



## CHAPTER -9

### “STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION”

#### **Animal Husbandry:**

The agricultural practice of breeding and raising livestock. Animal husbandry deals with the care and breeding of livestock like buffaloes, cows, pigs, horses, cattle, sheep, goats and camels etc. that are useful to humans. Extended, it includes poultry, farming and fisheries.

#### **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. Selection of good breeds having high yielding potential combined with resistance to diseases is very important. 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 maintained disease free. The feeding of cattle should be carried out in a scientific manner. Besides, stringent cleanliness and hygiene are of paramount importance while milking, storage, transport of milk and its products. Nowadays, of course, much of these processes have become mechanised, which reduces chance of direct contact of the products with the handler. Regular inspection visits by a veterinary doctor would be mandatory.

#### **Poultry Farm Management:**

Poultry is the class of domesticated fowl (Birds) used for food or their eggs. As in dairy farming selection of disease free and suitable breeds, proper and safe farm conditions, proper feed and water and hygiene and healthcare are important components of poultry farm management.

#### **Animal breeding:**

The mating or crossing of animals to improve the desirable qualities yield or productions.

#### **Objectives of Animal Breeding:**

1. To improve growth rate
2. To increased yield
3. To produce resistance to diseases.
4. To improve resistance to adverse environmental conditions i.e. heat, etc.





### Methods of Animal Breeding:

Methods of animal breeding are as follows:

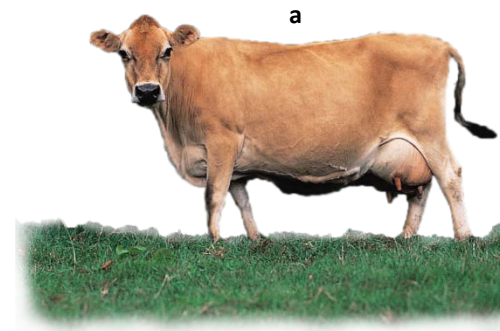
A. **Natural methods of breeding:** It includes inbreeding and outbreeding. When breeding is between animals of the same breed, it is known as inbreeding, while crosses between animals of different breeds is known as outbreeding.

Types of outbreeding:

- i. **Out-crossing:** The practice of mating of animals within the same breed, but having no common ancestors on either side of their pedigree up to 4-6-generations.
  - ii. **Cross-breeding:** Superior males of one breed are mated with superior females of another breed of the same species to get better progeny. Eg: Hisardale is a new breed of sheep developed in Punjab by crossing Bikaneriewes and Marino rams.
  - iii. **Interspecific hybridization:** The male and female animals of different related species are mated. Eg: Mule is a crossbreed of male donkey and female horse.
- B. **Artificial methods of breeding:** It includes the modern techniques of breeding.

**There are two types:-**

- I. **Artificial insemination:** The semen of superior male is injected into the reproductive tract of the selected female.
- II.
- III. **MOET:** The technique for herd improvement by successful production of hybrids. In this method, a hormone (FSH) is administered to the cow for inducing follicular maturation and super ovulation. The cow produces 6-8 eggs instead of one egg and is either mated with an elite bull or artificially inseminated. The fertilized eggs at 8-32 cells stages are recovered non-surgically and transferred to surrogate mothers.



b

Figure: - Improved breed of Chickens and Cattle  
(a) Leghorn (b) Jersey

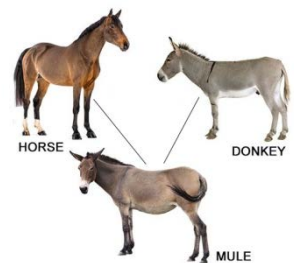


Figure: - Mule

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**BEE-KEEPING OR APICULTURE:-** The maintenance of hives of honeybees for the production of honey and bee wax common species of honey bees are *Apis dorsata* (rock bee), *Apis indica* (Indian bee), *Apis florea* (little bee) and *Apis mellifera* (Italian bee).

The following points are remembered for successful be 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.

**FISHERIES:** Fishery is an industry devoted to the catching, processing or selling of fishes, shellfish or other aquatic animals. Some of the marine fishes that are eaten include Hilsa, sardines, Mackerel and pomfrets and freshwater fishes include catla, Rau and common carp etc.

Aquaculture is rearing and management of useful aquatic plants and animals like fishes, oysters, mussel and prawns etc.

Pisciculture is rearing, catching and management of fish. This has led to the development and flourishing of the fishery industry, and it has brought a lot of income to the farmers in particular areas and the country in general.

### **PLANT BREEDING:**

Plant breeding is the purposeful manipulation of plant species in order to create desired plant types that are better suited for cultivation, give better yields and are disease resistant.

Steps in plant breeding are

- I. **Collection of variability:** The entire collection (of plants / seeds) having all the diverse alleles for all genes in a given crop is called germplasm collection.
- II. **Evaluation and selection of parents:** The germplasm is evaluated so as to identify plants with desirable combination of characters.
- III. **Cross hybridisation among the selected parents:** Cross hybridisation of the two parents to produce hybrids that genetically combine the desired characters in one plant.
- IV. **Selection and testing of superior recombinants:** Selection of the plants having desired character combination. This step yields plants that are superior to both of the parents.

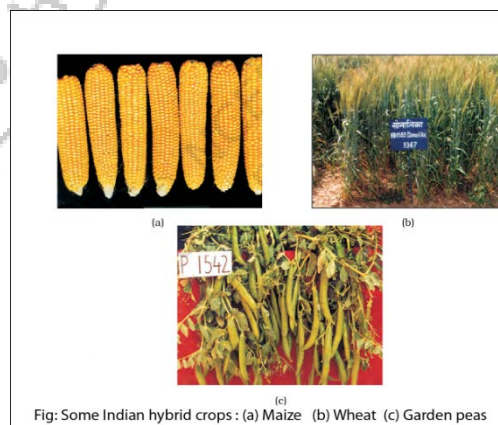


Fig: Some Indian hybrid crops : (a) Maize (b) Wheat (c) Garden peas



মহাশিক্ষা বিভাগে আৰু নৱজন্ম বিভাগে (সংস্কৃত)

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- V. **Testing, release and commercialisation of new cultivators:** The newly selected lines are evaluated for their yield and other agronomic traits of quality, disease resistance etc. and released into the market. High yielding and disease resistant wheat are Sonalika and Kalyan Sona. Taichung Native -1 (Taiwan), IR-64-(IRRI), Jaya and Ratna (India) are better yielding semi dwarf varieties of rice.

#### **PLANT BREEDING FOR DISEASE RESISTANCE:**

Some crop varieties bred by hybridisation and selection, for disease resistance to fungi, bacteria and viral diseases are released as follows.

Crop	Variety	Resistance to disease
Wheat	Himgiri	Leaf ant stripe rust, hill bunt
Brassica	Pusa Swarnim	White rust
Cauliflower	Pusa shubhra snowball k-1	Pusa Black rot and curl blight black rot
Cowpea	Pusa Komal	Bacterial blight
Chilli	Pusa Sadabahar	Chilly mosaic virus, Leaf curl and Tobacco mosaic virus

#### **PLANT BREEDING FOR DEVELOPING RESISTANCE TO INSECT PEST:**

Some released crop varieties bred by hybridisation and selection, for insect pest resistance are given follows

Crop	Variety	Insect pests
Brassica	Pusa Gaurav	Aphids
Flat bean	Pusa Sem 2 Pusa Sem 3	Jassids, aphids and fruit borer
Okra (Bhindi)	Pusa Sawani Pusa A-4	Shoot and Fruit borer



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### **PLANT BREEDING FOR IMPROVED FOOD QUALITY:**

Breeding crops with higher levels of Vitamins and Minerals, or higher protein and healthier fats is called biofortification.

Breeding for improved nutritional quality is undertaken with the objectives of improving protein content and quality, oil content and quality, vitamin content, micronutrient and mineral content.

Eg: Wheat – Atlas 66 (Height protein content)

### **SINGLE CELL PROTEIN (SCP):**

The protein rich cell biomass from microbes such as bacteria, yeast and algae are used as alternative food.

Eg: Spirulina can be grown in waste water to produce protein rich biomass treated as food.

Certain bacterial species like *Methylophilus methylotrophus* can be expected to produce 25 tonnes of protein due to its high rate of biomass production and growth.

#### **Advantage of Single cell protein (SCP):**

- I. Provides protein rich food supplement in human diet.
- II. Use of waste water reduces pollution level.
- III. Reduce pressure of conventional agricultural production etc.

### **TISSUE CULTURE:**

Tissue culture is the technique of maintaining the plant cells, tissues or organs aseptically on artificial medium in suitable container under controlled environmental condition in Vitro. The part which cultured is called explant.

Methods:

- I. **Callus culture:** cell division in explant form an unorganized mass of cell called callus.
- II. **Suspension Culture:** It involves single cells or small group of cells suspended in a liquid medium containing auxin 2, 4-D.
- III. **Meristem culture:** Apical shoot meristem is used as explant and supports multiple shoot development.
- IV. **Embryo culture:** Excision of young embryo from developing seeds and culture in nutritional media.
- V. **Anther culture:** production of haploid plant species by desired anther cultured in suitable medium.





- VI. **Protoplast culture and somatic hybridization:** In this method, hybridization of different species could produce of economic value as follows:  
Isolation of desired single cells, digestion of cell wall by pectinase and cellulase enzyme for exposure of protoplast, fusion of protoplast by polyethyleneglycol(PEG) and sodium nitrate, hybrid protoplast culture resulting in desired variety of plant. Eg: pomato is obtained by somatic hybrid of potato and tomato.
- VII. **Micropropagation:** Tissue culture technique used for rapid vegetative multiplication of ornamental plants and fruit trees by using small explants. It is done by shoot meristem culture and somatic embryogeny. It is results in genetically identical plants.
- VIII. **Somaclonal variation:** Genetic variation in plants regenerated from single culture is used to develop several useful varieties. Eg: Short duration sugarcane, Rust resistant wheat.
- Uses:
- Rapid clonal Multiplication.
  - Production of virus free plants.
  - Production of transgenic plants etc.