

STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION

Animal husbandry - is 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, camel, goat etc. it also includes poultry farming and fisheries. More than 70% of livestock population of the livestock live in India and China.

Management of Farm and Farm Animals

Some of the management procedures applied in various livestock are as follows.

Dairy farm management

Dairying is the management of animals for its milk and its product for human consumption. Milk production mainly depends upon the quality of breeds in the farm. Selection of good breeds having high yielding potential combined with resistance to disease is very important.

Poultry Farm Management

Poultry is the class of domesticated birds used for their meat. It includes chicken and ducks and with turkey and geese. Important components of poultry farm management includes - Selection of disease free and suitable breeds, Proper and safe farm condition, Proper feed and water, and Hygiene and health care.

Animal Breeding — aims at increasing yields of animals and improving the desirable qualities of the produce. A breed is a group of animals related by descent and similar in most of characters like general appearance, features, size, configuration etc. there are two kinds of breeding

- **Inbreeding** — breeding between animals of same breeds.
- **Interspecific hybridization** — crossing between different breeds.
- **Mating of more closely related individuals within the same breed for 4-5 generation is called inbreeding.** It includes - Identification and mating of superior males and females of same breeds and Evaluation of progeny and identification of superior male and female from them.
- **Inbreeding increases heterozygosity.** Close inbreeding usually reduces fertility and even productivity. This is called breeding depression.
- **Outbreeding** is the breeding of unrelated animals, which may be between individuals of same breed but, having no common ancestors or between different breeds (cross breeding) or different species (interspecific hybridization).
- **Out-crossing** - this is the practice of mating of animals within the same breed but having no common ancestors on either side of their pedigree up to 4- generation. The offspring are called out-cross.
- **Cross breeding** - superior male of one breed are mated with superior female of another females of another breed. Cross breeding allows the desirable qualities of two breeds to be combined.
- **Interspecific hybridization** - male and female animals of two different species are mated. The progeny may combine desirable features of both and parents. Ex - mule.

- Controlled breeding experiments are carried out using 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.
- Multiple Ovulation Embryo Transfer Technology (MOET) is used to increase the success rate of artificial insemination. In this method, a cow is administered hormones FSH II to induce follicular maturation and super ovulation, instead of one egg they produce 6-8 eggs. The fertilised eggs at 8-32 cell stages, are recovered non-surgically and transferred to surrogate mothers.

Bee-keeping

Bee-keeping or apiculture is the maintenance of hives of honeybees for the production of honey. Honey is a food of high nutritive value and also finds use in the indigenous systems of medicine. It also produces beeswax. The most common species of honey bee is *Apis indica*.

Fisheries

Fishery is an industry devoted to catching, processing or selling of fish, shellfish or other aquatic animals. Fresh water fishes which are very common include catfish, rohu and common carp. Common marine fishes are Hilsa, sardines, mackerel and prawns.

- Different techniques have been applied to increase production like aquaculture and pisciculture. Green Revolution is implemented to increase fish production.

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

The main steps in plant breeding are

- Collection of variability** is the collection and preservation of all the different wild varieties, species and relatives of the cultivated species. The entire collection having all the diverse alleles for all genes in a given crop is called germplasm collection.
- Evaluation and selection of parents** is the identification of plants with desirable combination of characters. The selected plants are multiplied and used in the process of hybridization.
- Cross hybridization** among the selected parents to obtain desired crop characters.
- Selection and testing** of superior recombinants
- Testing, releasing and commercialization** of new cultivars.

Wheat and Rice

Production of wheat and rice increased tremendously between 1960-2000 due to introduction of semi dwarf varieties of rice and wheat. Several varieties such as Sonalika and Kalyansona, which were high yielding and disease resistant were introduced all over the rice and wheat growing field of India. Semi dwarf rice varieties were derived from IR-8 and Taichung Native 1. Two new varieties are better yielding and semi dwarf, Jaya and Ratna were developed in India.

Sugar cane

Sugar cane (cane) was grown in north India and SEACCNOR811 in south India. Two species are successfully crossed to get sugar cane varieties combining the desirable qualities of high yield, thick stems, high sugar and ability to grow in sugar cane areas of north India.

Hybrid maize.. Jowar and bajra are developed in India. These varieties are high yielding and resistant to water stress.

Plant Breeding for Disease Resistance

Some crop varieties bred by hybridization and selection for disease resistance to fungi, bacterial and viral disease are released

Crop	Variety	Resistance to diseases
Wheat	Himgini	Leaf and stripe rust, hill bunt
Brassica	Pusa sera rim (Karanal)	White rust
Cauliflower	Pusa Shulabha, Pusa Snowball K-1	Black rot and Curl blight black rot
Cowpea	Pusa korma	Bacterial blight
Chilli	Pusa Sada bahar	Chilly mosaic virus, Tobacco mosaic virus and Leaf curl

Mutation is the process by which genetic variations are created through changes in the base sequence within genes resulting in the creation of a new character or trait not found in the parental types. It is done by using mutants like chemicals or radiations. This process is called mutation breeding. Mung bean resistance to yellow mosaic virus and powdery mildew were induced by mutation.

Plant breeding for developing Resistance to insect Pests

- Crop plant and crop products are destroyed by insects and pests on large scale. To prevent this loss new varieties resistance to them are developed. Breeding is similar to other breeding programme and resistance gene is obtained from cultivated varieties, germplasm collection of crop or wild relatives.

Crop	Variety	Insect Pests
Brassica (rapeseed mustard)	Pusa Eaurav	Aphids
Flat bean	Pusa SEM 2, FUSE Sem 3	Jassids, aphids and fruit borer
Okra (Bhindi)	Pusa Sawani Pusa A-4	Shoot and Fruit borer

Bio-fortification - Breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats. Breeding for improved nutritional qualities have following objectives of improving

- Protein content and quality
- Oil content and quality
- Vitamin content
- Micronutrient and mineral content

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IARI, New Delhi have released many varieties of vegetables crops rich in vitamins and minerals like vitamin A enriched carrot, spinach and pumpkin and vitamin C enriched bitter gourd, bathua, mustard etc.

Single Cell Protein (SCP) – alternate source of protein for animal and human nutrition. Microbes are grown on industrial scale as a source of good protein. Microbes like spirulina can be grown easily on materials like waste water from potato processing plants having starch, molasses, animal manure and even sewage to produce large quantities and can serve as food rich in protein, minerals, fats, carbohydrates and vitamins.

Tissue Culture

The capacity to generate whole plants from any cell of a plant is called totipotency. Thousands of plants can be produced from explants in short interval of time using suitable nutrient medium, aseptic condition and use of phytohormones. This method of producing thousands of plants is called micropropagation.

Somatic Hybridization

Isolation of single cells from their plants and after digesting their cell wall fusing the cytoplasm of two different varieties is called somatic hybridization. The hybrid obtained is called somatic hybrid.