IMPROVEMENT IN FOOD RESOURCES

CBSE CLASS 9 SCIENCE • CHAPTER 12 • HIGH-YIELD REVISION MANUAL

1. Introduction & Core Objectives

Food supplies the essential carbohydrates, proteins, fats, vitamins, and minerals required for the metabolic sustenance, development, and physiological survival of all living organisms. To support a rapidly increasing global population without depleting natural reserves, sustainable methodologies must be developed to optimize agri-food systems.

Core Strategic Objectives:

- Maximize food volume outputs per unit area (higher yield).
- Improve nutritional profiles and qualitative stability of food products.
- Minimize systematic losses caused by biotic stresses (pests, diseases) and abiotic factors.
- Ensure sustainable, long-term national food security.

2. Major Food Resources

Plant-Based Food Resources

- **Cereals:** Wheat, Rice, Maize, Millets (Carbohydrates).
- **Pulses:** Gram, Pea, Lentil, Pigeon pea (Proteins).
- **Oilseeds:** Groundnut, Mustard, Soybean, Sesame (Fats).
- **Vegetables & Fruits:** Source of essential vitamins and minerals.

Animal-Based Food Resources

- **Dairy:** Milk and derived nutritional products.
- **Poultry:** Eggs and premium protein meats.
- **Fisheries:** Marine and freshwater aquatic proteins.
- **Apiculture:** Raw natural honey and industrial beeswax.

3. Crop Variety Improvement

This process focuses on selecting and breeding crop strains with desirable genetic traits to optimize performance.

- **Desirable Trait Goals:** High yield capacity, resistance to diseases and pests, drought tolerance, low response to variable salinity, and early maturity periods.
- **Hybridisation:** The deliberate crossing of two genetically diverse plant varieties to combine top traits into a single offspring line.
  - *Intervarietal:* Cross between two completely distinct varieties of the same species.
  - *Interspecific:* Cross between two different species belonging to the identical genus.
  - *Intergeneric:* Cross executed across distinct biological genera.

4. Crop Production Management: Nutrient Management

Plants absorb essential chemical elements from their surroundings to sustain growth. There are 16 essential nutrients required by plants, divided into two categories based on the volume needed:

[Image of nutrient deficiency symptoms in plants]

Macronutrients (Required in Large Volumes)

Elements heavily utilized by plant tissues for structural synthesis and metabolic regulation.

- **Nitrogen (N):** Promotes leaf growth and chlorophyll formation.
- **Phosphorus (P):** Stimulates root growth and early development.
- **Potassium (K):** Regulates water balance and plant immunity.
- **Secondary Nutrients:** Calcium (Ca), Magnesium (Mg), Sulfur (S).

Micronutrients (Required in Trace Amounts)

Elements required in small amounts, acting primarily as vital co-factors for enzymatic reactions.

- Iron (Fe)
- Zinc (Zn)
- Copper (Cu)
- Boron (B)
- Manganese (Mn)

5. Organic Manures vs. Chemical Fertilisers

Restoring soil nutrients requires balancing organic conditioners with concentrated chemical fertilizers:

Property	Manures (Organic)	Fertilisers (Chemical)
Origin	Natural substances derived from the biological decomposition of plant residues and animal wastes.	Chemically synthesized compounds manufactured on an industrial scale.
Soil Humus	Adds large amounts of organic humus, significantly improving soil structure and water retention.	Does not add organic humus to the soil profile.
Nutrient Concentration	Contains low concentrations of specific plant nutrients; slow-acting but long-lasting.	Highly rich in targeted macronutrients (NPK); fast-acting but short-lasting.
Eco-Safety	Completely eco-friendly and biodegradable; safely enhances soil microbial health.	Excessive use alters soil pH, harms helpful microbes, and can cause water pollution through runoff.
Key Types	Compost, Vermicompost (using earthworms), Green Manure (ploughed legumes).	Urea, Ammonium Sulfate, Superphosphate, Potash.

6. Water Management: Irrigation

Irrigation is the artificial application of water to crops at regular intervals to maintain moisture and ensure nutrient absorption. Modern farming uses high-efficiency irrigation methods to optimize water use:

[Image of drip irrigation system layout]

- **Sprinkler System:** Water is pumped through rotating nozzles, spraying it over the crop canopy like natural rain. Ideal for sandy soils and uneven land layouts.
- **Drip Irrigation:** Delivers water directly to the root zone drop-by-drop through a network of pipes and emitters. This method minimizes evaporation losses and optimizes water use efficiency.

7. Sustainable Cropping Patterns

Mixed Cropping:

Growing two or more crops simultaneously on the same piece of land without a fixed row layout (e.g., Wheat + Gram). This spreads economic risk by preventing total crop failure during droughts.

Crop Rotation:

Growing different crops sequentially on the same plot of land across seasons (e.g., growing nitrogen-fixing pulses or legumes after grain crops). This practice naturally breaks pest cycles and preserves soil fertility without relying heavily on chemical inputs.

Intercropping:

Growing different crops in alternate, fixed rows (e.g., Soybean + Maize) to optimize space and nutrients. It prevents pests from spreading across an entire field easily.

[Image of intercropping layout with alternate rows]

8. Crop Protection Management

Crops must be protected against biological stresses that threaten yield stability:

- **Weeds:** Unwanted plants (e.g., *Parthenium*, *Xanthium*) that compete with crops for sunlight, space, and soil nutrients. They can be managed mechanically by hand removal or chemically using selective weedicides like 2,4-D.
- **Pests & Diseases:** Insects, rodents, and pathogenic organisms (bacteria, viruses, fungi) damage plant structures. Integrated management combines clean field cultivation, crop rotation, and the targeted use of chemical pesticides.
- **Grain Storage Management:** Harvested grains must be thoroughly dried and cleaned to prevent losses from moisture, insects, and molds during storage. Large-scale storage utilizes protective, moisture-controlled **Silos and Granaries**.

9. Animal Husbandry: Livestock, Poultry, & Aquaculture

Animal Husbandry is the scientific management of livestock, covering breeding, feeding, housing, and health care to improve production quality.

A. Cattle Farming

Cattle are raised for milk production (milch animals) and draft labor in agriculture (draught animals). Dairy breeding programs cross distinct cattle lines to combine top traits:

- **Indigenous** / **Local Breeds:** Varieties like *Sahiwal* and *Red Sindhi* are selected for their natural resistance to tropical diseases.
- **Exotic** / **Foreign Breeds:** Breeds like *Jersey* and *Holstein-Friesian* are chosen for their long lactation periods and high milk yields.

B. Poultry Farming

Poultry farming focuses on raising domesticated birds for eggs and meat. Birds are selectively bred based on their commercial purpose:

- **Layers:** Specialized egg-producing birds requiring nutrient-rich feed high in vitamins and minerals.
- **Broilers:** Fast-growing meat birds fed a diet rich in proteins and fats to promote rapid muscle development.

C. Fish Production (Aquaculture & Pisciculture)

Fish provide an affordable source of animal protein. Production is divided by habitat and capture method:

- **Marine Fisheries:** Harvesting fish varieties like Tuna, Sardines, and Mackerel from open seas and oceans using modern sonar tracking systems.
- **Inland Fisheries:** Cultivating freshwater fish within rivers, ponds, and reservoirs. **Composite Fish Culture Systems** combine 5 to 6 non-competing species (e.g., surface-feeding Catla, column-feeding Rohu, and bottom-feeding Mrigal) in a single pond to maximize feed use and boost yields.

D. Bee Keeping (Apiculture)

Apiculture is the commercial management of honeybees. It requires minimal financial investment while providing dual benefits: producing nutritious raw honey and industrial beeswax, and boosting crop yields through bee pollination.

10. Chapter Summary & Core Keywords

Summary: Improving food resources relies on breeding better crop varieties, managing soil nutrients with manures and fertilizers, and using efficient irrigation. Sustainable cropping patterns like intercropping and rotation preserve soil fertility and manage pests naturally. In animal husbandry, scientific management optimizes production across dairy cattle breeding, specialized poultry lines, and composite freshwater fish systems.

Essential Exam Keywords for High Scoring:

`Desirable Genetic Trait` `Macronutrient Sufficiency` `Humus Soil Improver`

`Root Drip Irrigation` `Sequential Crop Rotation` `Exotic High Lactation` `Composite Aquaculture` `Apiculture Pollination`