gola, Seb, Mundiya, Banarasi Kasak) may be planted at 6 × 6 m with 2 plants of subabul in between.
Under partial irrigation, Guava, pomegranate, Lemon, Kinnow have been successfully grown at 6 × 5 m along with crop like wheat, groundnut and subabul (200 plant/ha) for quick leaf fodder and fuel wood production. For further protecting fruit crops from desiccating hot summer and cold winter planting of subabul/sesbania at every 2 meter apart as wind breaks. Alternate plants of subabul/sesbania could be harvested for quick fodder and fuel wood production every 3rd year. Relative grain yield was 70-85% even in 3rd and 4th year.

(3) Silvi-Pastoral system: In the silvi-pastoral system, improved pasture species are introduced with tree species. In this system grasses or grass legume mixture is grown along with the woody perennial simultaneously on the same unit of land. In the marginal, sub-marginal and other degraded lands silvipastoral system has been found to be most economic agroforestry system especially in arid and semi-arid regions. It involves lopping trees and grazing understory grasses and bushes in forests or plantations. It helps in reduction of the cost of concentrated feed to animal during lean period. A number of fodder trees like *Leucaena latisiliqua, Bauhinia variegata, Albizzia labbek, Albizzia amara, Moringa olerifera, Sesbania sesban, S. grandiflora, Hardwickia binata* are identified for different regions of the country for silvi pastoral systems. Trees provide fuel and timber in the extreme dry season and lean periods, animal graze on pastures and feed on the leaves of nutritious trees and shrubs. Multilayered vegetation covers are very effective in controlling run-off and soil loss from erosion prone areas.

(4) Horti-silvi-pasture system: It involves integration of fruit trees with pasture. In the degraded arid and semi arid rangeland regimes number of over grazed plants of *Ziziphus nummularis* are found which could be successfully budded with improved variety of ber (*viz.,* Gola, Seb, Umran, Banaras, Kaska) besides planting MPTs like anjan, Subabul, *Khejri* along grasses and legumes like *Cenchrus, Lasiurus, Chrysopogon, Stylosanthes, Sirato* etc.

(5) Agri-silvi-pasture: It is a combination of agri-silviculture and silvi-pastoral system. In arid degraded lands of Rajasthan, Gujarat and Haryana often dryland crops viz. bajra, moth, urad, til etc. are grown in strips along with grass strips to avoid shifting sand reaching cropped area. MPTs could be introduced both in the pasture strips as well as in the crop strips, which besides protecting the crops from desiccating hot and cold wind would also provide leaf fodder, timber etc. besides pasture when there is a crop failure. Woody plants could be *Acacia senegal*, ber, anjan, neem etc. Grasses like *Cenchrus, Lasiurus* and legume *Stylo spp*.

(6) Pastoral silvicultural system: Integrated crop farming is practiced to meet the requirements of grasses and fodder for livestock. The pastoral silvicultural system is the practice in which grazing is the main component with scattered trees grown in the area. This practice is adopted in semi-arid regions of the country comprising the states of Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra and Madhya Pradesh.
The cultivators leave the fields fallow with existing trees and protect the same. *Dichanthium annulatum* is an important grass under this system. The important planted trees in the system are *Eucalyptus* hybrid, *Casuarina equisetifolia, Borassus flabellifa* and *phoenix sylvestris.* Generally trees are lopped for fuel and fodder. Custard apple, mango, Zizyphus and tamarind fruits are used for domestic consumption.

BIOGAS UNIT

A biogas unit is an asset to a farming family. It produces good manure and clean fuel and improves sanitation. Biogas is a clean, unpolluted and cheap source of energy, which can be obtained by a simple mechanism and little investment. The gas is generated from the cow dung during anaerobic decomposition. Biogas generation is a complex biochemical process. The celluloitic material is broken down to methane and carbondioxide by different groups of microorganisms. It can be used for cooking purpose, burning lamps, running pumps etc.

Selection of a model:

The two main designs of biogas plants are the floating gas holder and fixed-dome types. The merits and demerits of each design need to be considered while selecting a model.

(i) Float dome type: Different models are available in this category e.g., KVIC vertical and horizontal, Pragati model, Ganesh model.

(ii) Fixed dome type: The gas plant is dome shaped underground construction. The masonary gasholder is an integral part of the digester called dome. The gas produced in the digester is collected in dome at vertical pressure by displacement of slurry in inlet and outlet. The entire construction is made of bricks and cement. The models available in this category are Janata and Deen-Bandhu.

Selection of Size:

The size of the biogas plant is decided by the number of family members and the availability of dung. One cubic meter capacity plant will need two to three animals and 25 kg of dung. The gas produced will meet the requirement of a family of 4-6 members. It would suffice to have a 2 cubic meter plant to cater to the needs of a family of 6-10 members.

Biogas slurry:

Slurry is obtained after the production of bio-gas. It is enriched manure. Another positive aspect of this manure is that even after weeks of exposure to the atmosphere, the slurry does not attract fleas and worms.