

# STRATEGIES FOR ENHANCEMENT OF FOOD PRODUCTION IN ANIMAL

## INTRODUCTION

Ever increasing population of the world has necessitated the enhancement of food production. Biological principle applied to animal husbandry has had a major role in our efforts to meet the growing demands. This chapter deals with management of farms and farm animals, animal breeding, apiculture and fishery.

## ANIMAL HUSBANDRY

Animal husbandry is the agricultural practice of breeding and raising livestock. Domesticated animals which are raised for our use or profit are collectively called **livestock**. As such, it is a vital skill for farmers and is as much a science as it is an art. Animal husbandry deals with the care and breeding of livestock like buffaloes, cows, pigs, horses, cattle, sheep, camels, goats, etc., that are useful to humans. Extended, it includes poultry farming and fisheries. Ever since the beginning of civilisation, humans have dependency on animals for many requirements, such as food (milk, meat, honey and egg), clothing (hide, silk, wool), labour (pulling, carrying load) security etc. The development of desirable quantitative and qualitative animal species, through creating better breeds, has been an important human achievement. For this, humans have consistently tried to improve the breeds of domesticated animals to make them more useful.

It is estimated that **more than 70 percent of the world livestock population is in India and China**. However, it is surprising to note that their contribution to the world farm produce is only 25 percent, *i.e.*, the productivity per unit is very low. Hence, in addition to conventional practices of animal breeding and care, newer technologies are also to be applied to achieve improvement in quality and productivity.

## MANAGEMENT OF FARMS AND FARM ANIMALS

A professional approach to traditional practices of farm management has given the much needed boost to our food production. Farm management is the controlled and scientific handling of farm animals in their rearing, grooming, breeding and caring so as to maximise their yield. Let us discuss some of the management procedures, employed in various animal farm systems.

- (i) **Dairy Farm Management:** Dairying is the management of animals for milk and its products for human consumption.

In dairy farm management, we deal with processes and systems that increase yield and improve quality of milk.

- (a) **Selection of Breed:** Milk yield is primarily dependent on the quality of breeds in the farm. Selection of good breeds having high-yielding potential (under the climatic conditions of the area), combined with resistance to diseases is very important.
- (b) **Housing:** For the yield potential to be realised the cattle have to be well looked after - they have to be housed well, should have adequate water and be disease free.
- (c) **Feed:** The feeding of cattle should be carried out in a scientific manner - with special emphasis on the quality and quantity of fodder.
- (d) **Cleanliness:** The cattle should be regularly cleaned. Cleanliness and hygiene (both of the cattle and the handlers) is of paramount importance while milking, storage and transport of the milk and

its products. Nowadays, much of these processes have become mechanised, reducing chance of direct contact between produce and the handler.

Ensuring these stringent measures, require regular inspections, with proper record keeping. It also helps to identify and rectify the problems as early as possible. Regular visits by a veterinary doctor is mandatory.

### Resonate the Concept

Animals that one would expect to find in a dairy are :

1. Cow, buffalo, goat and sheep for milk.
2. Dairy farm may also have dogs to help in moving groups of cows, sheep, goat etc. from one location to another.
3. Some dairy farm have cats to keep the barns free of rodents.

**Different kinds of products that can be made from milk in a dairy farm are:**

- (i) **Cream** : It is prepared by churning milk, the fat comes on the top which is separated by draining out the liquid. This cream is with 10-70% fat content.
- (ii) **Curd** : Milk is converted to curd due to bacterial activities.
- (iii) **Butter milk** : It is left over liquid after removal of butter.
- (iv) **Ghee** : After heating butter, the water evaporates and fat contents are almost 100%.
- (v) **Condensed milk** : Milk is concentrated by removing water contents with or without adding sugar. It has 31% milk solids with 9% fats.
- (vi) **Powdered milk** : It is the powdered form of milk.
- (vii) **Cheese** : It is coagulated milk protein 'casein' with fat and water.

### Cattle disease

1. Bacterial
  - (a) Anthrax - *Bacillus anthracis*
  - (b) Mastitis - *Corynebacterium dyogenes*. (inflammation of udder)
2. Viral
  - (a) Rinderpest (Cattle plague)
  - (b) Foot & Mouth Disease
  - (c) Cowpox.
3. The best milk-yielding breed of cattle in the world *Holstein friesian* of Holland.
4. Father of white revolution in India is Varghese Kurein.

- (ii) **Poultry Farm Management:** Poultry is the class of domesticated fowl '(birds)' used for food and for their eggs. They typically include chicken and ducks, and sometimes turkey and geese. The word poultry is often used to refer the meat of only these birds, but in a more general sense it may refer to the meat of other birds too.

As in dairy farming, selection of disease free and suitable breeds, proper and safe farm conditions, proper feed and water, hygiene and health-care are important components of poultry farm management.

### Resonate the Concept

1. Poultry birds exclusively grown for meat are called **broilers** (e.g., Plymouth rock).
2. **Layers** are female fowls raised for egg production (e.g., White leghorn).
3. Bird flu is an avian influenza which can also attack human beings. It was caused by (H<sub>5</sub>N<sub>1</sub>) influenza virus in 2003 (Thailand).

Infected birds pass on virus through their saliva, nasal secretions and faeces. In 1918, it attacked human beings and killed about 50 million humans. The reservoir of bird flu seems to be migratory birds. The virus attacks and kills monocytes. The raw meat and eggs may contain virus. Once an outbreak is detected, the infected chicken are culled to prevent spread of the disease.

The chicken is commonly classified on the basis of its origin.

**(a) American breeds :** Plymouth rock, Rhode Island Red, New Hampshire.

**(b) English breeds :** Australorp, Cornish (dark)

**(c) Asiatic breeds :** Brahma (light), Cochin, Langshan (black).

**(d) Mediterranean breeds :** Leghorn.

**Indigenous breeds :** Aseel, Busra, Chittagon, Karaknath, Ghagus.

Aseel fowls are used in cock fighting

#### Poultry Disease -

- (1) Viral - Ranikhet, Fowlpox, Bronchitis, Bird flu
- (2) Bacterial - Cholera, Coryza, Pullorum.
- (3) Protozoan - Coccidiosis, spirochaetosis.
- (4) Fungal
- (5) Aspergilliasis

### ANIMAL BREEDING

Breeding of animals is an important aspect of animal husbandry. Animal breeding aims at increasing the yield of animals and improving the desirable qualities of the produce.

**Breed:** A group of animals related by descent and similar in most characters like general appearance, features, size, configuration, etc., are said to belong to a breed.

#### Methods of Animal Breeding:

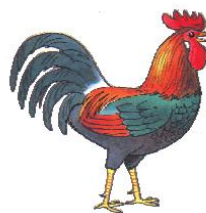
Two methods of animal breeding are - inbreeding and outbreeding.

- (i) Inbreeding:** Inbreeding refers to the **mating of more closely related individuals within the same breed for 4-6 generations**. The breeding strategy is as follows - superior males and superior females of the same breed are identified and mated in pairs. The progeny obtained from such mating are evaluated and superior males and females among them are identified for further mating. A superior female, in the case of cattle, is a cow or buffalo that produces more milk per lactation. On the other hand, a superior male is a bull, which gives superior progeny as compared to other males. **Inbreeding increases homozygosity. Thus inbreeding is necessary if we want to evolve pure line in any animal. Inbreeding exposes harmful recessive that are eliminated by selection process.** It also helps in accumulation of superior and elimination of less desirable genes. Therefore, this approach, where there is selection at each step, increases the productivity of inbred population. However, continued inbreeding, especially close inbreeding, usually reduces fertility and even productivity. This is called **inbreeding depression**. Whenever this becomes a problem, selected animals of the breeding population should be mated with unrelated superior animals of the same breed. This usually helps restore fertility and yield.

- (ii) **Outbreeding:** Outbreeding is the breeding of the unrelated animals, which may be between individuals of the same breed but having no common ancestors for 4-6 generations (outcrossing) or between different breeds (cross-breeding) or different species (inter-specific hybridisation).
- (a) **Outcrossing:** This is a practice of **mating of animals within the same breed, but having no common ancestors on either side of their pedigree for up to 4-6 generations**. The offspring of such a mating is known as an, outcross. It is the best breeding method for animals that are below average in milk productivity, growth rate in beef cattle, etc. A single outcross often helps to overcome **inbreeding depression**.
- (b) **Cross-breeding:** In this method, **superior males of one breed are mated with superior females of another breed**. Cross-breeding allows the desirable qualities of two different breeds to be combined. The progeny hybrid animals may themselves be used for commercial purpose. Alternatively, they may be subjected to some form of inbreeding and selection process to develop new stable breeds that may be superior to the existing breeds. Many new animal breeds have been developed by this approach. *Hisardale* is a new breed of sheep developed in Punjab by crossing Bikaneri ewes with Merino rams.
- (c) **Interspecific hybridisation:** In this method, male and female animals of two different related species are mated. In some cases, the progeny may combine desirable features of both the parents, and may be of considerable economic value, e.g., the mule. (a cross between male donkey and female horse). **Reciprocal cross give rise to Hinny.**



(a)



(b)

**Fig.** Improved breed of cattle and chickens (a) Jersey (b) Leghorn



**Figure :** Mule

### **Controlled Breeding Experiments**

These are carried out by using Artificial Insemination and Multiple Ovulation Embryo Transfer (MOET).

- (i) **Artificial insemination:** The semen is collected from the male that is chosen as a parent and injected into the reproductive tract of the selected female by the breeder. The semen may be used immediate or can be frozen and used at a later date. It can be transported in a frozen form to a place where the female is housed. In this way desirable matings are carried out. Artificial insemination helps us to overcome several problems of normal matings. Often, the success rate of crossing mature male a female animals is fairly low even though artificial insemination is carried out.
- (ii) **Multiple Ovulation Embryo Transfer Technology (MOET):** It is one of the programmes for herd improvement. In this method, a cow is administered hormones, with' FSH-like activity, to induce follicular maturation and superovulation - instead of one egg, which they normally Yield per cycle, they produce 6-8 eggs. The animal is either mated with an elite bull or artificially inseminated. The fertilised eggs at 8-32 cells stages, are recovered non-surgically and transferred to surrogate mothers. The genetic mother is available for another round of superovulation. This technology has been demonstrated for cattle, sheep, rabbits, buffaloes, mares, etc. High milk-yielding breeds of females and high quality (lean meat with less lipid) meat-yielding bulls have been bred successfully to increase herd size in a short time.

## **BEE-KEEPING**

Bee-keeping or apiculture is the maintenance of hives of honeybees for the production of honey. It is an age-old cottage industry. Honey is a food of high-nutritive value and also used in the indigenous systems of medicine. Honeybee also produces beeswax, which finds many uses in industry, such as in the preparation of cosmetics and polishes of various kinds. The increased demand of honey has led to large-scale bee-keeping practices; it has become an established income-generating industry, whether practiced on a small or on a large scale.

Bee-keeping can be practiced at any place where there are sufficient bee pastures of some wild shrubs, fruit orchards and cultivated crops.

There are several species of honeybees which can be reared. Of these, the most common species is *Apis indica*. Beehives can be kept in one's courtyard, on the verandah of the house or even on the roof. Beekeeping is not labour-intensive.

Bee-keeping though relatively easy does require some specialised knowledge and there are several organisations that teach bee-keeping. The following points are important for successful bee-keeping-

- (i) Knowledge of the nature and habits of bees,
- (ii) Selection of suitable location for keeping the beehives,
- (iii) Catching and hiving of swarms (group of bees),
- (iv) Management of beehives during different seasons, and
- (v) Handling and collection of honey and beeswax. Bees are the pollinators of many of our crop species such as sunflower, *Brassica*, apple, pear etc. Keeping beehives in crop fields during flowering season as well as that of increases pollination efficiency and improves the yield - of the crop honey.

### **Resonate the Concept**

<b>Bee disease</b>	- Nosema- <i>Nosema apis</i> (Protozoa, Sporozoa) Acarine - Mite.
<b>Bee enemy</b>	- Wax moth- <i>Galleria mellonella</i> . Vasp.- <i>Wespa</i> . Black Ants.

## **FISHERIES**

Fishery is an industry devoted to the catching, processing and selling of fish, shellfish or other aquatic animals. A large number of our population is dependent on fish, fish products or other aquatic animals such as prawn, crab, lobster, edible oyster, etc., for food. Some of the freshwater fishes which are very common include *Catla*, Rohu and common carp. Some of the popular marine fishes that are eaten include - *Hilsa*, Sardines, Mackerel and Pomfrets.

Fisheries has an important place in Indian economy. It provides income and employment to millions of fishermen and farmers, particularly in the coastal states. For many, it is the only source of their livelihood. In order to meet the increasing demands of fisheries, different techniques have been employed to increase production. For example, through aquaculture and pisciculture we have been able to increase the production of aquatic plants and animals, both fresh-water and marine. This has led to the development and flourishing of the fishery industry, which has brought a lot of income to the farmers in particular and the country in general. This enhancement of fish production is called '**Blue Revolution**'.

## ADDITIONAL INFORMATION

- Karan swiss, Karan fries and Sunandini are examples of cross-breed.
- Inland fisheries involves culturing fish in water bodies which are land locked like lakes, ponds.
- The honey bees are social insects having three castes - Queen, Drones and Workers. The workers can be classified on the basis of work performed. The nurse bees look after the grubs (larvae). Scout bees search for food source and communicate it to foraging bees which collect food.
- Composite culture involves culturing two or more types of fish in the same pond as they do not compete with each other for food.
- Rinderpest or cattle plague is a viral disease that effects cattle. Anthrax is bacterial disease of cattle, sheep. Tick fever is protozoan disease of cattle. Coccidiosis is protozoan disease of poultry.
- Ranikhet (New castle) diseases one of viral diseases in poultry.
- Shahtoosh is one of the finest wools made from the hair of the Tibetan antelope (*Pantholops hodgson*) also called CHIRU. The shawls made from chiru wool are so fine that they can be slipped through a finger ring. Due to high scale poaching of these animals on high desert plateau of China, International trade in shahtoosh has been prohibited.
- Angoor wool is obtained from rabbit.
- Silks are of two main types, mulberry silk or cultivated silk and non-mulberry silk or wild silk.
- The non-mulberry silk industry is found in Assam, Bihar, Bengal, Orissa and Madhya Pradesh. There are three main types of this silk.
  - (i) Tassar (tussore, tussur) silk (kosa) is obtained from the oak-feeding larvae of the silk moth. It is a native of India and China. Tassar cocoons are attached by a peduncle to twigs of sal trees.
  - (ii) Muga silk is produced in Assam. It is golden yellow in colour and superior to tassar silk in gloss and other qualities. It is an excellent material for embroidery.
  - (iii) Eri or Arundi silk is made in Bengal, Bihar and Assam. The eri silkworms feed on castor leaves and is reared indoors. The cocoons are soft and white or yellowish. The filaments are very delicate, so that the yarn is spun like cotton.
- Common diseases of silkworm are pebrine by protozoan *Nosema bombycis*, muscardine by fungus *Spicaria* and *Botrytis* and flacherie by virus.