



IMPROVEMENT IN FOOD RESOURCES



Chapter 15 - Class 9 Biology

CBSE Curriculum 2025-26

Comprehensive Study Material by Math Love Institute

Raipur, Chhattisgarh



1. INTRODUCTION

Why Improvement in Food Resources?

India has a large population and increasing food demand. To feed everyone, we need to:

- **Increase Crop Production:** More yield from same land
- **Improve Food Quality:** Nutritious and safe food
- **Sustainable Practices:** Without harming environment
- **Cost-Effective Methods:** Affordable for farmers

Green Revolution (1960s): India achieved self-sufficiency in food grains through improved agricultural practices, high-yielding varieties, and better irrigation.

Key Concept

Food Security: Availability, accessibility, and affordability of food for all people at all times.

Three Main Activities for Improvement:

1. **Crop Production Management**
2. **Crop Protection Management**
3. **Animal Husbandry**



2. CROP PRODUCTION MANAGEMENT

Definition

Crop Production Management: Scientific methods and practices used to improve crop yield and quality while maintaining soil fertility.

A. Crop Variety Improvement

Methods of Crop Improvement:

1. Hybridization:

- Crossing between genetically dissimilar plants
- **Types:**
 - Intervarietal: Between different varieties of same species
 - Interspecific: Between different species of same genus
 - Intergeneric: Between different genera
- **Example:** High-yielding varieties of wheat, rice

2. Genetic Modification (GM):

- Introduction of desirable gene into plant cells
- **Example:** Bt cotton (pest resistant)

Desirable Agronomic Characteristics

Characteristic	Benefit
Tallness in fodder crops	More green fodder
Dwarfness in cereals	Less nutrient consumption
High yielding varieties	More production per area
Disease resistance	Reduced crop loss
Drought/frost tolerance	Survival in adverse conditions
Early maturity	Multiple crops per year

B. Crop Production Practices

1. Nutrient Management

Essential Nutrients for Plants:

A. Macro-nutrients (required in large quantity):

- **Nitrogen (N):** Growth of leaves and stems, protein synthesis
- **Phosphorus (P):** Root development, flowering, fruiting
- **Potassium (K):** Overall plant vigor, disease resistance
- **Calcium, Magnesium, Sulphur**

B. Micro-nutrients (required in small quantity):

- Iron, Manganese, Boron, Zinc, Copper, Molybdenum, Chlorine

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Types of Fertilizers & Manures

Aspect	Manure	Fertilizers
Source	Organic (plant/animal waste)	Inorganic (chemical synthesis)
Nutrient Content	Low	High
Effect on Soil	Improves soil structure, adds humus	No effect on soil structure
Absorption	Slow	Fast
Cost	Cheap	Expensive
Example	Compost, Vermicompost, FYM	Urea, NPK, Superphosphate

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Types of Manure

1. Compost:

- Decomposed farm waste, animal excreta, domestic waste
- Rich in organic matter and nutrients

2. Vermicompost:

- Prepared by using earthworms
- High quality, nutrient-rich manure

3. Green Manure:

- Growing plants (like Sunn hemp, Guar) and ploughing them into soil
- Enriches soil with nitrogen

2. Irrigation

Importance of Irrigation

- Provides water for crop growth
- Increases moisture for seed germination
- Helps in nutrient absorption
- Maintains temperature for plant growth
- Protects crops from frost and hot winds

Sources of Irrigation

Source	Description
Wells	Dug wells, Tube wells - groundwater source
Canals	From rivers and reservoirs
Rivers	Direct irrigation from rivers
Tanks	Small storage reservoirs

Modern Irrigation Methods

1. Sprinkler System:

- Water sprayed through nozzles like rain
- Useful for: Uneven land, sandy soil
- Saves water 30-50%
- Suitable for: Wheat, gram, vegetables

2. Drip System:

- Water drops directly to plant roots
- Most efficient water saving (up to 70%)
- Reduces weed growth
- Suitable for: Fruit crops, vegetables, flowering plants

3. Cropping Patterns

Types of Cropping Patterns

1. Mixed Cropping:

- Growing two or more crops simultaneously on same land
- **Example:** Wheat + Gram, Wheat + Mustard
- **Advantages:** Risk minimization, better use of resources, improved soil fertility

2. Inter-cropping:

- Growing two or more crops simultaneously in definite row pattern
- **Example:** Soybean + Maize, Groundnut + Sunflower
- **Advantages:** Maximum utilization of nutrients, pest control, higher productivity

3. Crop Rotation:

- Growing different crops in pre-planned succession on same land
- **Example:** Rice → Wheat → Legume
- **Advantages:** Soil fertility maintained, pest and disease control, nitrogen fixation

Comparison Table

Feature	Mixed Cropping	Inter-cropping
Pattern	No definite pattern	Definite row pattern
Harvesting	Difficult (mixed harvest)	Easy (separate harvest)
Seeds	Seeds are mixed	Seeds planted in rows
Example	Wheat + Gram mixed	Maize rows + Soybean rows

3. CROP PROTECTION MANAGEMENT

Crop Losses

Crops can be damaged by:

- **Weeds:** Unwanted plants competing for nutrients, water, light
- **Insect Pests:** Damage crops by eating, boring, sucking
- **Diseases:** Caused by bacteria, fungi, viruses

A. Weed Control

What are Weeds?

Definition: Unwanted plants growing along with crop plants

Examples: Parthenium (gajar ghas), Xanthium (gokhru), Cyperinus rotundus (motha)

Harmful Effects:

- Compete for water, nutrients, space, light
- Reduce crop yield
- Some weeds are poisonous to animals
- Interfere in harvesting

Methods of Weed Control

1. Mechanical Methods:

- **Tilling:** Before sowing to remove weeds
- **Hand weeding:** Manual removal using khurpi
- **Inter-cultivation:** Removal during crop growth

2. Chemical Methods:

- Using **Weedicides/Herbicides**
- Sprayed during vegetative growth of weeds
- **Example:** 2,4-D (kills dicot weeds, not monocot crops)
- **Caution:** Should be used carefully, can harm crops and environment

3. Preventive Methods:

- Use clean seeds
- Crop rotation
- Proper seed bed preparation

B. Pest Control

Types of Insect Pests

Type	Damage	Example
Chewing Pests	Cut leaves, stems, roots	Grasshopper, Caterpillar
Sucking Pests	Suck cell sap	Aphids, Jassids
Boring Pests	Bore into stems, fruits	Stem borer, Fruit borer

Methods of Pest Control

1. Cultural Methods:

- Crop rotation
- Summer ploughing
- Proper timing of sowing and harvesting
- Inter-cropping

2. Biological Control:

- Using natural predators
- **Example:** Ladybird beetle eats aphids
- Using **Bt toxin** (from bacteria *Bacillus thuringiensis*)
- Safe for environment

3. Chemical Control:

- Using **Pesticides/Insecticides**
- **Example:** DDT, BHC, Malathion
- **Disadvantages:**
 - Harmful to beneficial insects
 - Environmental pollution
 - Bioaccumulation in food chain
 - Pests develop resistance

C. Disease Management

Common Crop Diseases

Crop	Disease	Causal Organism
Rice	Blast	Fungus
Wheat	Rust	Fungus
Potato	Late Blight	Fungus
Tobacco	Mosaic	Virus
Citrus	Canker	Bacteria

Control Methods:

- Use of disease-resistant varieties
- Seed treatment with fungicides
- Crop rotation
- Proper sanitation

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4. ANIMAL HUSBANDRY

Definition

Animal Husbandry: Scientific management of animal livestock for production of food products and other useful materials.

Importance:

- Source of milk, meat, eggs
- Source of wool, leather, silk
- Animals used for labor (bullocks, horses)
- Animal waste used as manure

A. Cattle Farming

Types of Cattle

1. Milch Animals (Dairy Cattle):

- **Purpose:** Milk production
- **Indian Breeds:** Red Sindhi, Sahiwal, Gir
- **Foreign Breeds:** Jersey, Holstein-Friesian, Brown Swiss
- **Characteristics:** Long lactation period, high milk yield

2. Draught Animals (Labor Cattle):

- **Purpose:** Farm work, transport
- **Breeds:** Malvi, Hallikar, Amritmahal
- **Characteristics:** Strong, fast, less fat content

Management Practices for Cattle

1. Feeding:

- **Roughage:** Fibrous food (hay, straw, fodder)
- **Concentrates:** High protein, low fiber (oilcakes, grains)
- **Feed additives:** Minerals, vitamins

2. Shelter:

- Clean, well-ventilated shed
- Regular cleaning
- Protection from rain, heat, cold

3. Health Care:

- Regular vaccination
- Treatment of diseases
- External and internal parasites control

4. Breeding:

- **Artificial Insemination:** Improves breed quality
- **Cross-breeding:** Foreign breed bull × Indian cow
- Produces animals with high milk yield and disease resistance

B. Poultry Farming

Types of Poultry Birds

1. Egg Layers (Layers):

- **Purpose:** Egg production
- **Breeds:** Leghorn, Minorca
- **Characteristics:** Start laying early, lay more eggs (280-300 eggs/year)

2. Broilers (Meat):

- **Purpose:** Meat production
- **Breeds:** Aseel, Plymouth Rock
- **Characteristics:** Fast growth rate, good feed conversion

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Management of Poultry Farm

1. Housing:

- Well-ventilated, clean sheds
- Adequate space
- Proper temperature (18-25°C)
- Clean drinking water always available

2. Feeding:

- Balanced diet with proteins, carbohydrates, fats
- Vitamins and minerals supplements
- Clean, fresh water

3. Health and Hygiene:

- Regular vaccination against diseases
- Maintain cleanliness
- Separation of sick birds
- Protection from predators

Common Poultry Diseases

Disease	Symptoms	Prevention
Ranikhet (Newcastle)	Respiratory problems, twisting neck	Vaccination
Fowl Pox	Wart-like nodules on skin	Vaccination, hygiene
Coccidiosis	Bloody diarrhea	Clean water, dry litter

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C. Fish Production

Types of Fish Production

1. Capture Fishing:

- Capturing fish from natural resources
- **Marine Fishing:** From sea (sea fish)
- **Inland Fishing:** From rivers, lakes, ponds (freshwater fish)

2. Culture Fishery (Fish Farming):

- Rearing and breeding of fish in ponds
- More controlled and productive
- **Types:**
 - **Mariculture:** Culture of marine fish
 - **Aquaculture:** Culture of freshwater fish

Important Fish Species

Marine Fish:

- Pomfret, Mackerel, Tuna, Sardines, Bombay duck

Freshwater Fish:

- **Catla, Rohu, Mrigal** (Indian major carps)
- **Grass carp, Silver carp, Common carp** (Exotic carps)

Composite Fish Culture System

A system where 5-6 different fish species are grown together in same pond:

- Different species feed at different levels of pond
- **Catla:** Surface feeder
- **Silver carp:** Middle zone feeder
- **Rohu:** Middle zone feeder
- **Mrigal, Common carp:** Bottom feeders
- **Grass carp:** Weed feeder

Advantages:

- Maximum utilization of food in pond
- No competition for food
- Increases fish production

D. Bee Keeping (Apiculture)

Importance of Bee Keeping

- Source of **honey** - nutritious food
- Source of **beeswax** - used in cosmetics, polish
- **Pollination** - increases crop yield

Indian Species:

- **Apis cerana indica** (Indian bee)
- **Apis mellifera** (Italian bee) - more honey production

Management of Bee Colony

1. Selection of Location:

- Near flowering plants
- Availability of fresh water
- Away from high noise areas

2. Bee Boxes:

- Wooden boxes with removable frames
- Easy collection of honey without harming bees

3. Honey Collection:

- Smoking to calm bees
- Removal of honey-filled frames
- Extraction without killing bees



5. IMPORTANT DEFINITIONS

Key Terms to Remember

- 1. Hybridization:** Crossing between genetically dissimilar plants to produce improved varieties.
- 2. High Yielding Variety (HYV):** Crop varieties that give more yield per unit area.
- 3. Manure:** Organic matter added to soil to increase its fertility.
- 4. Fertilizers:** Chemical substances rich in nutrients added to soil.
- 5. Irrigation:** Artificial supply of water to agricultural land.
- 6. Crop Rotation:** Growing different crops in succession on same land.
- 7. Inter-cropping:** Growing two crops simultaneously in definite row pattern.
- 8. Weeds:** Unwanted plants growing along with crops.
- 9. Weedicide:** Chemical used to kill weeds.
- 10. Pesticide:** Chemical used to kill pests.
- 11. Animal Husbandry:** Scientific management of livestock.

12. Milch Animals: Animals kept for milk production.

13. Layers: Poultry birds reared for egg production.

14. Broilers: Poultry birds reared for meat.

15. Aquaculture: Culture of freshwater fish.



6. IMPORTANT QUESTIONS & ANSWERS

Very Short Answer Questions (1 mark)

Q1. What is Green Revolution?

Answer: Significant increase in agricultural production in India during 1960s through high-yielding varieties, modern techniques, and better irrigation.

Q2. Name the three nutrients needed by plants in large quantity.

Answer: Nitrogen (N), Phosphorus (P), and Potassium (K).

Q3. What is vermicompost?

Answer: Compost prepared by using earthworms to decompose organic matter.

Q4. Name two modern methods of irrigation.

Answer: Sprinkler system and Drip irrigation system.

Q5. What are milch animals?

Answer: Animals kept for milk production. Example: Cow, Buffalo.

Short Answer Questions (2-3 marks)

Q6. Differentiate between manure and fertilizers.

Answer:

Manure	Fertilizers
Organic substance	Inorganic (chemical)
Prepared from plant/animal waste	Manufactured in factories
Less nutrient content	High nutrient content
Improves soil structure	Does not improve soil structure
Example: Compost, FYM	Example: Urea, NPK

Q7. What is crop rotation? Give one example.

Answer:

Crop Rotation: Growing different crops in succession on same land in a pre-planned pattern.

Example: Rice → Wheat → Legume (pulse crop)

Advantages:

- Maintains soil fertility
- Legumes fix nitrogen in soil

- Controls pests and diseases
 - Reduces soil erosion
-

Q8. What are weeds? How do they harm crops?

Answer:

Weeds: Unwanted plants that grow along with crops.

Harmful Effects:

1. Compete with crops for nutrients, water, space, and light
2. Reduce crop yield significantly
3. Some weeds are poisonous for grazing animals
4. Interfere with harvesting operations

Examples: Parthenium, Xanthium, Motha

Q9. What is composite fish culture system?

Answer:

Composite fish culture is a system where 5-6 different species of fish are grown together in the same pond.

Different species feed at different levels:

- Catla - Surface feeder
- Rohu, Silver carp - Middle zone
- Mrigal, Common carp - Bottom feeders
- Grass carp - Weed feeder

Advantage: Maximum utilization of food, increases production.

Q10. Why is cattle cross-breeding done?

Answer:

Cross-breeding is done to obtain animals with:

- **High milk yield** (from foreign breeds)
- **Disease resistance** (from Indian breeds)
- **Tolerance to heat/cold** (from Indian breeds)

Example: Jersey bull (foreign) × Sahiwal cow (Indian)

Result: Offspring with high milk yield and disease resistance.

Long Answer Questions (5 marks)

Q11. Explain different methods of crop improvement.

Answer:

Crop improvement aims to develop varieties with:

- High yield
- Disease resistance
- Better quality
- Tolerance to adverse conditions

METHODS:

1. HYBRIDIZATION:

- Crossing between genetically dissimilar plants
- **Types:**
 - **Intervarietal:** Between different varieties of same species
 - **Interspecific:** Between different species of same genus
 - **Intergeneric:** Between different genera

2. GENETIC MODIFICATION:

- Introduction of desirable genes into plant
- Example: Bt cotton (insect resistant gene)

3. SELECTION:

- Choosing plants with desirable traits
- Continuously selecting for multiple generations

Result: High Yielding Varieties (HYV) like IR-8 rice, Sonalika wheat

Q12. Differentiate between mixed cropping and inter-cropping.

Answer:

Basis	Mixed Cropping	Inter-cropping
Definition	Growing 2+ crops simultaneously without pattern	Growing 2+ crops in definite row pattern
Sowing	Seeds are mixed before sowing	Seeds sown in separate rows
Harvesting	Difficult, crops harvested together	Easy, separate harvest
Seed selection	Crops with similar maturity period	One crop matures earlier
Example	Wheat + Gram mixed	Maize rows + Soybean rows

Common Advantages:

- Risk minimization
- Better use of resources
- Pest control
- Increased productivity

Q13. Describe the management practices for dairy animals.

Answer:

Management practices for high milk yield and healthy cattle:

1. FEEDING:

- **Roughage:** Fibrous food like hay, straw, green fodder (maintains rumen health)
- **Concentrates:** High protein food like grains, oilcakes (for milk production)
- **Feed additives:** Minerals and vitamins for proper nutrition
- Adequate clean drinking water

2. SHELTER:

- Clean, well-ventilated, spacious cattle shed
- Regular cleaning and disinfection
- Protection from extreme weather
- Proper drainage system

3. HEALTH CARE:

- Regular vaccination against diseases
- Timely treatment of sick animals
- Control of external parasites (ticks, lice)
- Control of internal parasites (worms)
- Regular veterinary check-ups

4. BREEDING:

- Selection of good quality breeds
- Artificial insemination for better offspring
- Cross-breeding for desired traits

Q14. What is biological control of pests? Explain with examples.

Answer:

Biological Control: Use of natural enemies (predators, parasites, pathogens) to control pest population.

EXAMPLES:

1. Use of Predators:

- **Ladybird beetle** feeds on aphids
- **Dragonfly** feeds on mosquito larvae

2. Use of Parasites:

- **Trichogramma wasp** lays eggs in butterfly eggs, killing them

3. Use of Pathogens:

- **Bacillus thuringiensis (Bt)** - bacteria producing toxin that kills insect larvae
- Used in Bt cotton, Bt brinjal

ADVANTAGES:

- Environmentally safe
- Target specific pests
- No chemical residues
- Cost-effective in long term
- No development of resistance

DISADVANTAGES:

- Slow acting
 - Requires knowledge and expertise
 - May affect non-target organisms
-

Q15. Describe the management practices for poultry farming.

Answer:

Good management is essential for successful poultry farming:

1. HOUSING:

- Well-ventilated, spacious sheds
- Adequate space per bird
- Proper lighting (natural + artificial)
- Temperature control (18-25°C)
- Clean, dry litter on floor

2. FEEDING:

- Balanced diet with proteins, carbohydrates, fats
- Vitamin and mineral supplements
- For layers: High protein (18-20%)
- For broilers: Very high protein (22-24%)
- Clean, fresh water always available

3. HEALTH & HYGIENE:

- Regular vaccination against diseases
- Daily cleaning of sheds
- Periodic disinfection
- Separation and treatment of sick birds
- Protection from predators

4. DISEASE MANAGEMENT:

- Vaccination against Ranikhet, Fowl pox
- Deworming periodically
- Biosecurity measures

5. BREEDING:

- Selection of good quality parent stock
- Proper incubation of eggs

7. EXAM PREPARATION GUIDE

High Priority Topics

- ✨ Methods of crop improvement (Hybridization, GM)
- ✨ Difference between Manure and Fertilizers
- ✨ Macro-nutrients and micro-nutrients
- ✨ Modern irrigation methods (Sprinkler, Drip)
- ✨ Cropping patterns (Mixed, Inter-cropping, Crop rotation)
- ✨ Weed control methods
- ✨ Biological control of pests
- ✨ Types of cattle (Milch vs Draught)
- ✨ Management of dairy animals
- ✨ Poultry farming (Layers vs Broilers)
- ✨ Composite fish culture system
- ✨ Bee keeping

EXAM STRATEGY

Common Question Patterns:

1. **Comparison tables (3-5 marks)** - Very common!

- Manure vs Fertilizers
- Mixed cropping vs Inter-cropping
- Layers vs Broilers
- Milch animals vs Draught animals

2. **Methods and Practices (3-5 marks)**

- Crop improvement methods
- Weed/Pest control methods
- Management of cattle/poultry








3. **Short definitions (1-2 marks)**

- Green Revolution, Hybridization
- Crop rotation, Vermicompost
- Aquaculture, Apiculture

4. **Reasons/Advantages (2-3 marks)**

- Why cross-breeding?
- Advantages of biological control
- Benefits of crop rotation

Common Mistakes to Avoid

-  Confusing manure with fertilizers
-  Mixing up mixed cropping and inter-cropping
-  Not mentioning specific examples
-  Forgetting to write full forms (NPK, HYV, GM)
-  Not explaining advantages when asked
-  Incomplete tables in comparison questions
-  Not mentioning scientific names (Bt, Apis cerana)

QUICK REVISION - Chapter Summary

CROP PRODUCTION:

- **Improvement:** Hybridization, GM crops, Selection
- **Nutrients:** NPK (Macro) + Micronutrients
- **Manure:** Organic (Compost, Vermicompost, Green manure)
- **Fertilizers:** Chemical (Urea, NPK, Superphosphate)
- **Irrigation:** Sprinkler (uneven land), Drip (best water saving)
- **Cropping:** Mixed (no pattern), Inter (rows), Rotation (succession)

CROP PROTECTION:

- **Weeds:** Mechanical, Chemical (weedicides), Preventive
- **Pests:** Cultural, Biological (natural enemies), Chemical (pesticides)
- **Diseases:** Resistant varieties, Crop rotation, Sanitation

ANIMAL HUSBANDRY:

- **Cattle:** Milch (milk), Draught (labor)
- **Management:** Feeding, Shelter, Health, Breeding
- **Poultry:** Layers (eggs), Broilers (meat)
- **Fish:** Composite culture system (5-6 species)

- **Bees:** Honey, Wax, Pollination

Key Mnemonics

NPK - Plant Nutrients:

- **N**itrogen - **N**ew leaves & stem growth
- **P**hosphorus - **R**oot, flower, fruit (think: P helps Plants)
- **K**alium (Potassium) - **K**eeps plant healthy (vigor)

Crop Patterns - "MIR":

- **M**ixed - Mixed together
- **I**nter - In rows
- **R**otation - Rotation in time

Fish Levels - "CSM":

- **C**atla - Ceiling (Surface)
- **S**ilver/Rohu - Standing (Middle)
- **M**rigal - Mat (Bottom)

Pest Control - "CCB":

- **C**ultural methods
- **C**hemical methods
- **B**iological methods

Important Tables for Exam

Make sure you can draw these comparison tables:

1. Manure vs Fertilizers (5 points minimum)
2. Mixed Cropping vs Inter-cropping (5 points)
3. Milch Animals vs Draught Animals (4 points)
4. Layers vs Broilers (4 points)
5. Indian Fish vs Exotic Fish (examples)
6. Macro-nutrients vs Micro-nutrients (with examples)

Writing Tips

- Always write full forms first: NPK (Nitrogen, Phosphorus, Potassium)
- Give specific examples: Don't just write "improved varieties", write "IR-8 rice, Sonalika wheat"
- For "advantages" questions, write minimum 4 points
- In comparison questions, make proper table format
- Use scientific terms: *Bacillus thuringiensis* (Bt), *Apis mellifera*
- Number your points clearly

Expected Questions for Board Exam

1 Mark Questions:

- What is Green Revolution?
- Name three macro-nutrients
- What is vermicompost?
- Give two examples of milch animals
- What are layers?

2-3 Mark Questions:

- Differentiate: Manure vs Fertilizers
- What is crop rotation? Give example
- Explain composite fish culture
- Why is cattle cross-breeding done?
- What are weeds? How harmful?

5 Mark Questions:

- Explain crop improvement methods
- Compare mixed cropping and inter-cropping
- Describe management of dairy animals
- Explain biological control of pests
- Management practices for poultry

Study Material Information

This comprehensive study material on **Improvement in Food Resources** (Chapter 15, Class 9 Biology) covers all aspects of crop production, crop protection, and animal husbandry as per the latest CBSE curriculum. It includes detailed explanations, comparisons, methods, and practice questions for thorough exam preparation.

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- Aristotle

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