# STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION ANIMAL HUSBANDRY

#### ANIMAL HUSBANDRY

#### **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** is the agricultural practice of breeding and raising livestock. As such it is a vital skill for farmers and is as much science as it is 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. Fisheries include rearing, catching, selling, etc,. of fish, molluscs (shell-fish) and crustaceans (prawns, crabs. etc.). Since time immemorial, animals like bees, silk-worm, prawns, crabs, fishes, birds, pigs, cattle, sheep and camels have been used by humans for products like milk, eggs. meat, wool, silk, honey. etc.

It is estimated that more then 70 per cent of the world livestock population is in India and China. However, it is surprising to note that the contribution to the world farm produce is only 25 per cent, i.e., the productivity per unit is very low. Hence in addition to conventional practices of animal breeding and care, newer technologies also have 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. **1.** 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 restify the problems of early as pageible. Decular visits by a

It also helps to identify and rectify the problems as early as possible. Regular visits by a veterinary doctor is mandatory.

#### Livestock-

Domesticated animals, especially the farm animals, kept for profit are collectively called as livestock. eg. Cattle, Buffaloes, Sheep, Goat, Pigs, Horses, Camel etc.

#### **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.

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# (A) Breeds of Cattle/Cow (Bos indicus) -

Depending upon the utility, the cattle are classified into the following groups-

1. Milch breeds	2. Draught breeds	3. General utility breeds
(Milk producing animal)	(Used for working)	(Can be used for both purpose)

# INDIAN BREEDS OF CATTLE-

1.

	Milch breeds	distribution
1.	Gir	Rajasthan, Gujarat
2.	Sahiwal (best in india)	Punjab, Hariyana, U.P
3.	Red Sindhi	Andhra Pradesh
4.	Deoni	Andhra Pradesh
5.	Rathi	Rajasthan

2.

S. No	Draught Breeds	Distribution	
1.	Malvi	Raj. M. P	
2.	Nageri	Haryana, Delhi, U.P	

# EXOTIC BREEDS OF CATTLE-

Holstein-Friesian (Best milch breed in world).

Jersey, Guernsey, Ayrshire,

Brown swiss, Red Dane.



#### (B) Breeds of Buffaloes (Bubalus bubalis) -

Surti, Niliravi, Nagpuri (Ellichpuri), Jaffrabadi, Bhadawari, Mehsana, Murrah(Haryana)

#### (C) Breeds of Sheep (Ovis aries) -

• Dorset, Horn and Merino are exotic breeds of sheep use for good quality of wool, mutton and also use for cross breeding.

#### INDIAN BREEDS OF SHEEP-

	Breed	Distribution	Use	
1.	Patanwadi	Gujarat	Wool for army hosiery	
2.	Lohi	Punjab, Rajasthan	Milk, Good Quality Wool	
3.	Rampur-	U.P, H.P, Rajasthan, Punjab, Haryana	Superior Cloth, Brown colour	
	Bushair		fleece	
4.	Nali	Haryana, Punjab, Rajasthan	Superior carpet wool	

# (D) Breeds of Goat (Capra capra)-

• The fine soft wool called PASHMJNA is the underfur of Kashmiri & Tibetan goat.

	Breed	Distribution
1.	Kashmiri Pashmina	Hills of Kashmir, Tibet, HP
2.	Gaddi	Himachal Pradesh
3.	Jamunapari	UP, MP

#### (E) Breeds of Pig (Sus sacrofa)

- Pig's meat is called PORK.
- The care & management of pigs is called PIGGERY

	Indigenous pigs Distribution		
1.	Ghnghroo	Bengal	
Exotic Pigs			
1.	Berkshire U.K		
2.	Large white Yorkshire	U.K	

#### (F) Mules & Hinny-

- Male Horse x Female Donkey = Hinny (Sterile)
- Female Horse x Male Donkey = Mule (Sterile)
- Stallions are uncastrated male horse especially used for breeding purpose.



Mule

# 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, and 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.

# CLASS XII BIOLOGY

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

#### **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.

# POULTRY

- Poultry is the class of domesticated fowl (birds) used for food or for their eggs. They typically include chicken and ducks, and sometimes turkey and geese. Turkey is recently domesticated bird. The word poultry is often used to refer to the meat of only these birds, but in a more general sense it may refer to the meat of other birds too.
- Selection of disease free and suitable breeds, proper and safe farm conditions, proper feed and water, and hygiene and health care are important components of poultry farm management.
- Poultry and poultry products are a rich source of animal protein & right kind of fats for good health.
- In our country poultry mainly means domestication of chickens for meat & eggs.

# Breeds of Hen (Gallus gallus)-

Indigenous (Desi) or Indian breeds	Exotic Breeds		
Aseel, Ghagus, Karaknath, Brahma,	White leghorn, Rhode island red,		
Bursa, Black Bengal, Chittagong,	Plymoth rock, New Hampshire,		
Tellicherry etc.	Sussex, Australop, Minorca etc.		

- 1. Aseel is best game bird, it is used in cock fighting.
- 2. Poultry birds exclusively grown for meat are called broilers (plymoth rocks)
- 3. Poultry birds exclusively grown for eggs are called layers (white leghorn)
- Indian breeds are slow growing, less efficient converters and produce fewer eggs (60 eggs/years).
- 5. The broilers with .high nutritive value have been produced by cross breeding (heterosis)



Leghorn

#### **COMMON DISEASES OF POULTRY**

- (i) Viral Diseases of Poultry- Fowlpox, Bird flu (H<sub>5</sub>N<sub>1</sub>-Virus), Ranikhet (New castle diseases) infectious bronchitis, lymphoid leukosis and are common viral diseases of poultry.
- (ii) Bacterial Diseases Fowl cholera, Puliorum, Corryza, Mycoplasmosis and Spirochaetosis.
- (iii) Fungal Diseases Aflatoxicosis (Aspergillosis flavus), Brooder pneumonia, Aspergillosis and thrush.

If any of the infectious disease has affected a mass proportion of the chicken and hens, then the best and safer decision, to avoid the fatal consequence, is to destroy the affected individuals. A poultry keeper must be aware about the common diseases so as to ensure the well being of hens and also of man.

#### **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.

#### Important species of Honey-bees :

- (i) Apis dorsata (Rock bee)- It is also named as saarang bee. It is of largest size and yields highest amount of honey. However, It is of highly aggressive nature and migratory species, which is not suitable for rearing by man.
- (ii) Apis indica (Indian Mona bee)- It lives across the whole country and is most commpn bee.
  It is mild in nature, so that it is easily manageable during rearing. Mona bee yields about 3-4 kg. of honey per hive.

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- (iii) (Apis florea (Bhringa bee)- This bee is smallest in size and of timid nature. It yields only about 250 gms of honey per hive. Hence it is not suitable for commercial purpose.
- (iv) Apis mellifera (European bee)- This bee is of mild nature. It yields more honey than most bee. It is the most useful bee for commercial purpose. The Italian variety of this species is by far the most important variety.

#### **Organisation :**

- Honey bees include specialized non reproductive group of worker bees so also called as Eusocial insect.
- They show polymorphism and good division of labour.
- Each colony has more than 40,000 to 50,000 insects consisting of 3 castes-
- 1. Queen:- It is about 15-20 mm long. Its body is about three times larger and 3 times heavier than a worker bee. The legs and wings are short but crop is long. It has ovary which is filled with eggs.

Only one queen develops from fertilized egg (i.e., it has 32 chromosomes). It feeds on Royal jelly. Its sole function is laying eggs. It lays 2000 eggs every day. One queen lays approx. 1500000 egg in its whole life.

 Drones:- About 100 male bees are present in one hive. These are approx. 7-15 mm long. Salivary glands, wax secreting glands. and stings are absent in drones. Like the queen they also depend on worker bees for nutrition. Their sole duty to fertilize the

queen. Drones are developed from unfertilized eggs so there are only 16 chromosomes present in them.

**3.** Worker :- Their number is maximum in a hive. These are the smallest individuals. Their wings and mouth parts are very strong. Their mouth parts and legs are modified to suck the nectar of flowers and to collect the pollen grains respectively. Pollen basket is present on hind leg (tibia) for collection of pollen. Pocket like wax glands are present at base of 2nd to 5th abdominal segment.

Worker bees are sterile females. These are developed from fertilized eggs (32 chromosomes). Due to high labour the life span of a worker bee is short (about 6-8 weeks).

# Life history of honey bee

- After fertilization the queen lays about 2000/eggs/ days
- One egg in each brood cell
- The egg hatches in about 3 days
- After hatching a white larva (Grub) emerges which is feed by workers (Nurse bees).
- From the 4th day\_all the worker bees provides food which consist pollen & honey to all baby bees.
- From the 7th day, Royal jelly is secreted from the maxillary glands of worker bees. Larva, pupa & queen bee are feed on this royal jelly.
- From 12th to 18th da:y, secretion of wax from wax gland also starts.
- Eggs destined to become drones are unfertilized & are laid in cells of slightly greater diameter than those of workers
- Drone develop parthenogenetically (Arrhenotoky) from unfertilized egg.
- The egg hatched in royal chamber is looked after by workers & fed with royal jelly so that it convert into queen.
- The time required to produce a queen from egg to adult is about 15-16 days, for a worker 21 days, & for a drone 24 days

# Nectar collection & Honey preparation

- Sucrose of nector  $\xrightarrow{\text{Invertase}}$  Glucose + fructose
- Nectar is stored in the crop
- Extra amount of water is evaporated by the fanners bees.
- This concentrated product is called Honey.

# Modem method of apiculture

Modern method of apiculture makes use of artificial bee hive. They are more convenient as these may be reused and can be shifted easily to safer place in adverse weather conditions. In addition to above, these are easy to handle and can be carried in a simple and easy manner.

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#### Procurement and rearing of honey-bees -

The increased demand of honey has led to large-scale beekeeping practices; it has become an established income generating industry. whether practiced on a small or on a large scale.

Bee-keeping can be practiced in any area 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. Bee-keeping is not labour-intensive.

Bee-keeping though relatively easy does require some specialised knowledge and there are several organizations 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 of beeswax.

#### Communication by dance :-

Karl Von Frish discovered communication in bees and shared Nobel prize in medicine (1973) with N. Tinbgergen and K. Lorenz for this discovery.

- The following type of dances can be seen in honey bees.
- Round Dance:- This dance indicates that the food source is about less than 75 m from a hive. The direction of food source can be identify with the help of smell of flowers which is present on the body of a scout honey bee.
- 2. Tail wagging Dance :- With the help of this dance bees give the information of that food source at a very far distance (more than 75 m). In it direction and distance of food source are indicated according to the position of sun. When the honey bee is flying in a straight line it wagging its tail and wings to produce the sound.

Distance of a food source can be identified with the help of speed of dance, speed of wagging tail and speed of sound.

- If the motion is in upper side of a straight line with wagging taU then food source will in the same direction of sun.
- If the motion is in lower side of a straight line then food source will be in opposite direction of sun.

# Honey

- Honey is a food of high nutritive value and also finds use in the indigenous systems of medicine. It is the secondary product of apiculture.
- It is an-aromatic viscid, sweet material consists of 17% water, sugar protein, minerals vitamins etc. pH = slightly acidic
- Its specific gravity is 1.45 to 1.48
- Composition of honey

(i)	Fructose	-	40-45%
(ii)	Glucose	-	32-37%
(iii)	Water	-	17-20%
(iv)	Sucrose	-	1-2%
(v)	Enzymes & pigments	-	2.21
(vi)	Minerals	-	1%
(vii)	Vitamins	-	B <sub>1</sub> , B <sub>6</sub> , C & D

# Bee wax

- Honeybee also produces beeswax, which finds many uses in industry, such as in the preparation of cosmetics and polishes of various kinds.
- Wax is the real and primary product of apiculture.
- It is obtained from bee hives
- This is a secretion of abdominal glands (wax glands) of worker bees.

## Propolis

- It is prepared from a plant substance (pollen) called 'PROPOLIS'
- The propolis gives the wax a hardly nature
- Propolis is a gum like substance which is used by bees to repair the old & destructed parts of hive.

#### 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'**.

#### Cultivable species of fresh water fishes -

#### Indigenous species-

- 1. Catla catla (Catla)
- 2. Labeo rohita (Rohu)- Most c6mmori carp
- 3. Labeo calbasu (Calbasu)
- 4. Cirrhinus mrigala (Mrigal)
- 5. Clarius batrachus (Magur)

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Exotic species-

- **Cyprinus carpio** (Cornmon carp)
- Ctenopharyngodon idella (grass carp)
- Hypopthalmicthys molitrix (Chinese carp/silver carp)

Marine fishes – are generally rich in Omega-3-fatty acids.

- 1. Hilsa (Hilsa)
- 2. Salmo (Salmon)
- 3. Sardinella (sardine)
- 4. Harpodon (Bombay duck)
- 5. Stomaleous (Pomfret) Introdued in Indian sea by foreigners
- 6. Rastrelliger (Mackerel)