

Strategies for Enhancement in Food Production

Animal Husbandry

- It deals with the scientific management of livestock.
 - It includes various aspects such as feeding, breeding and disease control.
 - It includes cattle, goat, sheep, poultry and fish farming.
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- **of farms and farm animals**
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- **Dairy farm management –**
 - It is done usually for the production of milk and draught labour for agricultural work.
 - The management of dairy farm animals involves regular maintenance and cleansing of animal shelters. Animals should be kept in well-ventilated roofs.
 - **Poultry farm management –**
 - It is done to meet the demands for egg and chicken. It involves the management of domestic fowls to improve the quality and productivity of egg and chicken.
 - For good production of poultry, regular cleansing of farm is of the utmost importance. Maintenance of temperature, and prevention and cure of diseases and pests are also required.
 - **Breeding**
 - It increases the yield of animals, improves the quality of animal produce and produces disease-resistant varieties of animals.

- **Methods of breeding –**

- **Inbreeding:** It is the method of mating closely related individuals of the same breed for four to six generations. It increases homozygosity and can lead to the evolution of a pure line.
- **Outbreeding:** It is the method of mating animals of different breeds. It brings heterozygosity.
- **Outbreeding involves three types of breeding –**
 - **Outcrossing:** It involves the mating of animals within the same breed, but they do not have any common ancestors for the last four to five generations.
 - **Cross-breeding:** It involves breeding between the superior individuals of two separate breeds; for example, *Hisardale* is a variety of sheep produced by crossing between Bikaneri ewes and Marino rams.
 - **Inter-specific hybridisation:** It involves the breeding between the individuals of two different related species; for example, mule.
- Other breeding experiments **include artificial insemination and multiple ovulations embryo transfer technology (MOET)**. These are the best methods to perform animal breeding.
- **Artificial insemination:** Process of introducing the semen collected from the male into the oviduct of the female by the breeder
- **Multiple ovulation embryo transfer technology:** It is a technique in which super-ovulation is induced by hormone injection.
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- **Apiculture:** Practice of bee-keeping for the production of various products such as honey, bee wax
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- It is an industry which deals with the catching, processing and marketing of fishes and other aquatic animals that are of high economic value.
- Examples of freshwater fishes are *Catla*, *Rohu*, while examples of marine fishes are *Hilsa*, Mackerel.

Plant Breeding

- It is the process in which two genetically similar varieties are purposely crossed to produce a new hybrid variety.
- **Steps involved in plant breeding are –**
 - Collection of genetic variability
 - Evaluation of germplasm and selection of parents
 - Cross-hybridisation between selected parents
 - Selection and testing of superior hybrids
 - Testing, release and commercialisation of new cultivars

Applications of Plant Breeding

- Plant breeding is one of the suitable ways to lower the dependency of plant on various insecticides.
- **Fungal, bacterial and viral pathogens affect the yield of crops.**
 - **Examples –**
 - ◦ rust of wheat, red rot of sugarcane
 - ◦ rot of crucifers
 - ◦ mosaic, turnip mosaic
- Disease resistance can be provided by conventional breeding, mutational breeding or genetic engineering.
- **Conventional breeding:** It includes the basic steps of screening, germplasm, hybridisation, selection, testing and release.
- **Mutational breeding:** In this method, genetic variations are created, which then result in the creation of traits not found in the parental type.
 - Mutations are induced with the help of mutagens (like chemicals) or irradiation.

- **Genetic engineering:**

- Certain wild varieties have disease-resistant characteristics, but they are low yielding.
- Disease-resistant genes from such varieties are introduced in high-yielding varieties through recombinant DNA technology.

- **Pest-Resistant Crops**

- Certain morphological characters and biochemical characters provide resistance from insects and pests.

- Such varieties are bred with non-resistant varieties to produce pest-resistant hybrids.

- **Examples of crop variety that provides resistance against diseases –**

- *Pusa Komal* is a variety of cowpea which is resistant towards bacterial blight disease.
- *Himgiri* is a variety of wheat which is resistant towards leaf and stripe rust.

- **Examples of crop variety that are resistant towards insect pests –**

- *Pusa Gaurav* is a variety of *Brassica* which is resistant against aphids.
- *Pusa Sawani* is a variety of *Okra* which is resistant against shoot and fruit borers.

- **Biofortification:** Process of breeding crops that have higher levels of vitamins, minerals, higher proteins and healthier fat content.

Single cell protein and tissue culture

- Single cell protein is the alternate source of proteins for animal and human nutrition. *Spirulina* can serve as the source of food rich in proteins, fats, carbohydrates, etc.
- **Tissue culture**
 - Manipulation of plants in vitro to produce new variety of plants.
 - Apical and axillary meristems of plant are used for making virus-free plants.
- **Somatic hybridisation:**
 - It is the technique that involves the fusion of protoplasts derived from two different plant varieties. The hybrid cells are known as **somatic hybrids**.
- **Micro-propagation:**
 - It is the method of producing new plants through tissue culture in a short duration. The plants produced are genetically identical and are known as **somaclones**.