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TARGET 2018

AGRICULTURE

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I N D E X

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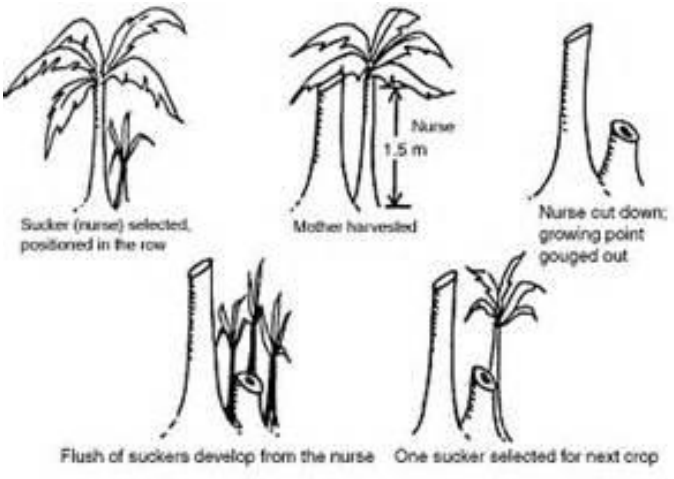
Agriculture – 2018

1. Agriculture terms & definitions

Ratooning

- Ratooning is a practice of growing a crop from the stubbles of previous crop, without replanting.
- Ratoon cropping is also referred to as stubble cropping, re-harvesting, second crop, etc.
- It is used extensively in sugarcane, bananas and plantains, pineapple, forage crops and minor fiber crops.
- To a limited extent it is also used in rice, sorghum, pigeon pea, and some vegetables.
- Only one ratoon should be taken because incidence of pests and diseases and deterioration of soil increases after that.



- **Benefits** - Ratoon saves cost on preparatory tillage and planting material.
- It gets the benefit of residual manure and moisture.
- Ratoon crop matures earlier and gives more or less the same yield.
- It makes efficient use of the growing seasons and facilitates crop intensification, and thus helps in improving agricultural productivity.

2. Multi tier cropping

- Multi tier cropping is a kind of intercropping. It is also called multi-layer cropping or multi storied cropping.
- It is the practise of growing plants of different height in the same field and at the same time.
- The objective is to utilize the vertical space more effectively.
- It is mostly practised in orchards and plantation crops for maximum use of solar energy even under high planting density.
- Some of the combinations may include Coconut+ coffee+ black pepper, Sugarcane + mustard+ potato, etc
- **Benefits** - All growing space is used, as crop fit together -
    i. vertically (tall, medium & short)
    ii. horizontally (all planting spots occupied)
    iii. underground (deep-rooted and shallow-rooted plants)
- Efficiently utilizes the soil moisture at different depths of soil, and receives solar energy at different heights.
- Income per unit area increases substantially. Also, harvesting different crops in different seasons ensures a more even distribution of income and employment throughout the year.

- Minimizes risks of crop yield loss. Reduces the impacts of hazards like high intensity rainfall, soil erosion and landslides.
- Effective utilization of leaching materials, effective weed control.
- It increases biodiversity which reduces pest and disease pressure.
- Provides micro-climate conditions that benefit crops underneath.

3. Contour farming

- Contour ploughing or contour farming is the practice of ploughing and/or planting across a slope.
- The furrows are ploughed perpendicular rather than parallel to the slopes.
- These contour lines create a water break which reduces the formation of rills and gullies during times of heavy water run-off, preventing top soil loss and soil erosion.
- Contouring can reduce soil erosion by as much as 50% from up and down hill farming.
- It helps reduce sediment runoff, increase water infiltration, and thus promotes better water quality.
- Contour farming is considered an active form of sustainable agriculture.
- A similar practice is contour bunding where stones are placed around the contours of slopes.

4. Terrace Farming

- Terrace farming is a method of farming whereby "steps" known as terraces are built onto the slopes of hills and mountains.
- Terrace farming was invented by the Inca people who lived in the South American mountains.
- The difference from contour ploughing is that contour ploughing follows the natural shape of the slope without altering it.
- On the other hand, terrace farming alters the shape of the slope to produce flat areas that provide a catchment for water.
- When it rains, water flows to the next terrace instead of carrying away the soil nutrients and plants down the slope.
- Terraces trap rainwater allowing cultivation of water-intensive crops such as rice.

5. Dry land Agriculture

- Dryland Agriculture in general refers to growing of crops entirely under rainfed conditions, in the **absence of irrigation facilities** in arid areas.
- Based on the amount of rainfall received, dryland agriculture can be grouped into three categories:
    1. **Dry Farming**: Cultivation of crops in areas where rainfall is less than 750 mm per annum
    2. **Dryland Farming**: Cultivation of crops in areas receiving rainfall above 750 mm
    3. **Rainfed Farming**: Cultivation of crops in regions receiving more than 1,150 mm.
- Dryland farming is highly important to ensure the economic stability of regions with arid lands. In its absence, vast tracts of lands would be left barren and unproductive.

- **METHOD** - Soil and water management methods are specifically designed to conserve the maximum quantity of water on a particular piece of land.
- Its success depends on the efficient use of the little **moisture** that is trapped in the soils of crop fields for growing crops.
- **Soil conservation** by contour bunding, terracing, land sloping and land levelling and also by practicing conservational tillage (zero tillage and minimum tillage) is important.
- Wise **selection of crops** that will suitably adapt to the farming conditions is also an essential component. Crops grown through dryland agricultural systems must be highly drought tolerant.
- Major dry farming crops are millets such as jowar, bajra, ragi, oilseeds like mustard, rapeseed, and pulse crops like pigeon pea, gram and lentil.
- Dryland areas also contribute significantly to wheat and rice production.

6. Wind breaks/ Shelter belts

- **Windbreaks** are any barrier that protects the crops from the effects of wind.
- **Shelter belts** are plantings of trees, shrubs, or a combination of the two, to reduce wind speed in an agricultural area.
- Heavy wind increases loss of moisture both by increasing transportation and surface evaporation.
- Fruit orchards usually cause heavy losses when exposed to strong wind.
- Shelter belts are generally erect and tall growing, hardy and drought resistant, mechanically strong and dense to resist maximum wind.
- The varied benefits are that it -
    i. reduces the wind velocity
    ii. checks the evaporation losses of water from the soil surface
    iii. prevents the damage caused by cold wind and frost
    iv. increases production by minimizing wind damage

7. Agri silviculture

- Agri-silviculture is a type of agro-forestry.
- It is a production technique which combines the growing of agricultural crops with simultaneously raised and protected forest crops.
- This system emphasizes rising of trees, and cultivation of food and fodder crops in the available space between the trees.
- Some of the benefits include the following :
    i. improved and sustained crop productivity
    ii. increased level of income for farmers

iii. improved nutritive value of animal feed due to the supply of green fodder
iv. suitable for soil nutrient recycling; helps reduce chemical fertilizer purchase
v. reduces surface run off, soil erosion, nutrient loss, gully formation and landslides
vi. reduces pressure on community and other natural forests for fodder, fuel wood and timber

8. Mixed farming

- In mixed farming a farmer can take up different types of practices along with doing the main business of agriculture.
- Some of these practices include poultry faming, dairy farming, bee keeping, sericulture, pisciculture, shrimp farming, goat and sheep rearing, piggery, etc.
- The aim is to increase income through different sources and to complement land and labour demands across the year.
- Diversification of crops and livestock offers varied options for farmers to face uncertain weather conditions associated with increased climate variability.
- Mixed cropping (polyculture, inter-cropping, or co-cultivation) is a type of agriculture that involves planting two or more plants simultaneously in the same field.

9. Agro pastoral farming

- Agro pastoral farming is a type of mixed farming.
- The structure of agropastoral farming systems is defined by
  i. the mix of crop and animal components
  ii. use of on-farm resources
  iii. interactions among the components
  iv. flows of energy and nutrients
  v. individual contribution of each component to farm productivity
- In effect, the incorporation of livestock into farming systems adds another trophic level to the system.
- Animals recycle the nutrient content of plants, transforming them into manure and allowing a broader range of fertilization alternatives in managing farm nutrients.

10. Agrostological measures

- Agrostological measures refer to the practices that are aimed at soil conservation to protect the soil from erosion and to maintain the productive capacity of the soil.

- The following are the important agrostological practices that check soil erosion:
- **Cultivation of grasses** (Ley farming) - It is recommended for heavily eroded soil to grow grass for many years to let the soils naturally repair themselves.
- Ley farming practises cultivating grass in rotation with regular crops to increase the nutrient level in the soils.
- Grasses improve the soil structure, porosity, infiltration and also add organic matter to the soil. It also helps prevent soil erosion by intercepting rainfall, binding the soil particles, etc.
- **Retiring the land -** Land retirement is a practice that takes agricultural lands out of production.
- It is resorted due to poor drainage and soils containing high levels of salt and selenium (a mineral found in soil).
- Restored native plant communities on retired land may also provide important habitat for the recovery of special-status species.
- **Afforestation and Reforestation** - Healthy vegetational cover is essential to check accelerated erosion, flooding and silting.
- In this regard, afforestation refers to growing forests at places where there were no forests before.
- Reforestation means replanting of forests at places where they have been destroyed by uncontrolled forest fires, excessive felling, etc.
- **Checking of overgrazing** - A system of restricted and rotational grazing may be helpful in checking soil erosion to some extent.

11. Soil fertility

- Soil fertility is the ability of the soil to provide all essential plant nutrients in available forms and in a suitable balance.
- It is the ability of the soil to sustain plant growth and optimize crop yield.
- A fertile soil contains all the major nutrients for basic plant nutrition.
- These include macro-nutrients such as hydrogen, oxygen, carbon from air and water, and nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, etc from the soil.
- The micro-nutrients include iron, manganese, zinc, copper, boron, molybdenum, chlorine, nickel, etc.
- Macronutrients are needed in high quantity, and micronutrients are needed in small amounts.

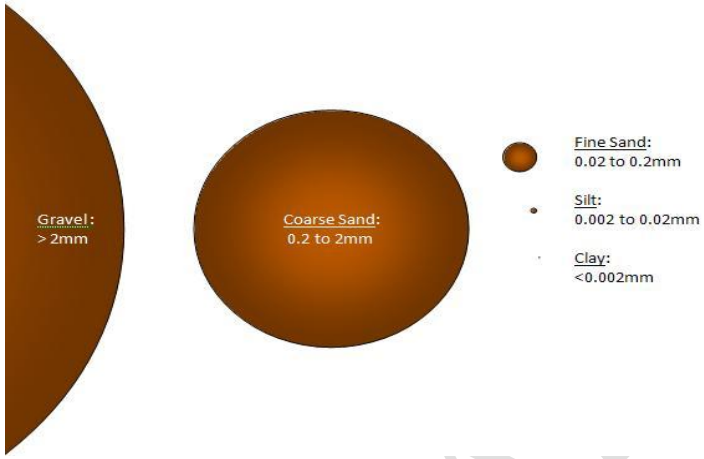
12. Soil productivity

- Soil productivity refers to how productive the soil is in terms of output.
- Soil productivity is the resultant of several factors such as -
    i. soil fertility
    ii. good soil management practices
    iii. availability of water supply
    iv. suitable climate, etc
- Soil fertility refers to the nature of the soil. A fertile soil may not be productive, as soil productivity depends on various other factors as well as the requirements of the crops planted.
- Soil fertility can be enhanced through the application of organic and inorganic fertilizers to make it more productive.

13. Soil texture

- Soil texture is a classification of soil based on its physical texture and characteristics, particularly the size of the particles that make up the soil.
- Depending on the size of the particles and its amount, the soil texture is classified as gravel, coarse sand, fine sand, silt, and clay.

- Most soils are usually a combination of sand, silt and clay.
- Soil texture influences
    i. the ease with which soil can be worked
    ii. the amount of water it holds
    iii. the rate at which water can enter and move through soil
    iv. the amount of air it holds
- All these in turn decide the choice of crop for the soil.

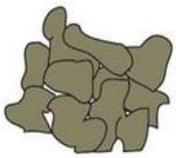


14. Soil structure

- Soil structure is defined by the way individual particles of sand, silt, and clay are assembled.
- Single particles when assembled appear as larger particles called aggregates.
- Aggregation of soil particles can occur in different patterns, resulting in different soil structures. Structure is one of the defining characteristics of a soil horizon.
- Soil structure is primarily classified into four types:
- **Granular and crumb structures** - individual particles of sand, silt and clay grouped together in small, nearly spherical grains. They are commonly found in the A-horizon of the soil profile.
- Water circulates very easily through such soils.
- **Blocky and subangular blocky structures** - soil particles cling together in nearly square or angular blocks having more or less sharp edges. They are commonly found in the B-horizon where clay has accumulated.
- Relatively large blocks indicate that the soil resists penetration and movement of water.
- **Prismatic and columnar structures** - soil particles are formed into vertical columns or pillars separated by miniature, but definite, vertical cracks. They are commonly found in the B-horizon where clay has accumulated.
- Water circulates with greater difficulty and drainage is poor.
- **Platy structure** - soil particles are aggregated in thin plates or sheets piled horizontally on one another. It is commonly found in forest soils, in part of the A- horizon, and in claypan soils.
- Plates often overlap, greatly impairing water circulation.

Granular (high permeability)

Aggregated (high permeability)

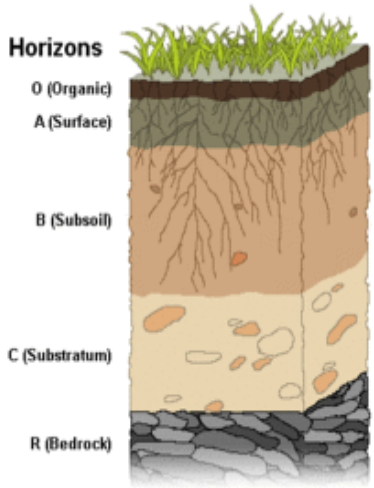


Blocky (moderate permeability)

Columnar/prismatic (moderate permeability)

Platey (low permeability)

Massive (low permeability)



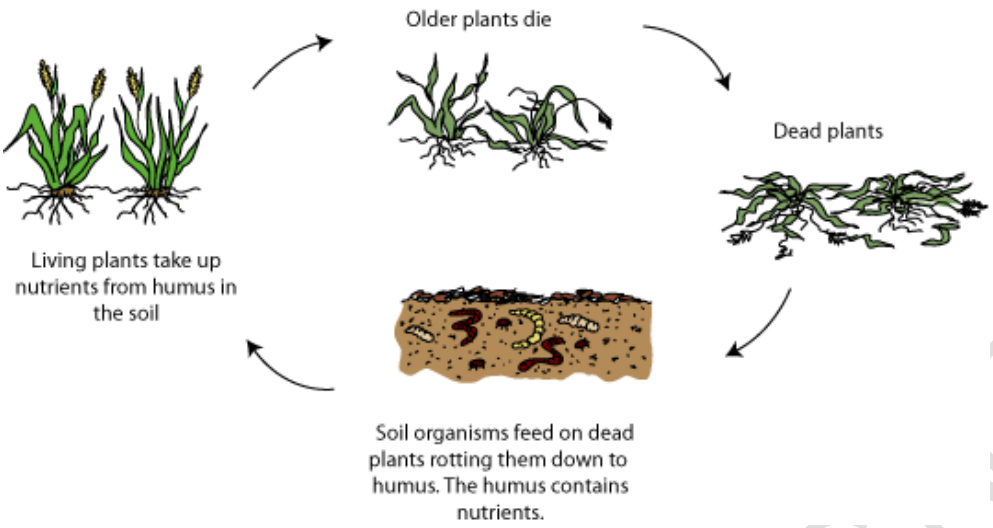
15. Decomposition

- Decomposition in soil is a natural process which involves soil organisms breaking-down large pieces of organic matter into smaller ones.
- Decomposition recycles nutrients back to the soil from formerly living organisms.
- Detritivores and saprophytes are essential in the recycling and disintegration processes of decomposition.
- **Detritus** is the disintegrated organic material produced on decomposition.
- **Detrivores -** Detritivores are organisms that consume detritus for energy.
- Earthworms, insects, and snails are examples of detritivores that are involved in the initial stages of the decomposition process.
- **Saprophytes** - Bacteria and fungi that thrive in soil and feed upon dead organic matter are called saprophytes.
- After larger particles are broken down, these microorganisms further the decomposition process by secreting chemicals that digest organic material in detritus.

16. Humus

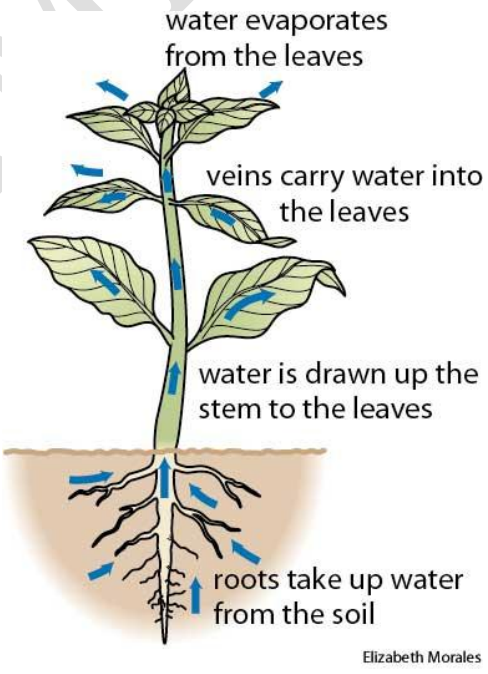
- The partially digested organic material left in soil as the result of decomposition of plant and animal residues in soil is called humus.
- Humus is then available for plants to use.
- In most soil, percentage of humus ranges from 2-10%, whereas it is up to 90% in peaty soil.

  Significance - Humus plays an important role in determining the fertility level of the soil.
- It serves as the store house for essential plant nutrients.
- It improves microbial/biological activity in soil.
- Humus also encourages better development of plant-root system in soil.
- It improves the water holding capacity of soil, prevents leaching, etc. It improves aeration and drainage by making the soil more porous.
- It acts as a buffering agent i.e. prevents sudden change in soil PH/soil reaction.



17. Transpiration

- Transpiration is essentially the evaporation of water from plant leaves.
- Moisture is carried through plants from roots to small pores on the underside of leaves.
- From leaves, moisture is changed to vapour and is released to the atmosphere.
- Transpiration also includes a process called guttation.
- It is the loss of water in liquid form from the uninjured leaf or stem of the plant, principally through water stomata.
- Transpiration rates vary widely depending on weather conditions.
- It includes temperature, humidity, sunlight availability and intensity, precipitation, soil type and saturation, wind, land slope, and water use and diversion by people.
- Higher temperatures stimulate the plant's pores to open, which triggers a higher rate of transpiration and water usage. Cooler temperatures cause the pores to close, which conserves moisture.
- Roughly, about 10% of the moisture found in the atmosphere is released by plants through transpiration.



18. Green manure

- Green, undecomposed material used as manure is called green manure.
- Green manure can be obtained by collecting green leaf (along with twigs) from plants grown in wastelands, field bunds and forest.
- It can also be obtained by growing green manure crops. The plants that are grown for green manure are known as green manure crops.
- Growing of green manure crops in the off season reduces weed proliferation and weed growth.
- Green manuring improves soil structure, increases water holding capacity and decreases soil loss by erosion.
- Green manuring also helps in reclamation of alkaline soils.

19. Organic Agriculture

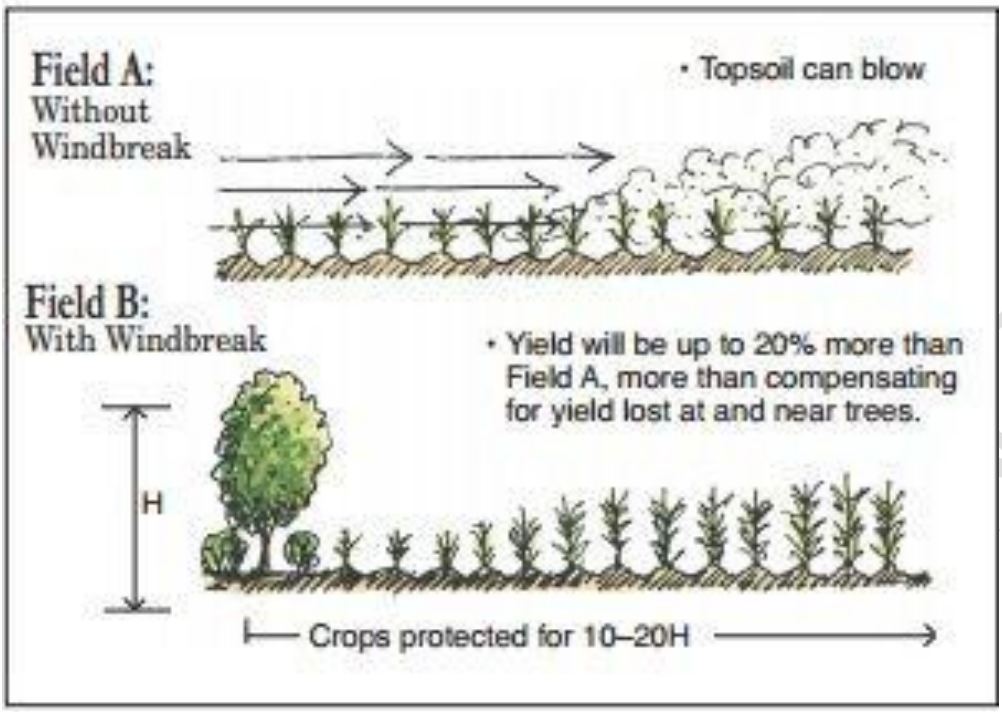
- Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity.
- This is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs.
- Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.

20. Sustainable Agriculture

- Sustainable agriculture is the production of food, fibre, or other plant or animal products using farming techniques that protect the environment, public health, human communities, and animal welfare.
- This form of agriculture enables us to produce healthful food without compromising future generations' ability to do the same.
- Every person involved in the food system such as growers, food processors, distributors, retailers, consumers, and waste managers, play a role in ensuring a sustainable agricultural system.

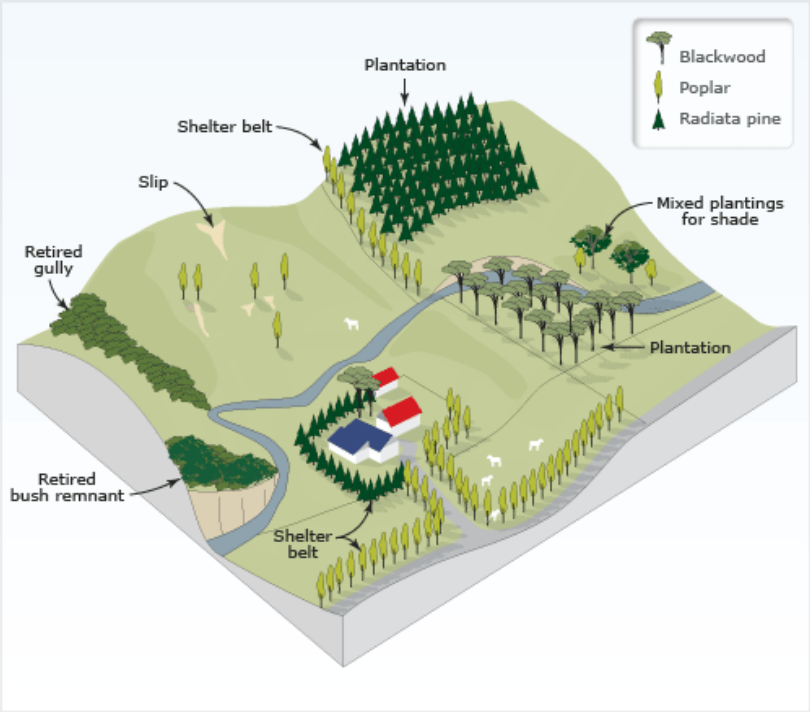
21. Wind breaks

- Windbreaks are plantings of trees, shrubs, or a combination of the two installed to direct, block or reduce wind speed in an agricultural area.
- Wind breaks are usually raised to
    1. Protect field crops / livestock from cold / hot wind.
    2. Prevent soil erosion.
    3. Improve the microclimate.
    4. As fencing and boundary demarcation.
    5. Used as fuel, fodder, etc.



22. Shelter belts

- Shelter belt is a wide range of trees, shrubs and grasses planted in rows around the land at right angles to deflect the prevailing winds.
- They are also used to reduce wind velocities, wind erosion, and crop damage.



23. Agri silviculture

- Agri-silviculture is a production technique which combines the growing of agricultural crops with simultaneously raised and protected forest crops.
- Agroforestry is a collective name for a land-use system and technology whereby woody perennials are deliberately used on the same land management unit as agricultural crops and/or animals in some form of spatial arrangement or temporal sequence.

- In this system there are both ecological and economical interactions between the various components.

24. Agri pastoral

- Agro-pastoral systems are farming systems that combine animal and crop production.
- The close interaction between crops and livestock is the most striking feature of agro-pastoral farms.
- These systems are usually highly diverse and several crops are produced on the same land within a single growing season or period.

25. Agrostological measures

- Using grasses to control soil erosion is called as agrostological measures.
- Cultivation of grasses in a land which is heavily eroded or in strips between the crops is called an agrostological measure.
- Agrostological measures include :
    1. Lay farming – Where grasses are allowed to grow in rotation with field crops, for building up the structure of soil and improving its fertility.
    2. Retiring lands to grasses – This involves growing grasses on such lands where major proportion of the top soil has been eroded. This helps in soil reclamation as well as fodder for cattle.

26. Soil fertility

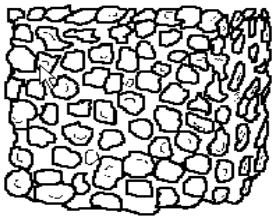
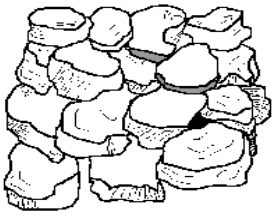
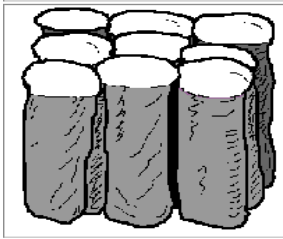
- Soil fertility is defined as the ability of soil to provide all essential plant nutrients in available forms and in a suitable balance.
- These plants nutrients will be absorbed from the soil through the roots for healthy growth of the plants.

27. Soil texture

- Soil texture is a classification of soil based on its physical texture and characteristics, particularly the size of the particles that make up the soil.
- Various sizes of particles in the soil are sand, silt and clay, gravel, etc.
- Texture influences the ease with which soil can be worked, the amount of water and air it holds, and the rate at which water can enter and move through soil.
- This determines the suitability of soil for specific agricultural crops.

28. Soil structure

- Soil structure is defined by the way individual particles of sand, silt, and clay are assembled.
- Single particles when assembled appear as larger particles which are called as aggregates
- These aggregates of soil occur in different patterns, resulting in different soil structures.
- The natural processes that aid in forming aggregates and finally soil structures are -
    1. Wetting and drying
    2. Freezing and thawing
    3. Microbial activity that aids in the decay of organic matter
    4. Activity of roots and soil animals

		
Granular: Resembles cookie crumbs and is usually less than 0.5 cm in diameter. Commonly found in surface horizons where roots have been growing.	**Blocky**: Irregular blocks that are usually 1.5 - 5.0 cm in diameter.	**Prismatic**: Vertical columns of soil that might be a number of cm long. Usually found in lower horizons.
		
Columnar: Vertical columns of soil that have a salt "cap" at the top. Found in soils of arid climates.	**Platy**: Thin, flat plates of soil that lie horizontally. Usually found in compacted soil.	**Single Grained**: Soil is broken into individual particles that do not stick together. Always accompanies a loose consistence. Commonly found in sandy soils.

29. Humus

- Humus is a complex organic substance resulting from the breakdown of plant material in a process called humification.
- This process can occur naturally in soil, or in the production of compost.
- Humus is extremely important to the fertility of soils in both a physical and chemical sense.

30. Decomposition

- It agriculture, decomposition refers to a biological process of breaking down an organic material into smaller constituent parts.
- A decomposer is an organism whose ecological function involves the recycling of nutrients by performing the natural process of decomposition as it feeds on decaying organisms.
- Examples of decomposers are fungi and bacteria that obtain their nutrients from dead plant or animal material by breaking down cells of dead organisms available in the ecosystem.

31. Detritivores

- Detritivores are organisms that feeds on detritus or organic waste and decompose plants and animals as well as faeces.
- They in contrast to decomposers, ingest lumps of matter instead of absorbing and metabolizing detritus.
- Examples of detritivores include millipedes, woodlice, dung flies, many terrestrial worms and burying beetles.

32. Transpiration

- Transpiration is the process by which moisture is carried through the plants from roots to small pores on the underside of leaves, where it changes to vapour and is released to the atmosphere.
- The purpose of transpiration in plants is to create a negative pressure gradient that helps the plants to draw minerals and nutrients through water from the roots.
- It aids the plant to maintain its temperature during hot weather, supports photosynthesis and exchange of gases.
- It also plays important role in water cycle as it releases approx. 10% of water back to the environment.

33. Green manure

- It is a practice of ploughing in the green plant tissues grown in the field or adding green plants with tender twigs or leaves from outside and incorporating them into the soil for improving the physical structure as well as fertility of the soil.
- The object of green manuring is to add an organic matter into the soil and enriching with important and deficient nutrients in the soil.

34. Green leaf manure

- Green leaf manures (GLMs) are organic manures made from leaves, twigs collected from various trees, herbs and shrubs forsupplying essential plant nutrients to the soil and increase soil fertility in a healthy manner
- Forest tree leaves are major sources of these manures while herbs and shrubs growing in field bunds, wastelands etc. are some other mentionable sources.
- Some of the advantages of GLM are improved soil structure, increased water holding capacity, decreased soil erosion, reduction of weed growth, etc.

35. Farm yard manure

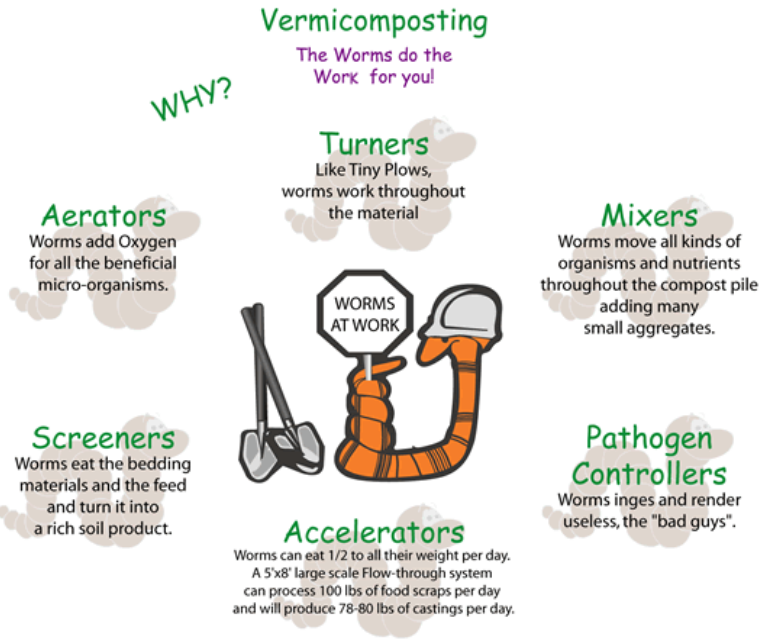
- Farmyard manure (FYM) refers to the decomposed mixture of dung and urine of farm animals along with litter and leftover materials from roughages or fodder fed to the cattle.
- It is a highly useful manure and some of its properties are -
    1. FYM is rich in nutrients especially Nitrogen which is made available to the plants as and when the FYM decomposes.
    2. Balanced nutrition to the plants as cow dung, urine, fibres from fodder are mixed.
    3. Potassium and Phosphorus available from FYM is similar to that from inorganic sources

36. Compost

- Composting is a natural biological process, carried out under controlled aerobic conditions where various microorganisms, including bacteria and fungi, break down organic matter into simpler substances.
- The effectiveness of the composting process is dependent upon the environmental conditions present within the composting system i.e. oxygen, temperature, moisture, material disturbance, organic matter and the size and activity of microbial populations.
- Composting biodegrades organic waste. I.e. food waste, manure, leaves, grass trimmings, paper, wood, feathers, crop residue etc., and turns it into a valuable organic fertilizer.

37. Vermi-Compost

- Vermi-Compost is the end product of vermicomposting, a method by which compost or mixed manure of organic origin is prepared by the use of earthworms.
- It is a controlled degradation of the organic wastes for the consumption of earthworms, helps in the recycling of food wastes, reduces the waste bulk density and the final product may contain hormone-like substance which accelerates the plant growth.



38. Bio fertilizers

- Bio fertilizers or microbial inoculants are defined as preparations containing live or latent cells of efficient strains of nitrogen fixing, phosphate solubilising or cellulolytic microorganisms.
- This is used in fields with the objective of increasing the availability of nutrient in a from easily assimilated by plants.

39. Predators

- In ecology, predators are those animals that live by preying on other organisms for food.
- Many predators hunt and eventually kill their prey, such as lion preying upon a buffalo, mantis eating a bee,baleen whale consuming millions of microscopic planktons, etc.

40. Parasitoid

- Parasitoid are insects whose larvae feed and develop within or on the bodies of other arthropods.
- Each parasitoid larva develops on a single individual and eventually kills that host.
- Most parasitoids are wasps, flies, beetles and moths.
- These are of significant importance to the growth of plant/tree species which are generally affected by its host.
- E.g. the parasitoid kills the host Oak bark beetle which would have affected the Oak Bark trees if alive.

41. Allelochemicals

- It is a substance produced by members of one species that influences the behaviour or growth of members of another species.
- Allelochemicals can be divided into several categories like
    1. Kairomones which benefit the receiving organism but cause disadvantage to the producer.
    2. Allomonesthat benefit the producer but have no effect on the receiver.
- Synomones are beneficial to both producer and recipient.

42. Micro irrigation

- Microirrigation is a broader term that is used to cover all forms of small emission devices including individual emitters, rowcrop tubing, spray strakes, and micro-sprinklers.
- All of these devices were developed for water distribution to small crop area, frequently to individual plants.

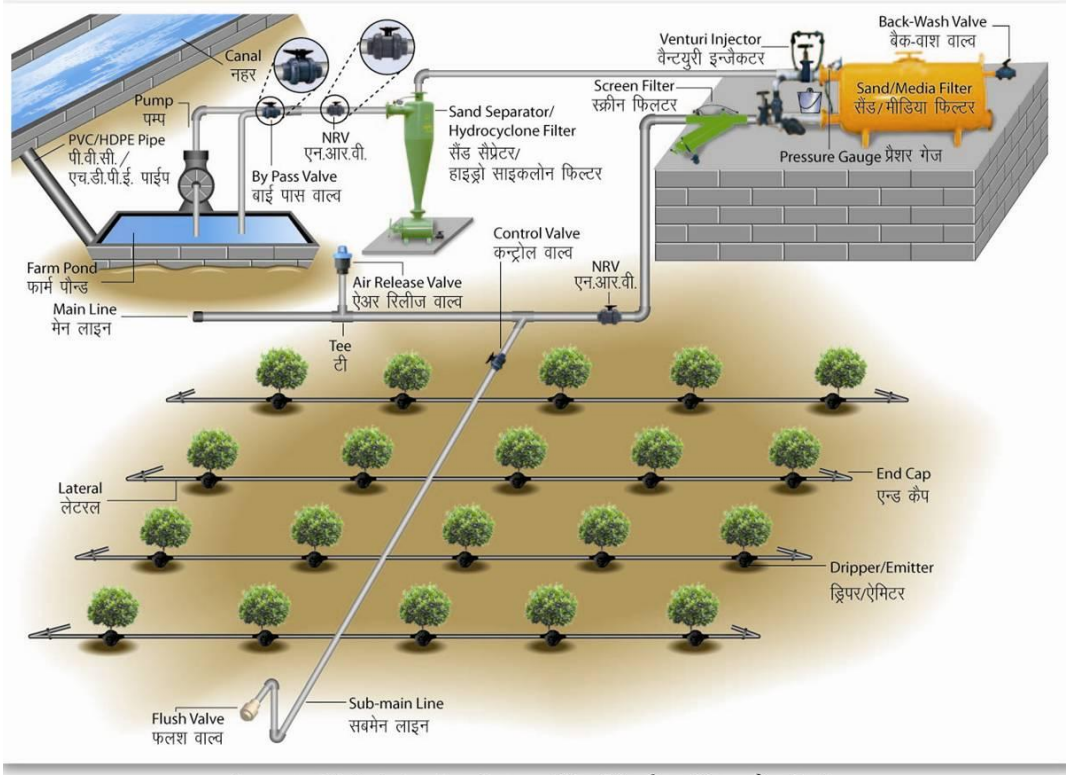
- This micro irrigation system encompasses several ways of water application to plants such as drip, spray, subsurface and bubbler irrigation.

43. Pressurized irrigation

- It is a system that relies on water pressure for the system to work to supply required quantity of water to the roots.
- The main variations of pressurized irrigation systems are drip irrigation and sprinkler irrigation.
- These systems have the potential to avoid the water loss related to surface irrigation with efficiency in the range of 75% 95%.

44. Drip irrigation

- Drip irrigation sometimes called as trickle irrigation, involves dripping water onto the soil at very low rates from a system of small diameter plastic pipes fitted with outlets called emitters or drippers.
- Water is applied close to plants so that only part of the soil in which the roots grow is wetted, unlike surface and sprinkler irrigation which involves wetting the whole soil profile.
- The advantages are high water application efficiency, lower labour costs, minimised fertiliser/nutrient loss andability to irrigate irregular shaped fields.



Layout of Drip Irrigation System (ड्रिप सिंचाई पद्धति का रेखाचित्र)

45. Sprinkler irrigation

- Sprinkler irrigation system allows application of water under high pressure with the help of a pump.
- It releases water similar to rainfall through a small diameter nozzle placed in the pipes.
- Water is distributed through a system of pipes, sprayed into air and irrigates in most of the soil type due to wide range of discharge capacity.
- Advantages of sprinkler irrigation are –
    - Reducing water loss due to conveyance
    - Suitable in all types of soil except heavy clay
    - Best suited for fields with high plant population per unit area.
    - Reduces soil compaction.

- Saves land as no bunds required.
- Reduces labour cost.

46. Salinity of soil

- Soil salinity is a term used to describe the salt content within soil.
- Salt is a naturally occurring mineral within soil and water that affects the growth and vitality of plants.
- Soil salinity can be influenced through several different factors ranging from human influence to environmental causes.
- If the salt content becomes high, the soil becomes known as sodic soil and can present many difficulties when used as a growing medium.

47. Alkalinity of soil

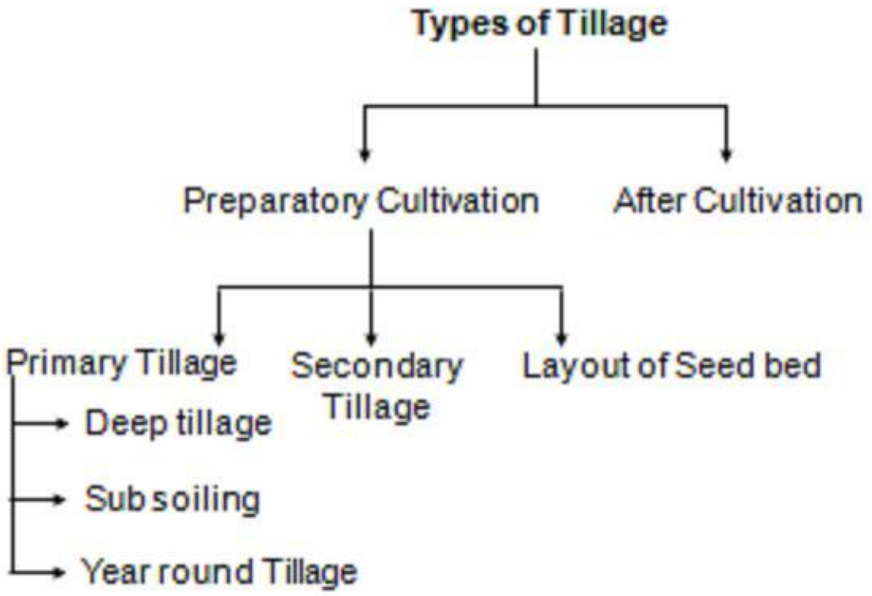
- Alkaline soil is any soil that falls above 7 on the pH scale which is the unit of measure for acidic versus alkaline soil.
- The pH scale is a numeric system between 0 and 14 used to test the acidity or alkalinity of soil with a measurement of 7 being completely neutral.
- Soils with a high pH tend to contain higher levels of sodium, calcium and magnesium.
- The availability of nutrients is often limited and plants can become stunted in alkaline soils because they're not as soluble as acidic soils.
- Alkaline soil may also be known as sweet soil.

48. Acidity of soil

- Acid soil is any soil that falls below 7 on the pH scale.
- Acid soil can be caused by many things and can occur naturally in areas with high rainfall amounts and by geological factors.
- Soils high in minerals and clays tend to fall on the acidic side, but acid soil can also be caused by other factors like nitrogen from fertilizers.
- Acidic soil effects particularly the subsurface which will restrict root access to water and nutrients.

49. Deep tillage

- Deep tillage means performing tillage or ploughing operations below the normal tillage depth to modify the physical or chemical properties of a soil.
- Deep ploughing turns out large sized clods, which are baked by the hot sun when it is done in summer.
- These clods crumble due to alternate heating and cooling and due to occasional summer showers.
- This process of gradual disintegration of clods improves soil structure and kills pests' larvae due to exposure to hot sun.



50. Kharif season crops

- The Kharif cropping season is from July to October during the south-west monsoon.
- The crops sown in this season includes rice, maize, sorghum, pearl millet/bajra, finger millet/ragi (cereals), arhar (pulses), soyabean, groundnut (oilseeds), cotton etc.
- These crops are dependent on the quantity of rainwater as well its timing, as too much or too little or at wrong time waste's the whole year's efforts.

51. Rabi season crops

- Rabi cropping season is from October to March during the winter months.
- The Rabi crops include wheat, barley, oats (cereals), chickpea/gram (pulses), linseed, mustard (oilseeds) etc.
- These crops are grown either with rainwater that has percolated into the ground, or with irrigation and not dependent on rain as too much water can be harmful for these crops.

52. Zaid season crops

- Zaid cropping season is from March to May during the summer season.
- These are crops grown on irrigated lands that do not have to wait for monsoons.
- They require warm dry weather for major growth period and longer day length for flowering.
- The main produce are seasonal fruits and vegetables.
- Some Zaid crops are Water melon, cucumber, muskmelon, sunflower, sugarcane, etc.

53. Crop rotation

- Crop rotation is the systematic planting of different crops in a particular order over several years in the same growing space.
- This process helps maintain nutrients in the soil, reduce soil erosion, and prevents plant diseases and pests.

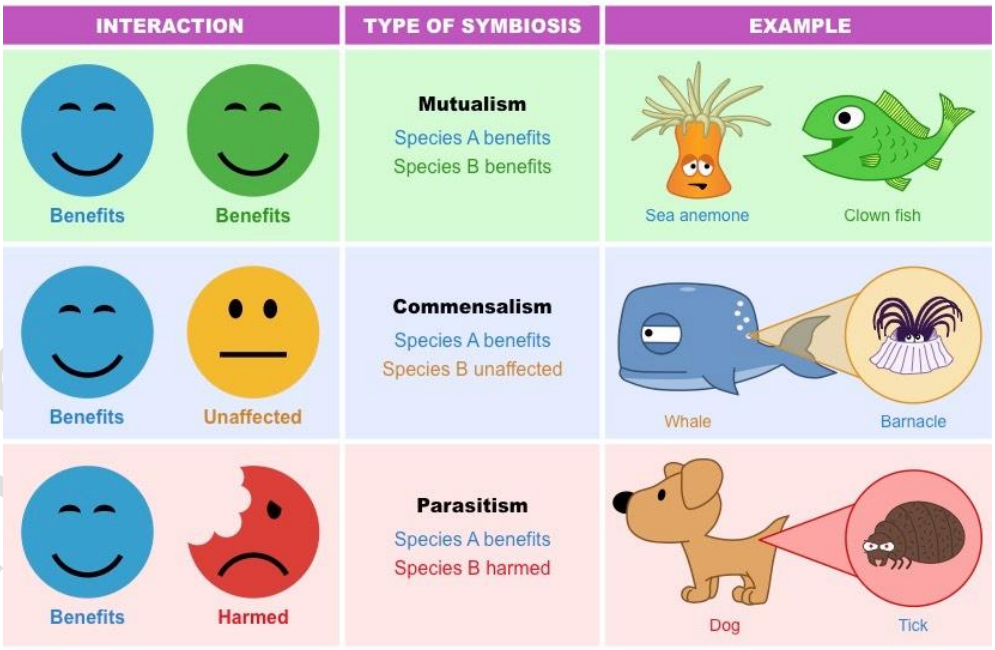
- There is no universally accepted rotation schedule as the types of plants in a particular farm or garden depend on the local soil, climate, and resources available.
- The length of rotation time between different plants will also vary depending on the needs of the farmer.

54. Crop diversification

- Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value-added crops with complementary marketing opportunities.
- Major advantages of crop diversification are
    - Increasing income on small farm holdings
    - Withstanding price fluctuation
    - Balancing food demand
    - Improving fodder for livestock animals
    - Conservation of natural resources
    - Minimising environmental pollution
    - Increasing community food security

55. Symbiotic association

- Symbiosis describes a close association of two organisms that benefits at least one of the organisms.
- At times, these close relationships evolve, some beneficial relationships may go sour, while destructive relationships persist to the point of benefiting both species.
- Changes in genes or behaviour that improve reproductive chances transfers to offspring, while any trait detrimental to an organism's survival generally decreases in frequency in descendant populations until that characteristic dies out altogether.



56. Mutualism

- Mutualism is a symbiotic relationship between individuals of different species in which both individuals benefit from the association.
- In this type of symbiosis, both organisms of different species rely on one another for nutrients, protection and other life functions, hence, they are usually found living in close proximity.

- It can be thought of as a form of "biological barter" since the species trade resources (for example carbohydrates or inorganic compounds), or services such as gamete or offspring dispersal, or protection from predators.

57. Nitrification

- Nitrification is the process of oxidation of ammonium compounds in dead organic material into nitrates and nitrites by soil bacteria, which makes nitrogen available to plants.
- It also pertains to the conversion of nitrogen from inorganic to organic by nitrate bacteria, which effectively recycles the substance so that it can be used again by plants via root uptake.
- Natural nitrification is a biological occurrence performed by nitrifying bacteria or due to lightening, but Nitrogen can also be fixed artificially.

58. Ammonification

- Ammonification is the process by which the organically bound nitrogen of microbial, plant, and animal biomass is recycled after their death.
- It is carried out by a diverse array of microorganisms that perform ecological decay services, and its product is ammonia ion.
- Ammonium is a suitable source of nutrition for many species of plants, especially those living in acidic soils.
- However, most plants cannot utilize ammonium effectively, and they require nitrate as their essential source of nitrogen nutrition.

59. Biological Nitrogen fixation

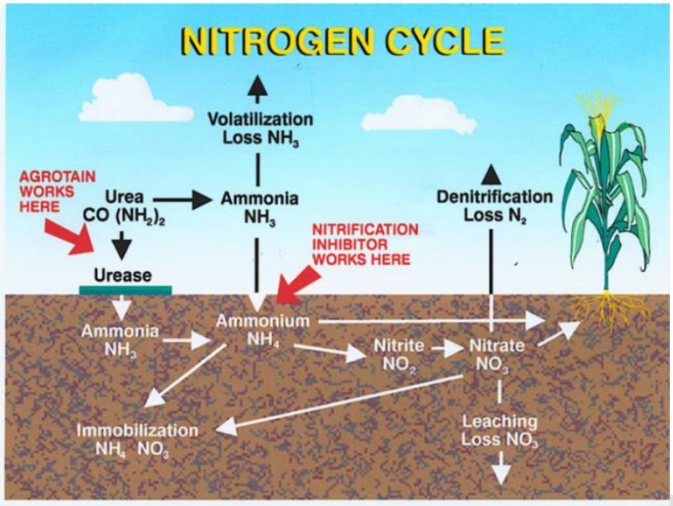
- Biological nitrogen fixation is an important factor in any sustainable agriculture program.
- It is a process in which nitrogen is taken from its relatively inert molecular form (N2) in the atmosphere and converted into nitrogen compounds useful for building plant protein.
- The best known nitrogen fixing plants are legumes which contain symbiotic rhizobia bacteria within nodules in their root systems, producing nitrogen compounds that help to fertilize the soil.

60. De-nitrification

- This is the reverse process of nitrification, during which nitrates are reduced to nitrites and then to nitrogen gas and ammonia.
- Thus, reduction of nitrates to gaseous nitrogen by microorganisms in a series of biochemical reactions is called “denitrification".
- The overall process of denitrification is as follows:

  NaR→NiR→NoR→NoR

  Nitrate --> Nitrite --> Nitric Oxide --> Nitrous Oxide --> Nitrogen gas
- When naturally occurring, this process is wasteful as available nitrogen in soil is lost to atmosphere.
- Nowadays, denitrification is seen as a remedy for decreasing acidity of soil which has surplus nitrogen due to application of excessive fertilizers.



61. Volatilization

- Volatilization is the process of converting a liquid or solid ammonium in soil to gaseous ammonia.
- Other terms used to describe the same process are vaporization, distillation, and sublimation.
- Several factors that affect volatilization of ammonia are – soil pH, type of fertilizer, soil temperature & moisture, crop residue, etc.

62. Organic inputs

- Organic inputs are raw materials such as fertilizers, seeds, land, water etc. which are unaltered or unaffected by synthetic products.
- The use of organic inputs have come into prominence as the concept of organic and sustainable farming is sprouting.
- All land friendly and sustainable practices use organic manure, non GM seeds, and other inputs which are derived organically.

63. Blanket recommendation

- Blanket recommendation is made by the higher authority like government to the farmers for using certain kinds of fertilizers or organic inputs to bring change in the production of agricultural products.
- Example: Government ordered for all fertilizers to be Neem coated, which will disintegrate slowly, requiring less fertilizers and also avoid leaching of fertilizers into the water table.

64. Herbicides

- An herbicide is a chemical substance used to control or manipulate undesirable vegetation, especially weeds in agricultural farms.
- They areclassified into two categories –
    - Selective herbicides kill specific unwanted plants while leaving desirable vegetation relatively unharmed.
    - Non-selective herbicides (total weed killers) kill all or most plant species.
- Herbicides are applied to maximize crop production by diminishing the development of unwanted plants.
- They are also applied in ponds and lakes to control aquatic plants, in forests to prepare logged areas for replanting, and to golf courses, lawns, parks, and other areas to clear out unwanted vegetation.

65. Saprophytes

- Saprophytes are living organisms that feed on dead and decaying organic matter, unlike parasites that live on living organisms.
- They are considered extremely important in soil biology as they break down dead and decaying organic matter into simple substances that can be taken up and recycled by plants.
- Examples of Saprophytes are fungi and some bacteria.

66. Evapo-transpiration loss

- Evapotranspiration (ET) is the loss of water to the atmosphere by the combinedprocesses of evaporation and transpiration.
- Evaporation occurs when waterchanges to vapour on either the soil or plant surfaces. Transpiration refers to the water lost through plant tissue.
- ET is a good indicator of how much water plantsare losing on a daily basis, and the rate of ET varies with different plants.
- Someplants retain moisture longer than others, even in very dry conditions and this is whysome plants are more drought tolerant than others.

67. Leaching

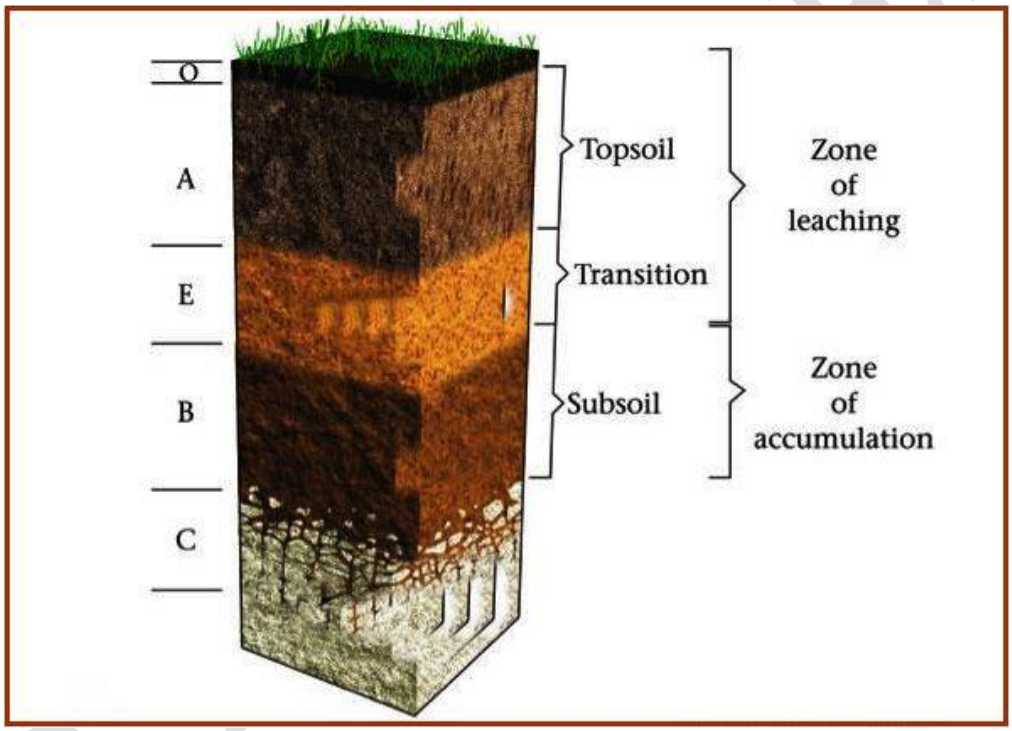
- Leaching is the process of water carrying soluble substances or small particles through soil or rock.
- It is actually two important actions occurring simultaneously
  1. Chemical interactions with surfaces
  2. Physical movement of water.
- Leaching creates is an important balance between preventing salt accumulation and removing nutrients from soil.
- But excessive leaching removes crucial nutrients from the soil and it also affects the ground water table which is an important source of drinking water.

68. Soil horizon

- Soil horizon is a layer generally parallel to the soil crust, whose physical characteristics differ from the layers above and beneath.
- Each soil type usually has three or four horizons defined physical features such as colour and texture.
- The differentiation of the soil into distinct horizons is largely the result of influences, such as air, water, solar radiation and plant material, originating at the soil-atmosphere interface.
- Since the weathering of the soil occurs first at the surface and works its way down, the uppermost layers have been changed the most, while the deepest layers are most similar to the original parent material.

69. Soil Profile

- A soil profile is a vertical cross section of the soil.
- When exposed, various soil horizons, or layers of soil, become apparent.
- The profile is made up of layers, running parallel to the surface, called Soil Horizons.
- Each horizon of soil may be different from the other horizons in physical or chemical ways.



- The differences are developed from the interaction of such soil-forming factors as parent material, slope, native vegetation, weathering, and climate.

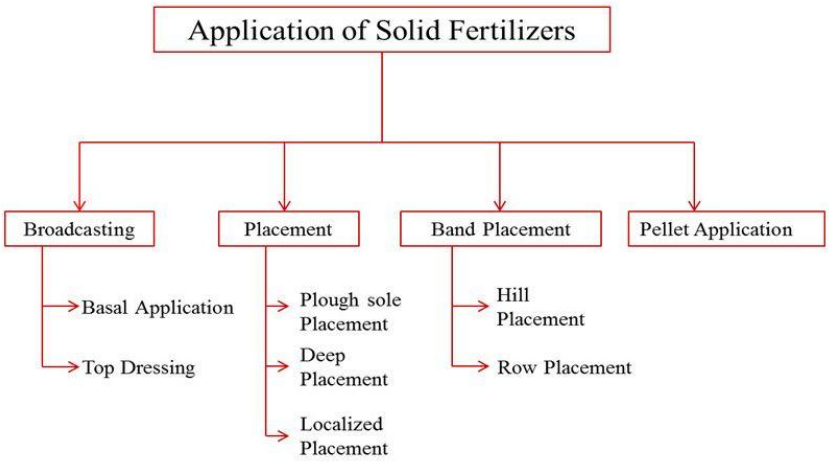
70. Irrigation efficiency

- Irrigation efficiency (IE) is the ratio of the amount of water consumed by the crop to the amount of water supplied through irrigation.
- The water applied by the irrigation system and not being made available to be taken up by plant roots is wasted and reduces irrigation efficiency.
- The term irrigation efficiency expresses the performance of a complete irrigation system or components of the system.
- The major causes for reduced irrigation efficiency include storage losses, conveyance losses and field application losses.
- In India, overall irrigation efficiency of major irrigation projects ranges between 35-40%.

71. Basal application of fertilizers

- Basal application of fertilizers is one of the Broadcasting techniques.

- The broadcasting of fertilizer refers to spreading fertilizers uniformly all over the field.
- The main objective of basal application of the fertilizers at sowing time is to mix it with soil properly.



- Insoluble phosphatic fertilizers such as rock phosphate are used in this method of application.
- The main disadvantages of application of fertilizers through broadcasting are:
    1. Nutrients cannot be fully utilized by plant roots as they move laterally over long distances.
    2. The weed growth is stimulated all over the field.
    3. Nutrients are fixed in the soil as they come in contact with a large mass of soil.

72. Integrated nutrient management

- Integrated Nutrient Management refers to the maintenance of soil fertility and of plant nutrient supply at an optimum level for sustaining the desired productivity.
- It is achieved through optimization of the benefits from all possible sources of organic, inorganic and biological components in an integrated manner.
- The concept of Integrated Nutrient Supply includes
    1. Regulated nutrient supply for optimum crop growth and higher productivity.
    2. Improvement and maintenance of soil fertility.
    3. Zero adverse impact on agro – ecosystem quality by balanced fertilization of organic manures, inorganic fertilizers and bio- inoculants.
- It improves and sustains the physical, chemical and biological functioning of soil.

73. Bulky organic manures

- Manures are grouped, into bulky organic manures and concentrated organic manures based on concentration of the nutrients.
- Bulky organic manures contain small percentage of nutrients and they are applied in large quantities.
- Farmyard manure (FYM), compost and green-manure are the most important and widely used bulky organic manures.
- Farmyard manure refers to the decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or fodder fed to the cattle
- Use of bulky organic manures has several advantages:
    1. They supply plant nutrients including micronutrients
    2. They improve soil physical properties
    3. They increase the availability of nutrients
    4. Carbon dioxide released during decomposition acts as a CO_2 fertilizer
    5. Plant parasitic nematodes and fungi are controlled

74. Concentrated organic manure

- Concentrated organic manures have higher nutrient content than bulky organic manure.
- The important concentrated organic manures are oilcakes, blood meal, fish manure etc.,
- These are also known as organic nitrogen fertilizer.
- These organic fertilizers are relatively slow acting, but they supply available nitrogen for a longer period.

75. Transplantation

- Transplanting is the process of moving a fully germinated seedling (or mature plant) and replanting it in a permanent location for the growing season.
- Transplanting is also called as replanting.
- Transplanting is a kind of Indirect Planting.
- A plant that has been recently transplanted is referred to as a transplant.
- Transplants can be more resistant to insect and other pest pressure, because they are more mature and stronger when they are replanted in the crop area.

76. Thinning

- Thinning denotes the removal of some plants, or parts of plants, to make room for the growth of others.
- It is the selective removal of flowers, fruits, shoots, and seedlings or young plants to allow adequate space for the remaining organs/plants to grow efficiently.
- The Benefits of Thinning include increased growth, improved utilization of resources, reducing vulnerability to insects and pests and fire prevention.

77. Weeding

- Weeding is an important control method practiced.
- Weed is a valueless plant growing wild, especially one that grows on cultivated ground to the exclusion or injury of the desired crop.
- The removal of weeds is useful because these unwanted plants compete with the crop for space, water and nutrients.
- Weeds can be controlled mechanically or by using chemicals (herbicides).

78. Micro propagation

- Micropropagation is the rapid vegetative propagation of plants under in vitro conditions of high light intensity, controlled temperature and a defined nutrient medium.
- It refers to the production of whole plants from cell cultures derived from explants (the initial piece of tissue put into culture) or meristem cells.
- Micro-propagation is widely used in forestry and in floriculture.
- Micro-propagation can also be used to conserve rare or endangered plant species.
- It is a best methodology available for rapid multiplication and production of quality seed free of any disease and pest which ensure maximum production, potential or varieties.

79. Genetic Engineering

- Genetic transformation is the heritable change in a cell or organism brought about by the uptake and establishment of introduced DNA.
- Genetic engineering allows the use of several desirable genes in a single event and reduces the time to merge novel genes into elite background.
- Genetic engineering has a number of useful applications, including scientific research, agriculture and technology.
- In plants, genetic engineering has been applied to improve the resilience, nutritional value and growth rate of crops such as potatoes, tomatoes and rice.
- Selective breeding is not considered a form of genetic engineering.

80. GM crop

- A Genetically Modified or transgenic plant is a plant that has a novel combination of genetic material obtained through the use of modern biotechnology.
- A transgenic crop plant contains a gene or genes which have been artificially introduced instead of the plant acquiring them through pollination.
- These genes are introduced with a view to expressing a novel trait which is not normally found normally in the given species.
- Bt Cotton is the best example of GM crop.

81. Soil Tilth

- Soil Tilth is the term used to express soil condition resulting from tillage.
- A soil is said to be in good Tilth when it is soft, friable & properly aerated.
- The Tilth is the physical condition of the soil brought out by tillage that influences crop emergence, establishment, growth and development.
- It is a loose, friable, airy, powdery granular & crumbly structure of the soil with optimum moisture content suitable for working & germination or sprouting seeds & propagates.
- An ideal soil tilth is not the same for all types of crops & all types of soils.
- For instance: small seeded crops like bajara, ragi, lucerne, Sesamum, mustard require a much finer seedbed, while Jowar & cotton require a moderately compact & firm seed bed.

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