INDIAN IQ

TARGET AIR 1

AFO MAINS AT YOUR FINGERTIPS

INDIA'S ONLY COMPLETE & SMART REVISION NOTES FOR IBPS AFO MAINS

SUBJECT WISE, TOPIC WISE COMPLETE CRUX OF ALL IMPORTANT TOPICS FROM WHERE IBPS ASKS QUESTIONS FOR FAST TRACK REVISION WITH SMART SCHEDULES

BY INDIAN IQ

#7_DAYS_REVISION_CHALLENGE

ENGLISH MEDIUM

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Note- Subject wise printable practice sets with exact actual exam level questions based on the revision notes will be sent in the month of January to all students who enrol for FINGERTIPS revision notes.

DEMO OF

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Note- This is not the complete notes. It is demo notes. The first pages of each subject is taken and added to the demo notes.

GENERAL AGRICULTURE

Branches of agriculture-

Branch of Agriculture	Focus Area	Description
Pomology	Fruit	Study and cultivation of fruit
Agronomy	Crop Cultivation	Science of soil and crop production
Pedalogy	Soil	Study of soil in its natural setting
Edaphology	Influence on Soil	Study of how soil influences living beings
Viticulture	Grapes	Study and production of grapes
Silviculture	Forest	Study and management of forests
Mori Culture	Mulberry	Cultivation of mulberry trees
Sericulture	Silkworm	Raising of silkworms for silk
Apiculture	Bees	Beekeeping
Olericulture	Vegetables	Study and cultivation of vegetables
Floriculture	Flowers	Cultivation and management of flowers and foliage plants
Vermiculture	Earthworm	Cultivation of earthworms
Pisciculture	Fish	Breeding, rearing, and transplantation of fish
Aviculture	Birds	Raising and care of birds
Horticulture	Plants	The art and science of plant cultivation specially fruits, vegetables, flowers, spices, medicinal plants etc.
Animal Husbandry	Domestic Animals	Breeding and care of farm animals
Hydrology	Water	Scientific study of movement, distribution and availability of water on earth

Event and Milestones in Agriculture-

Period	Events or Milestones
10000BC	Hunting & gathering
8700BC	Domestication of sheep
7500BC	Wheat & Barley cultivation
6000BC	Domestication of Cattle's & Pigs
4400BC	Maize Cultivation
3500BC	Potato cultivation
3400BC	Wheel invention
3000BC	Bronze tools
2900BC	Plough invention & irrigation
2700BC	Domestication of silkworm in China
2300BC	Cultivation of chickpea, Pear, sarson & cotton
2200BC	Domestication of Fowl, Buffalo, and elephant
2200-2000BC	Rice cultivation
1800BC	Finger millet cultivation
1725BC	Sorghum Cultivation
1700BC	Taming of horse
1500BC	Sugarcane cultivation & well irrigation
1400BC	Use of Iron
15th Century	Cultivation of Oranges, Brinjal

SEED TECHNOLOGY

Various classes of seeds with its description-

Seed Class	Description	Uses	Color of Seed Tag
Nucleus Seed	Purest form of seeds with the highest genetic purity.	Used for Breeder Seed production.	No colour
Breeder Seed	Produced from nucleus seeds and has high genetic purity.	Used for Foundation Seed production.	Golden Yellow
Foundation Seed	Produced from breeder seeds; less genetically pure compared to breeder seeds.	Used for Certified Seed production.	White
Registered Seed	Produced from foundation seeds; a transition stage to certified seeds.	Used for Certified Seed production.	Purple
Certified Seed	Meets minimum standards of quality and is used directly by farmers.	General cultivation	Blue
Truthfully Labelled Seed	Seeds sold with an assurance of physical and genetic quality as claimed by seller.	May be used for any class of production.	No specific color
Quality Declared Seed	Meets minimum quality standards but not as stringent as certified seeds.	Subsistence or small-scale farming.	-

Characteristics of good quality seed-

Parameter	Description
Genetic Purity	Ensure the seed's genetic makeup is consistent.
Physical Purity	Free from foreign matter, debris, and other seeds.
Germination Rate	Percentage of seeds capable of sprouting.
Vigor	Overall health and strength of seedlings.
Moisture Content	Optimal moisture levels for storage and planting.
Seed Size and Weight	Uniformity in size and weight for consistent planting.
Disease Resistance	Resistance to common pathogens and diseases.
Seed Coat Integrity	Presence of intact seed coats for protection.
Seedling Uniformity	Consistency in seedling growth for even crops.
Seed Maturity	Harvested at the right stage for maximum quality.

Higher genetically purity:

Breeder /Nucleus - 100%
Foundation seed - 99.5%
Certified seed - 99.0%

Higher physical purity for certification-

Maize, Bhendi - 99%
All crops (most) - 98%
Carrot - 95%
Sesame, soybean & jute - 97 %
Ground nut - 96 %

International Seed Analysis Certificate-

AGRONOMY

Crops Based on Indian Cropping Seasons-

Season	Crop Examples
Rabi	Wheat, Barley, Mustard, Gram, Peas, Sunflower
Kharif	Rice, Maize, Cotton, Soybean, Sorghum, Millet
Zaid	Watermelon, Cucumber, Bitter Gourd, Muskmelon

Category of field crops-

Type of Field Crop	Examples
Cereal Crops	Wheat, Rice, Maize, Barley
Pulses	Chickpea, Lentil, Pigeon pea
Oilseed Crops	Mustard, Soybean, Sunflower, Taramira, Sesame, Safflower, Flax
Fiber Crops	Cotton, Jute, Sisal
Forage Crops	Alfalfa (Nitrogen rich), Clover, Bermuda Grass
Tubers	Potato, Sweet Potato
Sugar Crops	Sugarcane, Sugar Beet
Spices	Chili, Turmeric, Black Pepper
Medicinal Crops	Aloe Vera, Ashwagandha
Fruits	Mango, Banana, Apple
Nuts	Cashew, Almond, Walnut
Beverage Crops	Tea, Coffee, Cocoa

Life cycle of crops-

Cycle	Description	Examples
Annual	Complete their life cycle in one growing season, after which the plant dies, and a new one must be grown from seed.	Rice, Wheat, Maize, Soybean, Sunflower
Biennial	Take two years to complete their biological life cycle. Grow leaves, stems, and roots in the first year and go dormant for winter. Flower, produce fruits and seeds, and then die in the second year.	Carrot, Onion, Beetroot, Cabbage
Perennial	Last for more than two years. These plants may produce fruit, flowers, and seeds over many years.	Coconut, Banana, Mango, Alfalfa, Sugarcane

Scientific name, family and chromosome numbers of important crops-

Common Name	Scientific Name	Family	Chromosome Number
Wheat	*Triticum aestivum*	Poaceae (Gramineae)	2n=42
Rice	*Oryza sativa*	Poaceae (Gramineae)	2n=24
Corn	*Zea mays*	Poaceae (Gramineae)	2n=20
Soybean	*Glycine max*	Fabaceae (Leguminosae)	2n=40
Cotton	*Gossypium hirsutum*	Malvaceae	2n=52
Sugarcane	*Saccharum officinarum*	Poaceae (Gramineae)	2n=80
Barley	*Hordeum vulgare*	Poaceae (Gramineae)	2n=14
Tomato	*Solanum lycopersicum*	Solanaceae	2n=24
Potato	*Solanum tuberosum*	Solanaceae	2n=48
Sunflower	*Helianthus annuus*	Asteraceae	2n=34
Peanut	*Arachis hypogaea*	Fabaceae (Leguminosae)	2n=40
Sorghum	*Sorghum bicolor*	Poaceae (Gramineae)	2n=20
Chickpea	*Cicer arietinum*	Fabaceae (Leguminosae)	2n=16
Lentil	*Lens culinaris*	Fabaceae (Leguminosae)	2n=14

SOIL SCIENCE

Types of rocks, parent material, formation and examples-

Rock Type	Examples	Parent Material for Soil Type	Formation
Igneous	Granite, Basalt	Sandy, Silty	Formed from the cooling and solidification of magma or lava
Sedimentary	Limestone, Shale	Loamy, Clayey	Formed from the accumulation and cementation of mineral and organic particles over time
Metamorphic	Slate, Marble	Varied depending on parent rock	Formed from the alteration of existing rock types (igneous, sedimentary, or other metamorphic) due to heat, pressure, or mineral exchange

Soil Orders and Their Characteristics-

Soil Order	Characteristics	Common Parent Material	Typical Climate
Alfisols	Moderately leached, high fertility	Shale, Limestone	Humid, Sub-humid
Andisols	Volcanic origin, high water holding capacity	Volcanic ash	Cool to Moderate
Aridisols	Dry, low organic matter, low plant nutrients, high Boron	Loess, Alluvium	Arid, Semi-arid
Entisols	Newly formed, limited profile development	Any	Various
Gelisols	Frozen, contain permafrost	Organic material	Polar regions
Histosols	Organic matter-rich, poor drainage	Peat, Muck	Wetlands, Cold regions
Inceptisols	Weakly developed horizons, young soils	Various	Various
Mollisols	Dark, organic-rich, fertile	Grasslands	Temperate, Prairie
Oxisols	Highly weathered, low fertility	Tropical plants	Tropical
Spodosols	Acidic, sandy, leached E horizon	Sandy parent materials	Humid, Cold
Ultisols	Strongly leached, acidic, low fertility	Shale, Sandstone	Hot, Humid
Vertisols (Black Soil)	High clay content, self-mixing, shrink-swell	Clayey materials	Various, often Tropical

Soil Forming Processes - Fundamental and Specific-

Category	Process Name	Description
Fundamental Processes	Humification	Transformation of raw organic matter into humus through a complex process involving various organisms.
	Eluviation	Washing out of constituents from upper to lower layers by percolating water. Results in an eluvial horizon (A or E horizon).
	Illuviation	Deposition of soil materials in the lower layer removed from the eluvial horizon. Results in illuvial horizons (B-horizons).
	Horizonation	Differentiation of soil into different horizons along the depth due to humification, eluviation, and illuviation.
	Hydration	Hydration involves the absorption of water molecules by minerals in the rock.
	Hydrolysis	Hydrolysis is a chemical reaction where water molecules dissociate into hydrogen and hydroxide ions, which then react with minerals to form new minerals and soluble salts.
Specific Processes	Calcification	Precipitation and accumulation of calcium carbonate (CaCO3) in part of the profile, forming a calcic horizon.
	Decalcification	Removal of $CaCO_3$ or calcium ions from the soil by leaching.
	Podzolization	Soil formation resulting in Podzols and Podzolic soils. Opposite of calcification in many respects.
	Laterization	Removal of silica, leaving sesquioxide to concentrate in the solum.
	Gleization	Formation of a glei or gley horizon in the lower part of the profile due to poor drainage and waterlogged conditions.
	Salinization	Accumulation of salts like sulphates and chlorides in soils, common in arid and semi-arid regions.
	Desalinization	Removal by leaching of excess soluble salts from the soil profile.
	Solonization	Accumulation of sodium ions on the clay's exchange complex, resulting in sodic soils (Solonetz).

GENETICS, PLANT BREEDING & BIOTECHNOLOGY

- **Genetics**: The study of heredity and the variation of inherited characteristics.
- **Gregor Mendel**: Known as the father of genetics, he laid the groundwork for the science of genetics through his work on pea plants.

Discoveries and Terms-

- **Nucleus**: The central and most important part of a cell, controlling its activities. Discovered in flowering plant cells by Robert Brown.
- **Biology**: The science that studies life. The term was coined by J.B. Lamarck.
- **Embryology**: The science of the development of embryos from fertilization to birth, founded by C.F. Wolff.
- **Protoplasm**: The living content of a cell, the term was given by Purkinje.
- Terms 'Cytoplasm' and 'Nucleoplasm': Strasburger
- Term 'Nucleic Acid': S. Altman
- Term 'Gene', 'Genotype', 'Phenotype': W.L Johannsen
- Cell Discovery: Robert Hook in cork tissue
- Cell theory in plants and animals: Schleiden and Schwann
- Theory of Pre-existing cells in animals: Virchow
- Pre-formation theory: Swammerdam and Bonnet

Theories in Genetics

- **Theory of Acquired Characters**: Proposed by Lamarck, it states that characteristics acquired or lost during an organism's lifetime are inherited. Disproved by Weismann.
- **Theory of Pangenesis**: Proposed by Darwin, it suggests that each part of the body contributes to the traits inherited by offspring.
- **Germplasm Theory**: Proposed by August Weisman, it opposes the concept of acquired characteristics being inheritable.

Chromosome Basics

- **Chromosomes**: Thread-like structures carrying genetic information, discovered by Strasburger.
- **Mitotic Metaphase**: The stage in cell division where chromosomes are most condensed and easiest to view.

Chromosome Components and Types

- **Chromatid**: Each of the two thread-like strands into which a chromosome divides during cell division.
- **Centromere**: The point on a chromosome where the chromatids are joined and where spindle fibers attach during cell division.
- **Telomeres**: The end structures of chromosomes, which protect them from degradation.

Phases and Events

- **Cell Cycle**: The cycle of growth, DNA duplication, and cell division that happens in eukaryotic cells.
- **Mitosis**: A type of cell division that results in two identical daughter cells. The term was coined by Flemming.
- **Meiosis**: A type of cell division that reduces the chromosome number by half, leading to four non-identical daughter cells.

Mendel's Contributions

- **Law of Segregation**: States that allele pairs separate independently during the formation of gametes.
- **Law of Independent Assortment**: States that genes found on different chromosomes are sorted into sex cells independently of one another.

Statistical and Analytical Tools

- **Probability**: The mathematical study of random events, or the likelihood that a specific event will occur.
- **Chi-Square Test**: A statistical test used to determine the probability of obtaining observed proportions by chance, under a specific hypothesis.

Concepts in Genetics

- **Allele**: One of the possible forms of a gene.
- **Phenotype**: The physical expression of a gene.
- **Genotype**: The genetic makeup of an individual.
- **Hybrid**: An organism produced by crossing parents that have different genetic characteristics.
- **Back Cross**: Crossing a hybrid with one of its parents.
- **Test Cross**: Crossing a hybrid with a homozygous recessive parent to determine the hybrid's genotyp

PLANT PATHOLOGY

Definition of diagnostic symptoms in plant diseases-

Disease	Diagnostic Symptoms	Affected Plants
Rust	Orange to reddish-brown pustules on leaves and stems.	Wheat, Corn, Roses
Mildew	White powdery substance on the surface of leaves, flowers, and fruits.	Grapes, Peas, Roses
Blight	Rapid and complete chlorosis, browning, then death of plant tissues.	Potatoes, Tomatoes
Wilt	Wilting and drooping of leaves despite adequate watering.	Tomatoes, Cotton
Canker	Sunken, dead areas on the bark or surface of stems and roots.	Citrus, Apple Trees
Scab	Raised, rough spots resembling a scab on fruits and leaves.	Apples, Potatoes
Rot	Softening, discoloration, and often decay of tissues.	Fruits, Tubers
Leaf Spot	Dark brown or black colored spots on leaves.	Many plants
Galls	Abnormal outgrowths or swellings of plant tissues.	Many plants
Anthracnose	Dark, sunken lesions on leaves, stems, flowers, and fruits.	Tomatoes, Beans
Damping-off	Seedlings collapse, darken at base, and die.	Various seedlings
Chlorosis	Yellowing of leaves, often due to lack of chlorophyll.	Various plants
Mosaic	Mottled green or yellow-green leaf coloring, often in a mosaic pattern.	Various plants
Fire Blight	Wilting, blackening and death of shoots, often resembling fire damage.	Apples, Pears
Downy Mildew	White to grayish, fuzzy growth on the underside of leaves.	Grapes, Lettuce
Necrosis	Death of plant tissue, usually leaves, turning them brown or black.	Various plants
Verticillium Wilt	Yellowing and wilting of older leaves, followed by younger leaves.	Tomatoes, Strawberries
Root Rot	Rotten, often discolored roots, leading to wilting of the plant.	Various plants
Clubroot	Swollen, deformed roots resembling clubs.	Cruciferous vegetables
Viral Stunting	Reduced growth, smaller leaves, and general loss of vigor.	Various plants
Crown Gall	Round, hard, tumor-like growths at the crown of the plant.	Various plants
Smuts	Dark, soot-like spores forming on leaves, stems or flowers.	Corn, Grasses
Fusarium Wilt	Yellowing of leaves, stunted growth, and wilting, starting with older leaves.	Tomatoes, Melons
Bacterial Soft Rot	Soft, watery, and decayed plant tissues with foul smell.	Potatoes, Carrots

- **Classification of diseases based on occurrence-**

Type of Occurrence	Examples of Diseases	Conditions Leading to Occurrence	Affected Plants
Endemic	Late Blight of Potato	Consistent in a specific geographic area	Potatoes
Epidemic	Wheat Rust	Rapid spread affecting many plants	Wheat
Sporadic	Fire Blight	Occurs infrequently and unpredictably	Apples, Pears
Seasonal	Powdery Mildew	Occurs during specific seasons	Various plants
Facultative	Anthracnose	Occurs under certain conditions	Various plants
Obligate	Downy Mildew	Always present and affects only specific hosts	Cucumbers, Grapes

- **Classification of plant disease based on different criteria-**

Basis of Classification	Types of Plant Diseases
Based on Causal Agents	
- Fungi	- Rusts, Smuts, Powdery Mildews, Downy Mildews, Molds
- Bacteria	- Soft Rot, Bacterial Wilt, Crown Gall
- Viruses	- Mosaic, Yellowing, Ringspot, Necrosis
- Nematodes	- Root-knot Nematodes, Cyst Nematodes
- Protozoa	- Slime Molds, Water Molds
Based on Affected Part	

ENTOMOLOGY

Taxonomical classification of Insects-

Phylum (Arthropoda)	Class (Pterygota or Apterygota)	Subclass (Exopterygota or Endopterygota)	Characteristics and Examples	Important Orders
Arthropoda	Pterygota	Exopterygota	- External wings, incomplete metamorphosis, nymph stage.	- Orthoptera (Grasshopper and Locusts)
			- E.g., Grasshopper	- Thysanoptera (Thrips)
				- Isoptera (Termites)
				- Hemiptera (Aphids, Leafhopper, True bugs, Whitefly)
	Apterygota		- Wingless, no metamorphosis.	
			- E.g., Silverfish	
		Endopterygota	- Internal wings, complete metamorphosis, larval and pupal stages.	- Coleoptera (Weevils and Beetles)
			- E.g., Bees and Wasps	- Lepidoptera (Moths and Butterflies)
				- Diptera (Flies)
				- Hymenoptera (Bees, Ants, and Wasps)

Types of Metamorphosis in insects-

Type of Metamorphosis	Description	Example(s)
Ametabolous/Ametamorphous	No metamorphosis; Egg transforms into adult-like structure	Silver fish
Hemi metamorphosis	Egg develops into nymph, which molts into adult	N/A
Holometamorphosis	Egg develops into larva, then pupa, and finally adult	N/A

Types of Larvae and Feeding Patterns-

Type of Larvae	Associated Order	Examples	Feeding Pattern	Example(s)
Nymph	Orthoptera, Hemiptera	Grasshoppers, Aphids, Whiteflies	Monophagous	Pink boll worm
Caterpillar	Lepidoptera	Butterflies, Moth	Oligophagous	Cabbage butterfly
Grub	Coleoptera, Hymenoptera	Weevils, Bees	Phytophagous	Gram Pod Borer
Maggots	Diptera	Housefly	Saprohagous	Drosophila
Niads	Odonatan	Dragonfly	-	-

Morphology of Head Structure-

Component	Description	Types	Example(s)
Head	Made of 5-7 fused segments	Prognathous (This is where the mouthparts are directed anteriorly)	Beetles
Eyes, Antennae	Sensory organs	Hypognathous (head is more or less vertical and the mouthparts are directed ventrally)	Grasshopper
Mouthparts	Used for feeding	Ophisthognathous (This is where the mouthparts are directed posteriorly)	Bugs

Type of antennae-

CROP PHYSIOLOGY

Terms Describing Levels of Nutrients in Plants

Term	Description
Deficient	Low concentration causing yield loss and visible symptoms.
Critical Range	Concentration below which yield loss occurs.
Sufficient	No increase in yield with added nutrient, luxury consumption possible.
Excessive/Toxic	High concentration that reduces growth and yield.

Classification of Essential Elements-

Element Type	Elements
Macronutrients	N, P, K, S, Ca, Mg
Micronutrients	Fe, Zn, Mn, Cu, B, Cl, Mo
Additional Micronutrients	Na, Co, Va, Ni, Si

Essential Nutrients for Plant Growth and Their Principal Forms for Uptake-

Nutrient	Chemical Symbol	Principal Forms for Uptake
Carbon	C	CO_2
Hydrogen	H	H_2O
Oxygen	O	H_2O, O_2
Nitrogen	N	NH^{+4}, NO^{-3}
Phosphorus	P	$H2PO^{-4}$, HPO_2^{-4}
Potassium	K	K^+
Calcium	Ca	Ca^{2+}
Magnesium	Mg	Mg^{2+}
Sulphur	S	SO_2^{-4}, SO_2
Iron	Fe	Fe^{2+}, Fe^{3+}
Manganese	Mn	Mn^{2+}
Boron	B	H_3BO_3
Zinc	Zn	Zn^{2+}
Copper	Cu	Cu^{2+}
Molybdenum	Mo	MoO_2^{-4}
Chlorine	Cl	Cl^-

Relative and Average Plant Nutrient Concentrations-

Plant Nutrient	Average Concentration*
H	6.0%
O	45.0%
C	45.0%
N	1.5%
K	1.0%
Ca	0.5%
Mg	0.2%
P	0.1%
S	0.1%
Others (Micronutrients)	Very minute concentration (in PPM)

AGRICULTURE EXTENSION

Classification of extension teaching methods-

Category	Description	Examples
According to Use		
Individual Contacts	Group Contacts	Mass Contacts
Office Calls	Group Meetings, Discussions	Electronic Media (Radio, Television, Cell-phones)
Personal Letters	Method and Result Demonstration	Internet-based Media
Telephone Calls	Field Trips, Field Days, Campaign	Print Media (Newspapers, Magazines, Leaflets, Posters, Pamphlets, Circular Letters, Bulletins)
Farm & Home Visits	Conferences, Seminars, Workshops	Exhibitions, Dairy Melas
According to Form		
Written	Spoken	Object or Visual
Circular Letters	Telephone Calls, Radio	Slides & Film-strips, Models, Exhibits
Bulletins	Farm & Home Visits	Demonstration Plots
Leaflets, Folders, News, Articles	Official Calls	Motion-Pictures or Movies, Charts
Personal Letters	General & Special Meetings	Result Demonstrations
Additional Extension Methods		
Farm & Home Visit	- Direct interaction between extension professionals and farmers.	Information exchange and two-way dialogue.
Method Demonstration	- Demonstrating new procedures or methods, often to groups.	Examples: clean milk production, paneer making, sowing new technology.
Result Demonstration	- Showing the benefits of recommended practices in local contexts.	Farmers learn by doing and seeing results.
Group Discussion	- Interaction in groups to discuss local issues and engage in democratic decision-making.	Stimulating debate and involvement.
Exhibition	- Planned presentation of data, specimens, models, posters, etc., to attract attention.	Effective for reaching illiterate audiences.
Campaign	- Drawing attention to specific issues, such as animal health and tick control.	Rapid outreach to a large number of people.
Field Tour	- Farmer-led tours to witness new techniques, products, and abilities in action.	Providing insights into local suitability.
Print Media	- Newspapers, magazines, bulletins, leaflets, folders, pamphlets, wall news sheets.	Providing detailed information on various topics.
Radio	- Mass communication tool for disseminating information and conducting talks, debates, etc.	Wide reach with minimal resources.
Television	- Aural and visual impact for spreading knowledge about agriculture and dairy.	Useful for demonstrating tasks and education.

Important agricultural extension programs in India-

Program Name	Objective	Implementing Agency	Key Features
Krishi Vigyan Kendras (KVKs)	Disseminate agricultural technology	ICAR	On-farm testing, frontline demonstrations, training
ATMA (Agricultural Technology Management Agency)	Integrate extension services	State Governments	Farmer-centric, decentralized planning
Rashtriya Krishi Vikas Yojana (RKVY)	Enhance agricultural productivity	Ministry of Agriculture	Financial support to states, focus on local needs

HORTICULTURE

Various branches of horticulture-

Branch	Description
Pomology	Study and cultivation of fruit crops
Olericulture	Study and cultivation of vegetable crops
Floriculture	Cultivation and management of flowering plants
Landscape Horticulture	Design, construction, and management of landscapes
Viticulture	Study and cultivation of grapevines
Arboriculture	Care and study of individual trees, shrubs, vines, and other woody plants
Apiculture	Study and maintenance of honeybees for the production of honey
Sericulture	Cultivation of silkworms to produce silk

Nutritive Value of Fruits and Vegetables-

Nutrient	Fruits Which Top	Vegetables Which Top
Vitamin A	Mango, Papaya	Carrot, Bathua leaves
Vitamin B1 (Thiamine)	Cashew, Walnut	Chilly, Colocasia
Vitamin B2 (Riboflavin)	Bael, Litchi, Papaya	Fenugreek, Amaranthus
Vitamin C (Ascorbic acid)	Barbados cherry, Aonla	Drumstick leaves, Coriander leaves
Carbohydrates	Raisin, Apricots	Tapioca, Sweet Potato
Protein	Cashewnut, Almond	Lima bean, Peas
Fibre	Avocado, Pomegranate	Potato
Fat	Walnut, Almond	Potato
Phosphorus	Almond, Cashewnut	Amaranthus, Garlic
Calcium	Litchi, Dry Karonda	Agathi, Curry Patta
Potassium	Guava, Banana	Spinach, Brussels sprout
Iron	Dry Karonda, Date	Agathi, Amaranthus
Calorific value	Walnut, Almond	Tapioca, Garlic

Area and Production of Fruits-

Leading in	Fruits	Percentage (%)
Area	Mango, Citrus, Banana, Apple, Guava, Papaya	36.5, 15.6, 12.1, 4.5, 3.5, 1
Production	Banana, Mango, Citrus, Papaya, Guava, Apple	37, 21, 13.5, 5.5, 3.6, 2.5

Productivity & Region-wise Dominance-

Information	States or Crops
Highest production of fruit crops	Andhra Pradesh, followed by Maharashtra
Largest area of fruit crops	Maharashtra, followed by Andhra Pradesh
Highest in productivity of fruit crops	Madhya Pradesh, followed by Tamil Nadu
Leading in Plantation Production & Area	Coconut, Cashew, Arecanut
Leading in Vegetable Production & Area	Potato, Onion, Tomato

Suitable Plants in Orchard for Intercrops-

Main Crop	Intercrop
Coconut	Banana
Mango	Papaya, Garlic

Botanical classification of Fruit Crops-

POST HARVEST MANAGEMENT

Harvest Operations in Various Field Crops-

Field Crop	Method of Harvesting	Equipment Used	Optimal Time for Harvesting
Rice	Manual cutting or mechanical harvest	Sickle, Combine Harvester	When grains are hard and moisture is below 20%
Wheat	Mechanical harvest or manual cutting	Combine Harvester, Sickle	When grains are hard and straw turns yellow
Maize (Corn)	Hand-picking or mechanical harvest	Corn Harvester, Hands	When kernels are hard and moisture is below 25%, Sweet corn: 1-3 days after emergence of silk
Sugarcane	Manual cutting	Cane Knife, Mechanical Harvester	When sugar content is high, usually 9-12 months after planting
Cotton	Hand-picking or mechanical harvest	Cotton Picker, Hands	When bolls open up and cotton fluff is exposed
Soybean	Mechanical harvest	Combine Harvester	When pods are mature and leaves drop
Sorghum	Manual cutting or mechanical harvest	Sickle, Combine Harvester	When grains are hard and moisture is below 20%
Barley	Mechanical harvest	Combine Harvester	When grains are hard and straw turns yellow
Sunflower	Manual cutting or mechanical harvest	Sickle, Combine Harvester	When back of the head turns yellow to brown
Groundnut (Peanut)	Manual lifting or mechanical digger	Spade, Mechanical Digger	When most of the pods are mature
Mustard	Manual cutting or mechanical harvest	Sickle, Combine Harvester	When pods turn brown and start to split
Lentils	Mechanical harvest	Combine Harvester	When 80-90% of pods have changed from green to tan

Harvest Operations in Various Horticultural Crops-

Horticultural Crop	Method of Harvesting	Equipment Used	Optimal Time for Harvesting
Apple	Hand-picking	Hands, Picking Poles	When fruit is firm and fully colored
Mango	Hand-picking or using a picking pole	Hands, Picking Poles	When fruit slightly changes color
Grapes	Hand-picking or mechanical harvest	Hands, Grape Harvester	When sugar content reaches desired level
Tomato	Hand-picking	Hands	When fruit is fully colored but still firm
Cucumber	Hand-picking	Hands	Before seeds fully develop
Watermelon	Hand-picking	Hands	When ground spot turns yellow and fruit sounds hollow
Strawberry	Hand-picking	Hands	When fruit is fully red
Potato	Mechanical digging or hand digging	Potato Digger, Spade	When foliage dies back
Onion	Hand-pulling or mechanical harvest	Hands, Onion Harvester	When tops fall over and begin to dry
Carrot	Hand-pulling or mechanical harvest	Hands, Carrot Harvester	When roots reach desired size
Cauliflower	Hand-cutting	Knife	When heads are compact
Spinach	Hand-cutting or mechanical harvest	Knife, Spinach Harvester	Before flowering begins
Broccoli	Hand-cutting	Knife	When heads are compact but before flowering
Rose	Hand-cutting	Pruning Shears	Early morning, when buds are partially open
Marigold	Hand-picking	Hands	Early morning, when fully open but fresh
Orchid	Hand-cutting	Pruning Shears	When first few buds start to open

ANIMAL HUSBANDRY

Taxonomic Classification of Important Livestock Animals in India-

Common Name	Kingdom	Phylum	Class	Order	Family	Genus	Species
Cow	Animalia	Chordata	Mammalia	Artiodactyla	Bovidae	Bos	*Bos taurus, Bos indicus*
Buffalo	Animalia	Chordata	Mammalia	Artiodactyla	Bovidae	Bubalus	*Bubalus bubalis*
Goat	Animalia	Chordata	Mammalia	Artiodactyla	Bovidae	Capra	*Capra aegagrus hircus*
Sheep	Animalia	Chordata	Mammalia	Artiodactyla	Bovidae	Ovis	*Ovis aries*
Pig	Animalia	Chordata	Mammalia	Artiodactyla	Suidae	Sus	*Sus scrofa domesticus*
Chicken	Animalia	Chordata	Aves	Galliformes	Phasianidae	Gallus	*Gallus gallus domesticus*
Duck	Animalia	Chordata	Aves	Anseriformes	Anatidae	Anas	*Anas platyrhynchos*
Horse	Animalia	Chordata	Mammalia	Perissodactyla	Equidae	Equus	*Equus ferus caballus*

Systems of livestock production-

System	Description	Characteristics
Extensive System	Livestock roam freely over large areas, often grazing on natural vegetation	Low input, low stocking density, extensive land use
Intensive System	Livestock are kept in confined spaces with controlled feeding and management	High input, high stocking density, efficient resource use
Semi-Intensive System	A combination of extensive and intensive, with some confinement and some access to grazing	Moderate input, moderate stocking density, balanced resource use
Pastoral System	Livestock are raised by nomadic or semi-nomadic herders who follow seasonal grazing patterns	Relies on natural pastures, mobile herding practices
Mixed Farming System	Livestock are integrated into crop farming, where both crops and animals are raised together	Diversified production, symbiotic relationship

Composite table for group, adult male, adult female, young male, young female, new born, castrated male, meat, mating, parturition, sound of various livestock animals-

Factor	Cattle	Buffalo	Goat	Sheep	Rabbit	Swine	Horse	Poultry	Yak	Camel
Group Term	Herd	Herd	Tribe/Flock	Flock	Colony	Herd	Herd/Troop	Flock	Herd	Herd
Adult Male	Bull	Bull	Buck	Ram	Buck	Boar	Stallion	Rooster	Bull	Bull
Adult Female	Cow	Cow	Doe	Ewe	Doe	Sow	Mare	Hen	Cow	Cow
Young Male	Bullock	Bullock	Kid	Lamb	--	Shoat	Colt	Cockerel	--	Calf
Young Female	Heifer	Heifer	Kid	Lamb	--	Gilt	Filly	Pullet	--	Calf
New Born	Calf	Calf	Kid	Lamb	Kitten	Piglet	Foal	Chick	Calf	Calf
Castrated Male	Steer	Steer	Wether	Wedder/Wether	Lapin	Barrow	Gelding	Capon	--	Gelding
Meat	Beef	Beef	Chevon	Mutton	Game	Pork	Horse meat	Poultry	Beef	Camel meat
Mating	Serving	Serving	Serving	Tupping	--	Boaring	Covering	Treading	--	--
Parturition	Calving	Calving	Kidding	Lambing	Kindling	Farrowing	Foaling	Hatching	Calving	Calving
Sound	Lowing	Grunting	Bleating	Baaing	Thumping	Grunting	Neighing	Clucking	Grunting	Groaning

Metabolic rates and physiological parameters of various livestock animals-

Animal	Normal Body Temperature (°C)	Heart Rate (beats/min)	Pulse Rate (beats/min)	Blood Pressure (mm Hg)	Respiration Rate (breaths/min)	Average Life Expectancy (Years)
Cattle	38.5 - 39.5	60 - 70	60 - 70	80 - 140	10 - 30	18 - 22
Buffalo	37.5 - 38.5	45 - 50	45 - 50	70 - 130	10 - 30	15 - 25

POULTRY

Taxonomic Classification of Important Poultry Birds-

Common Name	Kingdom	Phylum	Class	Order	Family	Genus	Species
Chicken	Animalia	Chordata	Aves	Galliformes	Phasianidae	Gallus	*Gallus gallus domesticus*
Duck	Animalia	Chordata	Aves	Anseriformes	Anatidae	Anas	*Anas platyrhynchos*
Turkey	Animalia	Chordata	Aves	Galliformes	Phasianidae	Meleagris	*Meleagris gallopavo*
Quail	Animalia	Chordata	Aves	Galliformes	Phasianidae	Coturnix	*Coturnix coturnix*
Pigeon	Animalia	Chordata	Aves	Columbiformes	Columbidae	Columba	*Columba livia*
Guinea Fowl	Animalia	Chordata	Aves	Galliformes	Numididae	Numida	*Numida meleagris*
Emu	Animalia	Chordata	Aves	Casuariiformes	Casuariidae	Dromaius	*Dromaius novaehollandiae*

Breeds of poultry-

Class	Breed	Origin / Native Tract	Key Features	Weight Range (Adults)	Use	Egg Color
Asiatic						
	Brahma	Brahmaputra Valley, India	Large body, pea comb, light and dark varieties	3.1 - 5.4 kg	Meat, Eggs	Brown
	Cochin	China	Crested heads, feathered legs		Meat, Feathers	Brown
	Longson	China	Crimson lobes, white skin, deep brown eggs	3.5 - 5 kg	Meat, Eggs	Deep Brown
	Asil	Bangladesh	Broad chest, lengthy necks, tiny eggs	2.5 - 4 kg	Meat	
	Kadak Nath	Madhya Pradesh, India	Dark-colored flesh, light brown eggs		Meat	Brown to Black
Others						
	Ankaleshwar	Gujarat				
	Aseel	Chhattisgarh, Orissa, AP				
	Busra	Gujarat, Maharashtra				
	Chittagong	Meghalaya, Tripura				
	Danki	Andhra Pradesh				
	Daothigir	Assam				
	Ghagus	AP, Karnataka				
	Harringhata Black	West Bengal				
	Kalasthi	Andhra Pradesh				
	Kashmir Faverolla	Jammu and Kashmir				
	Miri	Assam				
	Nicobari	Andaman & Nicobar				
	Punjab Brown	Punjab, Haryana				
	Tellichery	Kerala				
	Mewari	Rajasthan				

Class	Origin	Breed/Type	Key Characteristics	Weight (Adult Cocks & Hens in kg)	Egg Shell Color
American Class	U.S.A	Rhode Island Red	Hardy, good for all environments	C: 3.8, H: 3	Big, Brown

DAIRY TECHNOLOGY

Average Milk Production Per Lactation Length and Per Day in different breeds of cow, buffalo and goat-

Animal Type	Breed	Average Milk Production Per Lactation (Liters)	Lactation Length (Days)	Avg. Milk Production per Day (Liters)
Cattle	Holstein	10,000	305	32.8
Cattle	Jersey	6,000	280	21.4
Cattle	Guernsey	7,000	290	24.1
Cattle	Sahiwal	2,500	270	9.3
Cattle	Red Sindhi	2,000	260	7.7
Cattle	Ayrshire	6,500	295	22.0
Buffalo	Murrah	2,200	310	7.1
Buffalo	Nili-Ravi	2,000	300	6.7
Buffalo	Surti	1,800	280	6.4
Buffalo	Jaffarabadi	1,900	290	6.6
Buffalo	Bhadawari	1,600	275	5.8
Goat	Saanen	1,000	305	3.3
Goat	Alpine	900	290	3.1
Goat	Nubian	750	270	2.8
Goat	Boer	600	250	2.4
Goat	LaMancha	850	280	3.0
Goat	Toggenburg	700	265	2.6

Physical properties of milk-

Property	Typical Value	Unit
Density	1.027 - 1.033	g/cm³
pH	6.4 - 6.8	N/A
Freezing Point	-0.54 - -0.52	°C
Boiling Point	100.5 - 101.5	°C
Viscosity	1.5 - 3	mPa·s
Surface Tension	45 - 50	mN/m
Specific Heat Capacity	4.2	J/(g·K)
Thermal Conductivity	0.54	W/(m·K)
Refractive Index	1.34 - 1.35	-
Solubility (in water)	Miscible	-
Color	White to Creamy	-
Odor	Mild, Fresh	-
Taste	Sweet, Creamy	-

Composition of Milk (% by Weight) of Different Species-

Species	Water (%)	Fat (%)	Protein (%)	Lactose (%)	Minerals (Ash) (%)
Cow (Holstein)	87.8	3.6	3.2	4.9	0.7
Cow (Jersey)	86.5	5.3	3.8	4.7	0.9
Buffalo (Murrah)	81.1	7.4	3.9	5.2	0.9
Goat (Saanen)	88.0	3.1	2.9	4.4	0.9
Sheep	80.6	6.4	5.4	4.7	1.0
Camel	86.0	3.6	2.7	4.4	0.9

PROTECTED CULTIVATION, ORGANIC FARMING, PRECISION AGRICULTURE AND MUSHROOM FARMING

All types of Protected Cultivation Houses-

Type of Protected Cultivation House	Short Definition
Greenhouse	A structure with walls and roof made chiefly of transparent material for controlled environment.
Polyhouse	Similar to a greenhouse but covered with polyethylene or other plastic material.
Shade House	A structure that uses shade cloth to control the amount of sunlight that reaches the plants.
Cold Frame	A low, bottomless box with a transparent roof, used to protect plants from cold weather.
Hotbed	Similar to a cold frame but with a heat source like electrical cables for temperature control.
High Tunnel	A taller version of a polyhouse, allowing for the cultivation of taller crops.
Net House	A structure covered with mesh or netting to protect against pests while allowing natural airflow.
Walk-in Tunnel	A low-cost, low-height polyhouse that you can walk into, suitable for small-scale farming.
Glasshouse	A greenhouse with glass walls and roof for maximum light penetration and durability.
Conservatory	A greenhouse attached to a residence, used for the cultivation and protection of tender plants.
Terrarium	A small indoor garden in a transparent container for small, humidity-loving plants.
Mist House	A greenhouse with a misting system to maintain high humidity, often used for propagation.
Aquaponic Greenhouse	A greenhouse that combines aquaculture (raising fish) with hydroponics (soilless plant culture).
Aeroponic Greenhouse	A greenhouse where plants are grown in air or mist without the use of soil.

Types of Greenhouses Categorized on Different Bases-

Basis of Classification	Type of Greenhouse	Short Definition
Structure	Even Span	Greenhouses with symmetrical roof spans.
Structure	Uneven Span	Greenhouses with asymmetrical roof spans, often built on slopes.
Structure	Lean-To	Half a greenhouse, leaning against another structure.
Structure	Quonset	Semi-circular in shape, made of steel or PVC.
Structure	Sawtooth	Features a series of trapezoidal vents at the roof peak for natural ventilation.
Structure	Gothic Arch	Features a pointed arch for the roof, providing more headroom and less surface area.
Covering Material	Glass	Made entirely of glass, allows maximum light penetration.
Covering Material	Polyethylene	Covered with a layer of plastic film.
Covering Material	Polycarbonate	Made with twin-wall or multi-wall polycarbonate sheets.
Covering Material	Shade Cloth	Covered with woven or knitted fabric to control light and temperature.
Ventilation	Natural Ventilation	Uses roof and side vents for air exchange.
Ventilation	Forced Ventilation	Uses fans and shutters to control air exchange.
Heating	Heated	Equipped with heating systems for temperature control.
Heating	Unheated	Relies on solar heat and is not equipped with additional heating.

Important Components and Terms Associated with Greenhouses-

Component / Term	Short Definition
Glazing	The transparent material used to cover the greenhouse, e.g., glass, polyethylene.
Frame	The structural skeleton that holds the greenhouse together.
Vent	Openings used for natural ventilation, usually located on the roof or sides.
Fan	Mechanical device used for forced ventilation.
Heating System	Equipment used to maintain temperature, e.g., heaters, boilers.
Cooling System	Equipment used to lower temperature, e.g., evaporative cooling pads.
Drip Irrigation	A system that delivers water directly to each plant via tubing.

SERICULTURE & APICULTURE

Taxonomic Classification of Silkworm and Honeybee-

Common Name	Kingdom	Phylum	Class	Order	Family	Genus	Species
Silkworm	Animalia	Arthropoda	Insecta	Lepidoptera	Bombycidae	Bombyx	Bombyx mori etc.
Honeybee	Animalia	Arthropoda	Insecta	Hymenoptera	Apidae	Apis	Apis mellifera, Apis cerana etc.

Silkworm Species in India, type of silk, quality of silk, Host plants/foods and scientific name of host plants and distribution-

Silkworm Species (Scientific Name)	Type of Silk Produced	Quality of Silk	Host Plant or Food	Host Plant (Scientific Name)	Distribution in India
Bombyx mori	Mulberry Silk	Fine, lustrous	Mulberry leaves	*Morus alba, Morus indica*	All over India, especially South India
Antheraea mylitta	Tussar Silk	Coarse, textured	Arjun, Asan, Sal	*Terminalia arjuna, Terminalia tomentosa, Shorea robusta*	Central and Eastern India
Antheraea assamensis	Muga Silk	Golden, glossy	Som, Soalu	*Persea bombycina, Litsaea polyantha*	Assam, Northeastern India
Antheraea proylei	Oak Tussar Silk	Coarse, durable	Oak leaves	*Quercus spp.*	Himalayan region, Northeast India
Samia Cynthia/ Philosamia ricini	Eri Silk (Open ended cocoon)	Matte, wool-like	Castor, Kesseru	*Ricinus communis, Heteropanax fragrans*	Northeast India, parts of South India

Silkworm Morphology and Physiology-

Feature	Description
Body Segments	Divided into three main segments: head, thorax, and abdomen
Color	Varies depending on the species; commonly white or yellowish
Size	Larval stage can be up to 3 inches long; adult moths are generally smaller
Skin	Soft, segmented, and covered with fine hairs in some species
Mouthparts	Mandibulate mouthparts for chewing leaves
Antennae	Short and stubby; primarily for sensing
Eyes	Simple eyes (ocelli) for detecting light and dark
Silk Glands	Specialized glands for silk production; usually two, one on each side
Digestive System	Simple; consists of a foregut, midgut, and hindgut
Respiratory System	Tracheal system for gaseous exchange
Circulatory System	Open circulatory system with a dorsal heart
Excretory System	Malpighian tubules for waste removal
Reproductive System	Generally unisexual; females have ovaries and males have testes
Metamorphosis	Complete metamorphosis; stages include egg, larva, pupa, and adult
Silk Production	Produced in the larval stage; silk is a protein fiber spun for cocoon formation
Feeding Behaviour	Larvae are voracious feeders; adults generally do not feed
Life Span	Short; a few weeks for larvae, and a few days to weeks for adults depending on species

Temperature and Relative Humidity for Different Stages of Sericulture-

Stage of Sericulture	Optimal Temperature (°C)	Optimal Relative Humidity (%)	Additional Notes
Egg Incubation	24-28	80-85	Consistent temperature is crucial
Larval Stage (1st Instar)	24-28	75-80	High humidity helps in molting
Larval Stage (2nd Instar)	24-28	75-80	Similar to 1st instar
Larval Stage (3rd Instar)	24-28	70-75	Slightly lower humidity is better
Larval Stage (4th Instar)	24-28	65-70	Lower humidity helps in molting
Larval Stage (5th Instar)	24-28	60-65	Preparing for cocoon formation

FORESTRY & AGROFORESTRY

Disciplines of forestry-

Discipline	Definition
Silviculture	The science and art of cultivating forest trees, involving practices like planting, tending, and harvesting trees to achieve specific objectives such as timber production or conservation.
Arboriculture	The cultivation, management, and study of individual trees, shrubs, vines, and other perennial woody plants. It is often focused on ornamental trees rather than timber-producing forests.
Forest Ecology	The study of the interrelationships between forest organisms and their environment, exploring how factors like climate, soil, and water affect forest health and biodiversity.
Forest Management	The application of business methods and scientific principles to the operation and maintenance of forests, often with the aim of achieving sustainable yields and conservation.
Agroforestry	The practice of integrating trees or shrubs with crop and/or animal systems to achieve benefits such as increased biodiversity, reduced erosion, and improved water quality.
Dendrology	The identification and systematic classification of trees.

Types of forestry on different basis-

Basis for Classification	Types of Forestry	Description
Scale	Industrial Forestry	Large-scale operations often aimed at maximizing economic returns.
	Smallholder Forestry	Smaller scale, often family-owned forests, managed for subsistence or local markets.
	Urban Forestry	Management of trees in urban settings for the purpose of improving the urban environment.
	Farm Forestry	Involves the incorporation of commercial tree growing into farming systems.
Management Practices	Even-aged Forestry	Forests are managed so that all trees are of the same age class.
	Uneven-aged Forestry	Forests are managed to maintain a mix of age classes.
	High-Grade Forestry	Focuses on harvesting only the most valuable trees.
	Low-Grade Forestry	Focuses on harvesting less valuable trees to improve the overall quality of the forest.
	Selective Forestry	Only certain species or sizes of trees are harvested.
Ecological Focus	Restoration Forestry	Aims to restore ecosystems that have been degraded or altered.
	Sustainable Forestry	Manages forest resources to meet the long-term ecological, social, and economic needs.
Climatic Zones	Tropical Forestry	Focuses on the unique challenges and opportunities of managing forests in tropical climates.
	Temperate Forestry	Focuses on forest management in temperate zones.
	Boreal Forestry	Concerned with the management of forests in cold, northern latitudes.
	Dryland Forestry	Focuses on the challenges of managing forests in arid or semi-arid regions.
Productive Functions	Supply of Food	Trees like Mango, Ber, Jackfruit, etc. supply food.
	Supply of Fodder	Trees like Subabhul, Vilayti chinch, etc. supply fodder for cattle.
	Supply of Fuel Wood	Species like Subabul, Khair, Sissoo, etc. supply fuel wood.
	Supply of Timber	Trees like Teak wood, Eucalyptus, Silver oak, etc. produce timber.
	Other Products	Minor forest products like flower, medicinal plants, fibre, gum, etc.
Protective Function	Wind break	Reduces wind speed and erosion.
	Shelter belt	Provides shelter from wind, sun, snow, etc.
	Soil conservation	Prevents soil erosion.
	Moisture Conservation	Helps in retaining soil moisture.
	Soil improvement	Enhances soil fertility.

FISHERIES & AQUACULTURE

Taxonomic classification of fishes-

Kingdom: Animalia

- **Description**: All fishes belong to the Kingdom Animalia, characterized by multicellular organisms that are heterotrophic (consume organic substances for sustenance).

Phylum: Chordata

- **Description**: Fishes are part of the Phylum Chordata, which includes animals that have a notochord, a dorsal nerve cord, and gill slits at some stage in their life.

Subphylum: Vertebrata

- **Description**: Fishes fall under the Subphylum Vertebrata, which means they have a vertebral column or backbone.

Classes:

Class	Characteristics	Examples	Families
Actinopterygii	Ray-finned fishes; most numerous and diverse class; swim bladder for buoyancy	Salmon, Trout, Tuna, Perch	Salmonidae, Scombridae, Percidae
Sarcopterygii	Lobe-finned fishes; fleshy, lobed, paired fins, which are joined to the body by a single bone	Coelacanth, Lungfish	Coelacanthidae, Ceratodontidae
Chondrichthyes	Cartilaginous fishes; skeletons made of cartilage rather than bone; lack swim bladder	Sharks, Rays, Skates	Carcharhinidae, Rajidae
Myxini	Hagfish; jawless; produce slime as a defense mechanism	Pacific Hagfish	Myxinidae
Petromyzontida	Lampreys; jawless; parasitic or non-parasitic; single nostril	Sea Lamprey, River Lamprey	Petromyzontidae
Placodermi	Extinct; armored fishes; first jawed vertebrates	Dunkleosteus, Bothriolepis	Dunkleosteidae, Bothriolepididae
Osteichthyes	Bony fishes; includes both Actinopterygii and Sarcopterygii; true bone structure	All bony fishes	All families in Actinopterygii and Sarcopterygii

Additional Categories:

- **Genus**:
  - *Salmo* (Salmon)
  - *Carcharodon* (Great white shark)
  - *Danio* (Zebrafish)
- **Species**:
  - *Salmo salar* (Atlantic salmon)
  - *Carcharodon carcharias* (Great white shark)
  - *Danio rerio* (Zebrafish)

Overview of Fisheries-

Fisheries Resources, Management, and Exploitation

Fisheries can be broadly categorized into two types: Fin Fishery and Non-Fin Fishery. These can be further divided based on the environment in which they operate: freshwater, brackish water, and marine. The two main approaches to fisheries are Capture Fishery and Culture Fishery.

Fin Fishery (Cultivation of **true fishes is Fin fishery** which include two major groups Capture Fishery and Culture Fishery)

- **Capture Fishery**: This involves the natural recruitment of species and is carried out in various aquatic environments like seas, rivers, and reservoirs. Over time, the yield from capture fisheries has been decreasing due to overfishing, including the catching of brooders and juveniles.
- **Culture Fishery**: This is a more controlled form of fishery where selected fish species are cultivated in confined areas. The focus is on maximizing yield through stocking, nursing, and rearing in fertilized ponds with supplementary feeds. Culture fisheries is conducted **in freshwater, brackish water and sea waters.** With the development and expansion of new culture systems, farming of a wide variety of aquatic organisms like prawns, crabs, molluscs, frogs, sea weeds, etc. have come under culture fisheries. Due to the culture of a variety of aquatic organisms, culture fisheries has been termed as **aquaculture**.

Non-Fin Fishery

AGRICULTURE ENGINEERING

Various forms of mobile and stationary farm power and their technical details-

Form of Farm Power	Mobility	Power Source	Equipment/Machinery	Key Technical Details
Human Power	Mobile	Human labour	Hand tools like hoe, sickle, spade	- Uses human physical effort - Low power output (0.05 kW)
Draft Animal Power	Mobile	Animals like bulls, horses	Animal drawn implements like plough, harrow, cart	- Bullock pair can provide 0.5-1.0 kW power - Slow speed of operation (2-5 km/hr)
Tractor Power	Mobile	Diesel engine	Implements like MB plough, seed drill, threshers	- Power range 30-80 Kw - Speed range 2-30 km/hr
Power Tiller	Mobile	Gasoline engine	Rotary tiller, cultivator, trailer, thresher	- Power range 5-12 kW - Speed range 1.5-3.5 km/hr
Electric Motor	Stationary	Electricity	Water pumps, threshers, milling machines	- Power range 0.5-50 kW - Fixed installation, not portable
Diesel Engine	Stationary	Diesel	Water pumps, threshers, milling machines	- Power range 5-50 kW - Fixed installation, not portable
Windmill	Stationary	Wind energy	Water pumping, electricity generation	- Power range 0.1-3 kW - Require minimum wind speed
Biogas Plant	Stationary	Biogas	Biogas stove, lamps, dual fuel engines	- 1 m^3 biogas can produce 2 kW power - Limited portability
Solar PV System	Stationary	Solar energy	Water pumps, fodder choppers, lights	- Power range 0.1-5 kW - Require sufficient solar insolation

Some important terminology related to horsepower (HP) in agricultural engineering-

- HP (Horsepower) - A unit of power equivalent to 746 watts or 33,000 foot-pounds per minute. It was originally defined as the power a horse could exert over time.
- IHP (Indicated Horsepower) - The theoretical horsepower of an engine calculated from the cylinder pressure developed during the power stroke. It does not take into account mechanical losses in the engine.
- BHP (Brake Horsepower) - The usable power output of an engine at the flywheel or driveshaft. It takes into account the friction and other mechanical losses in the engine. Also called SHP (Shaft Horsepower).
- PTO HP (Power Take Off Horsepower) - The horsepower available at the power take off (PTO) shaft of a tractor or implement. Used to run implements and attachments.
- FHP (Frictional Horsepower) - The horsepower required to overcome friction in an engine. Calculated as IHP - BHP.
- Drawbar HP - The power available at the drawbar of a tractor for pulling implements. Less than PTO HP due to drivetrain losses.
- Belt HP - The horsepower delivered via a belt drive on a stationary engine. Used to drive machinery and implements.

Some other related terms-

- Torque - Rotational force measured in lb-ft or Nm. Torque x engine speed (RPM) = Power (HP).
- Kilowatt (kW) - Metric unit of power. 1 HP = 0.745 kW. Common in electrical equipment.
- Diesel engine HP ratings - Approximate max HP for diesel engines: stationary <100 HP; tractor 100-600 HP; combines/harvesters 300-500 HP. Peak HP - The maximum horsepower an engine can produce at a given rpm, usually the full throttle rpm.
- Rated HP - The sustained or continuous power output an engine can produce when running at a specified rpm. Lower than peak HP.
- PTO Power - The minimum PTO horsepower required to operate an implement or attachment. Used for selection.
- Load HP - The actual horsepower required to perform a specific task under field load conditions. Varies with load.
- Volumetric efficiency - Ratio of air actually inducted vs cylinder volume. Affects power generation. Improved by turbochargers/intercoolers.
- Mechanical efficiency - Ratio of BHP vs IHP. Improved by reducing friction losses.
- Thermal efficiency - Ratio of energy in fuel converted to work output. Improved by higher compression ratios.
- Swept volume - Total volume displaced by all pistons in an engine. Along with rpm, affects power developed.
- Boost pressure - Additional air pressure added by a turbocharger, measured in psi or bar. Increases volumetric efficiency.

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