Strategies for Enhancement in Food Production Class 12 Key Points

CBSE Class 12 Biology · NCERT · for boards, NEET and JEE revision

ChapterNotes

Why Enhance Food Production?

Animal husbandry + Plant breeding + SCP/Tissue culture → more food

India + China hold ~70% of world livestock but give only ~25% of farm produce - a management gap.

- Two tracks: animal-based (husbandry, breeding, apiculture, fisheries) and plant-based (breeding, SCP, tissue culture)
- Goal: higher yield + better quality + disease/pest resistance
- Green Revolution (food grains) ↔ Blue Revolution (aquaculture)

Animal Husbandry & Farm Management

Three pillars: good breeds · balanced feeding · hygiene/healthcare

Bird flu (avian influenza) is a POULTRY concern - not dairy or fisheries.

- Dairy: high milk yield + quality; cleanliness of cattle AND handlers is most stressed (milk is consumed raw)
- Poultry: disease-free breeds, safe housing, feed, disease prevention
- Balanced ration = roughage + concentrates + clean water; regular vet visits + records

Animal Breeding: Inbreeding vs Outbreeding

Inbreeding → ↑homozygosity; too much → inbreeding depression

Inbreeding depression (↓fertility/productivity) is the OPPOSITE of heterosis/hybrid vigour.

- Inbreeding: mate close relatives (4-6 generations); exposes recessives so selection can remove them
- Outbreeding: out-crossing (same breed, no common ancestor 4-6 gens), cross-breeding, interspecific hybridisation
- A single out-cross can reverse inbreeding depression

Cross-Breeds & Assisted Reproduction

Hisardale = Bikaneri ewes × Marino rams · Mule = mare × male donkey

In MOET, FSH causes super-ovulation (6-8+ eggs) - not lactation or higher milk fat.

- Hisardale sheep = cross-breeding; Mule = interspecific hybridisation (horse × donkey)
- AI: superior bull's semen introduced into female tract - one bull sires thousands
- MOET: FSH → 6-8+ eggs, fertilise, recover embryos, transfer to surrogate mothers

Apiculture (Bee-keeping)

Apis indica = common reared honeybee in India

Hives near crops help MAINLY by pollination → higher yield; bees do not fix nitrogen.

- Products: honey (food/medicine) + beeswax (cosmetics, polishes)
- Place hives near sunflower, apple, pear, Brassica during flowering → more crop + better honey
- Low investment; needs flower-rich location and gentle management

Fisheries & the Blue Revolution

Freshwater: Catla, Rohu, Common carp · Marine: Hilsa, Sardine, Mackerel, Pomfret

Aquaculture = rearing aquatic organisms; Pisciculture = fish culture specifically.

- Blue Revolution = boosting fish output via aquaculture (parallel to Green Revolution)
- Induced breeding via hormonal stimulation solves the quality fish-seed shortage
- Examiners mix freshwater vs marine lists - keep the trio (Catla/Rohu/carp) freshwater

Plant Breeding: Steps

Variability → parent selection → cross-hybridisation → select recombinants → release

Wrong step-order options are a common NEET trap - memorise the sequence.

- Step 1: collect variability (germplasm); Step 3: cross-hybridise selected parents
- Green Revolution: semi-dwarf high-yield wheat & rice
- India = M.S. Swaminathan; international semi-dwarf wheat = Norman Borlaug

Resistant & Biofortified Varieties

Himgiri (wheat) → leaf/stripe rust · Pusa Swarnim → white rust · Pusa Shubhra → black rot

Biofortification = nutrient enrichment; don't confuse with bioremediation/biomagnification.

- Pest resistance from morphology (hairy leaves) + biochemicals; e.g. Pusa Sem 2 & 3 flat bean
- Biofortification: wheat Atlas 66 (high protein); maize hybrids rich in lysine + tryptophan
- Pair each variety to its disease - examiners scramble these

Single-Cell Protein (SCP)

Examples: Spirulina · Methylophilus methylotrophus · Fusarium

A 250 kg cow gives ~200 g protein/day; 250 g of Methylophilus could (theoretically) give 25 tonnes/day.

- Microbes double in hours and are protein-rich - eases pressure on agriculture
- Grow on cheap/waste substrates (e.g. Spirulina on wastewater)
- Hurdles remain: taste, texture and acceptability

Tissue Culture & Micropropagation

Totipotency: single cell → whole plant · clones = somaclones

Use totipotency (plants), not pluripotency (an animal stem-cell term).

- Micropropagation: thousands of genetically identical clones (somaclones); explant = plant part used to start
- Meristem culture → virus-free plants (apical meristem is virus-free): banana, sugarcane, potato
- Somatic hybridisation: fuse protoplasts of two species → hybrid (e.g. pomato)

Quick revision

- Green Revolution: semi-dwarf wheat (Sonalika) and rice (IR-8)
- Plant breeding steps: collection → selection → crossing → testing → release
- Biofortification: Atlas 66 (protein-rich wheat), vitamin A rich carrots, spinach, pumpkin
- Tissue culture: totipotency, micropropagation (somaclones), somatic hybridisation
- Animal breeding: inbreeding → homozygosity; outbreeding → hybrid vigour
- MOET: superovulation + mating or AI + embryo transfer to surrogate mothers
- SCP: Spirulina (protein-rich, grown on waste)