INDIAN AGRICULTURE

- Agriculture is defined as the science, art and business of producing crops and livestock for consuming as well as economic purpose.
- The allied agricultural activities are animal husbandry (rearing of animals), dairy farming (for milk and other nutritious products), fisheries, horticulture (fruits, flowers and vegetables), apiculture (Honey bee), sericulture (silk worm rearing) etc.
- In the financial year 2020-21, share of primary (comprising agriculture, forestry, fishing, and mining & quarrying), secondary (comprising manufacturing, electricity, gas, water supply & other utility services, and construction), and tertiary (services) sectors have been estimated at 21.82 percent, 24.29 percent, and 53.89 percent in the Indian Economy.
- Nodal ministry related to agriculture is **Ministry of Agriculture and Farmer's Welfare**.
- Despite having vast arable land which is **52.61% (2018)** of the total area of the country, the arable land available per person is very less **(0.116 Hectare**) in India.

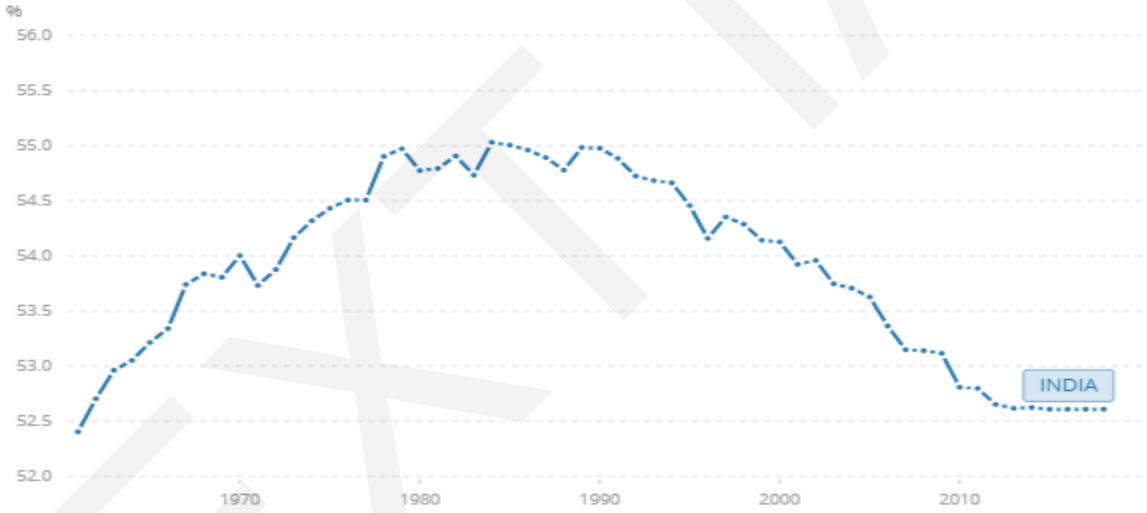


Figure 1: Arable land in India (% of land area) (2018 data)

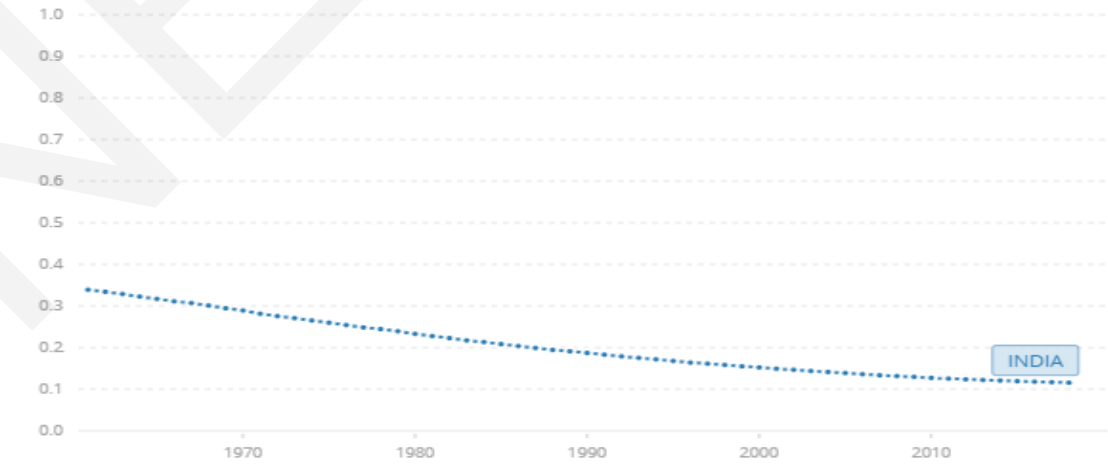


Figure 2: Arable land in India (Hectare per person) (2018 data)

- India has about 86% of the marginal (68%) and small landholding (18%) farmers.
  - Farmers with landholding less than a hectare are called **Marginal farmers**.
  - Farmers with landholding of 1-2 hectare are called **Small farmers**.

Land area (in Hectare)	Farmer type
< 1 Ha	Marginal
1-2 Ha	Small
2-4 Ha	Semi-medium
4-10 Ha	Medium
More than 10 Ha	Large

Table 1: Indian farmers with land area

Crop Seasons and crops

Crop Season	Months	Crops
Kharif	Sown in early June, harvested till October	Paddy, jowar, bajra, ragi, maize, tur (arhar), moong, urad, groundnut, sunflower (seed), soyabean, sesamum, nigerseed, cotton
Rabi	Sown around mid-November, harvested in March-April	Wheat, barley, gram, lentil (masoor), rapeseed & mustard, safflower
Zaid	March to June	Cucumber, watermelon

Table 2: Crop seasons and crops

Types of farming

- Farming in India varies from subsistence to commercial type. It varies in its methodology, physical environment, technicality and socio-cultural practices.

- **Primitive subsistence farming**
  - It is practiced on small patches of land with the help of primitive tools, family and community members.
  - It depends upon natural fertility of the soil and monsoon. Example- **Slash and burn agriculture or Jhumming or shifting cultivation**. In this, a tract of land is cleared first and burnt for removing weeds and insects. Secondly, it is sown and cultivated for some time and after the harvesting it is left for more than 8-10 years for regaining its fertility naturally.
  - Land productivity is low in primitive subsistence farming as the farmer doesn't use the fertilizers or other modern inputs.

Slash and Burn Agriculture

Regions	Regional names of Slash and Burn Agriculture
NE India (Assam, Meghalaya, Mizoram, Nagaland)	Jhum cultivation
Mexico and Central America	Milpa
Venezuela	Conuco
Brazil	Roca
Central Africa	Masole
Indonesia	Ladang
Vietnam	Ray

Table 3: Slash and Burn Agriculture regional names

- **Intensive Subsistence farming**
    - It is practiced in the areas of high population so the pressure on the land is high for productivity.
    - It is labour intensive farming and the agricultural inputs are intensively used here. Example- Fertilizers, irrigation methods etc.
    - Aim of the farming is maximum output from limited amount of land in the absence of alternative sources of livelihood.

- **Commercial farming**
    - Higher doses of modern inputs are used in this type of farming with **high yield variety (HYV) seeds, chemical fertilizers, insecticides** and **pesticides** in order to achieve higher productivity.

- **Plantation farming**
    - It is a type of commercial farming in which a single crop is grown in a large area. Example- **Banana, Bamboo, Tea, Coffee, Rubber, Sugarcane** etc.
    - Large tracts of estates or land ideal in environment and climate for the plantation crops are important.
    - Most of the times, plantation agriculture is crucial in catering to the national and international markets and takes place upon on a large scale when compared to other kinds of farming.
    - Large amount of capital and help of migrant labourers is taken in this type of farming.

- **Rain-fed farming**

  - Rain-fed farming occupies about 51% of the country's net sown area and accounts for nearly 40% of the total food production.
  - Types of rain-fed farming are- (i) **Dry-land farming**, (ii) **Wetland farming**
  - It is complex, highly diverse and risk prone.
  - It is characterized by low levels of productivity and input usage coupled with vagaries of monsoon emanating from climate change, resulting in wide variation and instability in crop yields.
  - If the management of the farming is done properly, these areas have tremendous potential to contribute a larger share in food production and faster agricultural growth.

- **Irrigated farming**

  - Water is provided artificially to the crops at regular intervals in irrigated farming.
  - Irrigation comes only with economic cost, as equipment, labor, maintenance, water, energy, of which all require investment.
  - Irrigation water can come from groundwater, through springs or wells, surface water, through river, lakes or reservoirs or even other sources such as treated wastewater or desalinated water.
  - There are many different types of irrigation systems, depending on how water is distributed throughout the field. Some common types are as follows-

    - **Surface irrigation**- Water is distributed over and across land by gravity, no mechanical pump is involved.

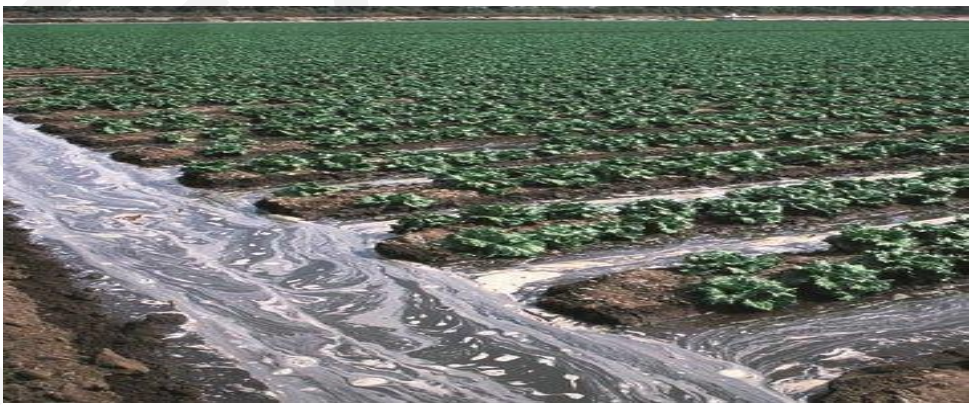


Figure 3: Surface irrigation

    - **Localized irrigation**- Water is distributed under low pressure, through a piped network and applied to each plant.

- **Drip irrigation**- A type of localized irrigation in which drops of water are delivered at or near the root of plants. In this type of irrigation, evaporation and runoff are minimized.

Figure 4: Drip irrigation

- **Sprinkler irrigation**- Water is distributed by overhead high-pressure sprinklers or guns from a central location in the field or from sprinklers on moving platforms.

Figure 5: Sprinkler irrigation

- **Center Pivot Irrigation**- Water is distributed by a system of sprinklers that move on wheeled towers in a circular pattern.

Figure 6: Center Pivot irrigation

- **Lateral move irrigation**- Water is distributed through a series of pipes, each with a wheel and a set of sprinklers, which are rotated either by hand or with a purpose-built mechanism. The sprinklers move a certain distance across the field and then need to have the water hose reconnected for the next distance. This system tends to be less expensive but requires more labor than others.

- **Sub-irrigation**- Water is disturbed across land by raising the water table, through a system of pumping stations, canals, gates, and ditches. This type of irrigation is most effective in areas with high water table.

- **Manual irrigation**- Water is distributed across land through manual labor and watering cans. This system is very labor intensive.

Irrigation methods

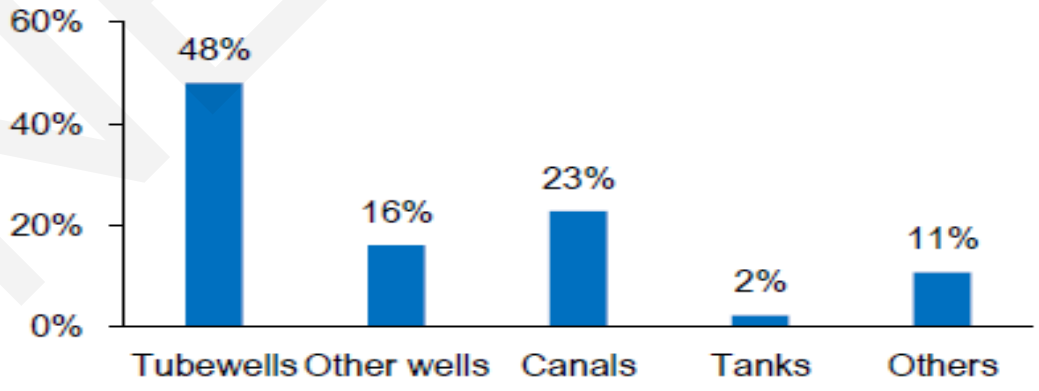


Figure 7: Sources of irrigation (2016-17), **Source:** Land Use Statistics (2016-17), MoAFW

- **Arable farming**

    - This is a perfect and apt fit method for hotter and warmer climatic conditions that systematically use the land to grow crops.
    - Farming is mainly popular in areas with fertile flat land without steeps heavily and moist land that is not very dry or wet.
    - In the Arable farming method, grain crops such as wheat, barley, maize, rice, and millets are perfect.

- **Pastoral farming**

    - This type of farming technique is solely for rearing animals and cattle, not for growing crops.
    - This producing livestock method is ideal for **sheep, beef cattle, dairy farming**, and other rearing.
    - This method is suitable for the climatic regions that are cold and wet, not very dry and hot.
    - If the land has stronger steeps and slopes, pastoral farming is helpful to rear animals such as sheep instead of growing crops.

- **Mixed farming**

    - It is probably the most benign agricultural production system from an environmental perspective because it is, at least partially a closed system.
    - The waste products of one enterprise (crop residues), which would otherwise be loaded on to the natural resource base, are used by the other enterprise, which returns its own waste products (manure) back to the first enterprise.
    - Unlike just following on rearing animals or entirely focusing on crops, the types of mixed farming incorporate crop cultivation and livestock in a single farm.
    - A single piece of land is here to support both arable and pastoral farming, which is advantageous for increasing the yield of farms from both crops and rearing.
    - Farming can be good to go in different climatic conditions as it provides two livelihood options with single land.
    - On the one hand, crop cultivation can go for farm yields, and on the other hand, pastoral farming can help rear animals for dairy or meat or eggs. The manure from animals is also further used to assist in soil fertility and manure.

- **Nomadic farming**

    - Nomadic farming is more of a method where the farmers or cultivators do not stick permanently to a place; instead keep moving with animals in search of water and land, pasture.
    - This practice and technique are heavily present in arid to semi-arid regions.
    - The animal's requirement for nomadic farming techniques includes **camels, cattle, goats, horses, donkeys** and **sheep**.

- **Sedentary farming**

    - Sedentary farming is unlike the actively moving nomadic farming technique.
    - In this method, farming involves not moving from the same land for several years to come and tilling in the same place.
    - The land here helps permanently to grow or cultivate crops or even to rear animals. This practice is one of the oldest techniques of farming across the globe.

- **Poultry farming**

    - Poultry farming is a specialized or targeted farming method, focusing only on one thing, here the case of poultry.
    - Poultry farming involves rearing **chickens, goat** and **turkey** for **meat and eggs**.
    - The farming can be through both a small or large scale, depending on choice. This can go with a wide range of climatic conditions as well.

- **Aqua farming**

    - Fish farming or aquaculture is already a well-known method of farming. In here, the fish development is through the fish ponds or tanks, usually in very large numbers.
    - There are several challenges pertaining to this. One of them is, growing fish cleanly and sustainably which are good in quality.

- **Dairy farming**

    - Dairy farming is all about rearing animals that give out the milk.
    - The most common dairy farming is in areas where the land or region does not have any cultivable land and is ideal only for rearing animals.
    - Challenges for dairy farming also exist as the dairy products or outputs are perishable quickly, they should be sold soon or found buyers.

- **Multiple farming**

    - Multiple cropping is also known as poly-culture, where two or more crops cultivation takes place and sown in the same piece of land instead of just one.
    - The crops are all matched according to the season and water requirements, and it helps to better and increase the yield in one growing season.
    - It is among the new technique that is into play recently where optimal spacing technique is helpful for the best use of all crops.
    - This different form of multiple cropping or agriculture can happen either by intercropping, where other crops in the same land cultivation in alternative rows or through the agroforestry method where crops are inter-grown perennial trees.

- **Organic farming**

    - In this method, farming **excludes** artificial inputs, pesticides, and fertilizers for farming activities.
    - Any harsh chemicals and usage are not put in usage, and the natural crop rotations and residues application to fertilize soil and crop.
    - Manures, non-farm organic waste, and biological nutrients are popular here to protect the yield and increase crop cultivation and overall quality.
    - This type of organic farming in Indian agriculture is widely coming up in recent days.

- **Terrace farming**

    - The terrace cultivation kind of farming is mostly in hills or mountains where the plantations are there over a plane on graduated surfaces.
    - Here, the plane is in the form of successive flat platforms that resembles something similar to steps.
    - This effective type of landscape farming is ideal for bringing in the most effective land use around hills and mountains and maximizing farming in the arable area.

- **Vertical farming**

    - In vertical farming, crops are grown indoors, which requires artificial light and temperature, plants are cultivated in a vertical position in which takes less space and gives more production in the agriculture industry.
    - Advantages of vertical farming are-
        - It ensures consistent crop production.
        - This farming uses space optimally.
        - It decreases the use of water.

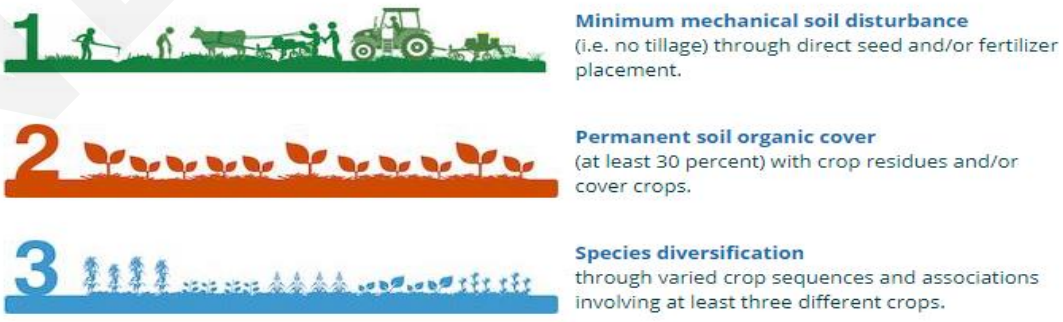
- It pulls down on transport cost.
- Labour cost is less in vertical farming.

- **Aquaponics**

  - Aquaponics is a sustainable method of raising both fish and vegetables. It is popular with individuals, entrepreneurs, educators, missions and governments.
  - In this type of farming, one grows substantially more food with less water, land and labor than traditional agriculture.
  - It combines raising fish in tanks (recirculating aquaculture) with soilless plant culture (hydroponics).
  - The nutrient rich water from raising fish provides a natural fertilizer for the plants and the plants help to purify.
  - Aquaponics is an excellent model of nature's biological cycles.

- **Conservation agriculture**

  - Conservation agriculture is a farming system that can prevent losses or arable land while regenerating degraded lands.
  - It promotes maintenance of a permanent soil cover, minimum soil disturbance, and diversification of plant species.
  - It enhances biodiversity and natural biological processes above and below the ground surface, which contribute to increased water and nutrient use efficiency and to improved and sustained crop production.
  - It facilitates good agronomy, such as timely operations, and improves overall land husbandry for rain-fed and irrigated production.
  - It is a base for sustainable agricultural production intensification. It opens increased options for integration of production sectors, such as crop-livestock integration and the integration of trees and pastures into agricultural landscapes.



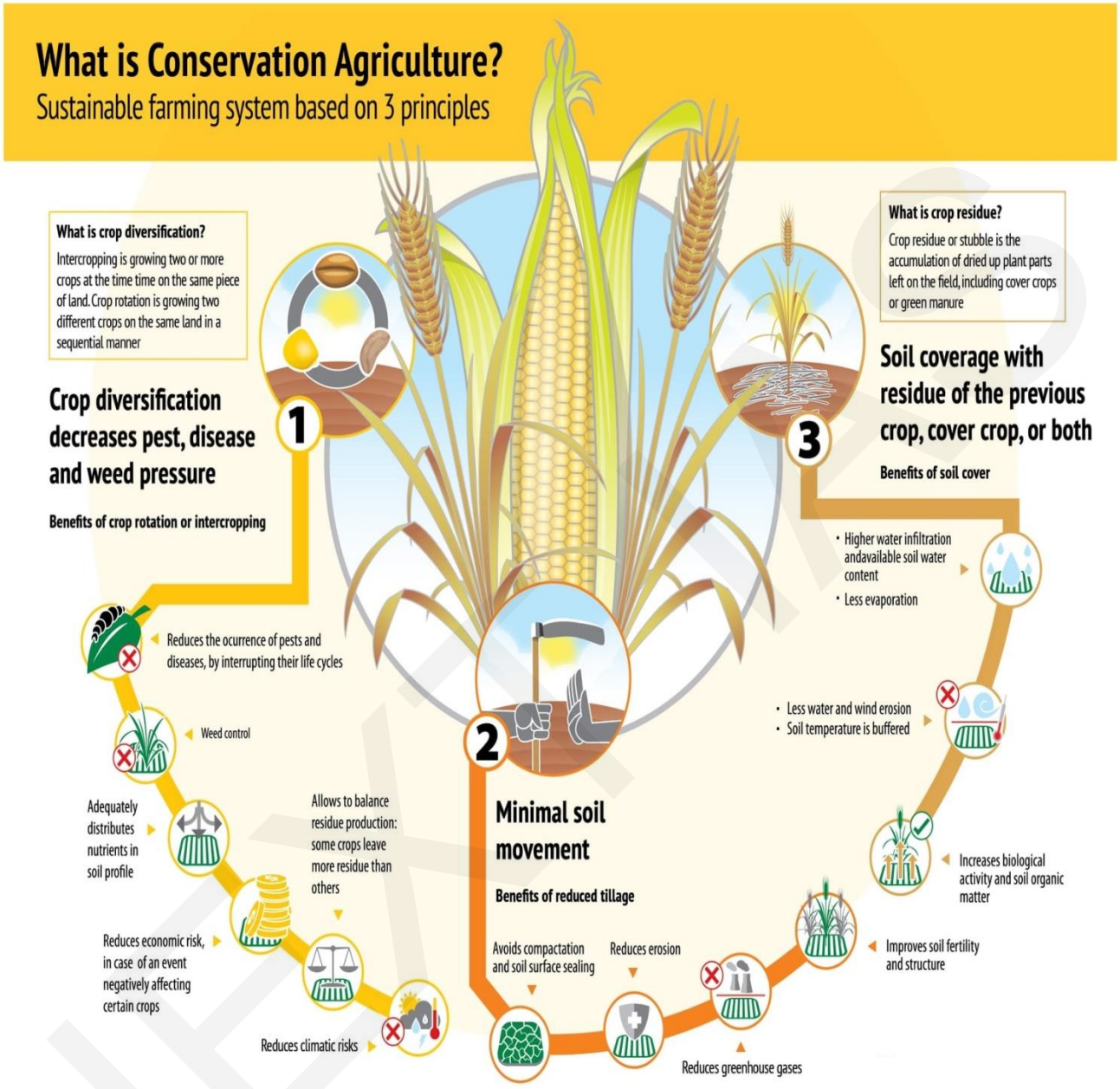


Figure 8: Conservation Agriculture

- **Regenerative agriculture**

  - Regenerative agriculture is a system of farming principles and practices that seek to rehabilitate and enhance the entire ecosystem of the farm by placing a heavy premium on soil health with attention also paid to water management, fertilizer use, and more.

- It is a method of farming that improves the resources it uses, rather than destroying or depleting them.
- More emphasis is placed on looking holistically at agro-ecosystem. Some of the key techniques include-

  - **Conservation Tillage-**

    (i) Plowing and tillage dramatically erode soil and release large amounts of carbon dioxide into the atmosphere. They also can result in the kind of bare or compacted soil that creates a hostile environment for important soil microbes.

    (ii) By adopting low- or no-till practices, farmers minimize physical disturbance of the soil, and over time increase levels of soil organic matter, creating healthier, more resilient environments for plants to thrive, as well as keeping more and more carbon where it belongs.

  - **Diversity-**

    (i) Different plants release different carbohydrates (sugars) through their roots, and various microbes feed on these carbs and return all sorts of different nutrients back to the plant and the soil.

    (ii) By increasing the plant diversity of their fields, farmers help create the rich, varied, and nutrient-dense soils that lead to more productive yields.

  - **Rotation and cover crops-**

    (i) Left exposed to the elements, soil will erode and the nutrients necessary for successful plant growth will either dry out or quite literally wash away. At the same time, planting the same plants in the same location can lead to a buildup of some nutrients and a lack of others.

    (ii) By rotating crops and deploying cover crops strategically, farms and gardens can infuse soils with more and more (and more diverse) soil organic matter, often while avoiding disease and pest problems naturally. It is to be remembered always that bare soil is bad soil.

  - **Avoid misapplication-**

    (i) In addition to minimizing physical disturbance, regenerative agriculture practitioners also often seek to be cautious about chemical or biological activities that also can damage long-term soil health. Misapplication of fertilizers and other soil amendments can disrupt the natural relationship between microorganisms and plant roots.

- **Sustainable agriculture**

  - The term sustainable agriculture means an integrated system of plant and animal production practices having a site-specific application that will, over the long term:
    - satisfy human food and fiber needs
    - enhance environmental quality and the natural resource base upon which the agricultural economy depends
    - make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls
    - sustain the economic viability of farm operations
    - enhance the quality of life for farmers and society as a whole

  - Sustainable agriculture does not mean a return to either the low yields or poor farmers that characterized the 19th century. Rather, sustainability builds on current agricultural achievements, adopting a sophisticated approach that can maintain high yields and farm profits without undermining the resources on which agriculture depends.
  - A systems approach is essential to understanding sustainability. The system is envisioned in its broadest sense, from the individual farm, to the local ecosystem, and to communities affected by this farming system both locally and globally.
  - An environmentally sustainable agriculture is one that is compatible with and supportive of the below criteria:

    - meeting the basic needs of all peoples, and giving this priority over meeting the greed of a few
    - keeping population densities, if possible, below the carrying capacity of the region
    - adjusting consumption patterns and the design and management of systems to permit the renewal of renewable resources
    - conserving, recycling, and establishing priorities for the use of nonrenewable resources
    - keeping environmental impact below the level required to allow the systems affected to recover and continue to evolve

  - **Sustainable farming practices commonly include:**

    - crop rotations that mitigate weeds, disease, insect and other pest problems; provide alternative sources of soil nitrogen; reduce soil erosion; and reduce risk of water contamination by agricultural chemicals
    - Pest control strategies that are not harmful to natural systems, farmers, their neighbors, or consumers. This includes integrated pest management techniques that

reduce the need for pesticides by practices such as scouting, use of resistant cultivars, timing of planting, and biological pest controls
    - increased mechanical/biological weed control; more soil and water conservation practices; and strategic use of animal and green manures
    - use of natural or synthetic inputs in a way that poses no significant hazard to man, animals, or the environment

- **Integrated farming**

    - In Integrated farming system, agriculture can be integrated with livestock, poultry and fish are maintained at same place to generate employment around the year and also get additional income. For example, same place poultry in upper layer and utilize their excreta. Pigs are in lower layer, residual water from pond was utilized for Agriculture and fodder crops production.
    - In integrated farming system, maintenance of cattle, realize more income; good quality fodder production is essential. Fodder cultivation improves soil fertility and soil water holding capacity. Weeds, non-beneficial plants and sedges growth were restricted. Legume fodder cultivation enriches soil nutrients particularly nitrogen.

- **Monoculture**

    - Monoculture farming is a form of agriculture that is based on growing only one type of a crop at one time on specific field.
    - It should be noted that the concept of monoculture does not apply to the crops, but to farm animals as well: it consists in breeding only one species of animals on a given farm, be it dairy cows, sheep, pigs, chicken etc.
    - Monoculture planning maximizes the efficient use of soil and local climate conditions.
    - When growing monoculture crops, agrarians tend to have some extra time and financial resources to refer to new technologies in agriculture helping them to maximize their agricultural performance.
    - Industrial monoculture planting allows farmers to specialize in a particular crop, as they usually deal with the same issues and problems that may arise in the process of growing.

- **Horticulture**

    - Horticulture is the science and art of the development, sustainable production, marketing and use of high-value, intensively cultivated food and ornamental plants.
    - Horticultural crops are diverse, including:
        - Annual and perennial species,
        - Fruits and vegetables,

- Decorative indoor plants and
- Landscape plants.

- Horticulture also contributes to quality of life, and the beauty, sustainability and rehabilitation of our environment and the human condition.

- **Apiculture**

  - Apiculture is the scientific method of rearing honeybees.
  - The word 'apiculture' comes from the Latin word 'apis' meaning bee. So, apiculture or beekeeping is the care and management of honey bees for the production of honey and wax.
  - In this method, bees are bred commercially in apiaries, an area where a lot of beehives can be placed.
  - The main advantages of beekeeping are:
    - It provides honey, which is one of the most valuable nutritional food.
    - It provides bee wax which is used in many industries, including cosmetics industries, polishing industries, pharmaceutical industries, etc.
    - Plays an excellent role in pollination. Honey bees are the best pollinating agents which help in increasing the yield of several crops.

- **Sericulture**
  - Sericulture is the rearing of silkworms for the production of raw silk.
  - The major activities of sericulture comprises of food-plant cultivation to feed the silkworms which spin silk cocoons and reeling the cocoons for unwinding the silk filament for value added benefits such as processing and weaving.
  - *Bombyx mori* is the most widely used. Silk-fiber is a protein produced from the silk-glands of silkworms.
  - Sericulture is ideally suited for improving the rural economy of the country, as it is practiced as a subsidiary industry to agriculture.

Major crops in India

- **Rice**
  - Paddy is a Kharif crop. It is unprocessed form of rice. It is a water intensive crop (>120 cm of rain required). It is the crop which is grown most in India with the irrigation practices available like- tube-wells, canals etc. High temperature (above 25 deg C) and high humidity is required for this crop.

- Top rice producing states are- **West Bengal > Uttar Pradesh > Andhra Pradesh > Punjab**
- India is the largest exporter of rice and second largest producer after China.
- Flood irrigation in the field of rice is responsible for global warming as Methane (CH_4) gas is produced on water logged fields due to anaerobic conditions.
- Pollution due to stubble burning is also an issue in the Northern India.
- **Methods of Rice cultivation-**

  - **Broadcasting method**- It is followed by the tribes. They throw seeds and press on the land. The seed germinates and grows on its own. This is the old and easy method of rice cultivation.
  - **Transplantation**- Seed is germinated in nursery and kept their in ideal conditions for 3-4 weeks and then they are planted in bunch in fields. It is a **water and labour intensive process**.
  - **Direct seeded rice (DSR)**-
    (i) DSR makes rice production water efficient. It has a low input demand and in light of the challenges of waterlogging and greenhouse gas emission, it is gaining popularity.
    (ii) The technology solves most of the problems –it is less labour intensive, requires less water, less drudgery, helps in early crop maturity, has a low production cost, provides better soil physical conditions for crops and reduces methane emissions.
    (iii) DSR refers to the process of establishing a rice crop from seeds sown in the field rather than by transplanting seedlings from the nursery.
    (iv) Direct seeding can be done by sowing of pre-germinated seed into a puddled soil (wet seeding) or standing water (water seeding) or prepared seedbed (dry seeding).
    (v) Improved short duration and high yielding varieties, nutrient and weed management techniques encouraged the farmers to shift from traditional system of transplanting to DSR culture.
    (vi) DSR technology saves up to 30% water used in transplantation as it uses chemical weedicides to remove these weeds.
    (vii) It also helps farmers save upto 15 litres/acre through this technology as puddling operations are eliminated.
  - **System of Rice Intensification (SRI)**-
    (i) The System of Rice Intensification involves cultivating rice with as much organic manure as possible, starting with young seedlings planted singly at wider spacing in a square pattern; and with intermittent irrigation that keeps the soil moist but not inundated, and frequent inter cultivation with weeder that actively aerates the soil.

(ii) SRI is not a standardized, fixed technological method. It is rather a set of ideas, a methodology for comprehensively managing and conserving resources by changing the way that land, seeds, water, nutrients, and human labour are used to increase productivity from a small but well-tended number of seeds.

- **Wheat**
  - It is a rabi crop and requires low temperature at sowing and growth time and high temperature during harvesting time. 50-75 cm rainfall is required for it.
  - Top wheat producing states are- Punjab, Madhya Pradesh, Uttar Pradesh, Haryana
  - It covers 2nd largest area cover of the total Indian agricultural area.
  - India is 2nd largest producer of wheat just after China.
  - Green revolution in India increased the wheat production and its consumption in India.

Points to remember-

India is the world's largest producer of milk, pulses ad jute.
India is the second largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruits, cotton.

  - The green revolution in India is the time when **Indian Agriculture was converted into an industrial system** due to the **adoption of modern methodology** such as the use of HYV seeds, tractors, irrigation facilities, pesticides and fertilizers.
  - It was an endeavor initiated by **Norman Borlaug** in the 1960s. He is known as the '**Father of Green Revolution**' in world. In India, the Green Revolution was mainly led by **M.S. Swaminathan.**

- **Millets**
  - These are coarse grains and highly nutritious. Jowar, bajra, ragi are important millets grown in India.
    - **Jowar-** It doesn't require much irrigation. It is a rain-fed crop and grown in states like Maharashtra, Andhra Pradesh, Karnataka and Madhya Pradesh.
    - **Bajra-** It can grow on sandy soils and shallow black soils. States where it is grown are Maharashtra, Uttar Pradesh, Gujarat, Haryana and Rajasthan.
    - **Ragi-** It is rich in iron, calcium and other micro-nutrients. It is produced in Karnataka, Tamilnadu, Himachal Pradesh, Uttarakhand, Sikkim, Jharkhand etc.

- **Maize**
  - It is a kharif crop which requires temperature between 21-27 deg C and grows well in Bhangar soil.
  - It is very rich in nutrition and residues of it can be used as fodder also.

- States where maize is produced intensively are Uttar Pradesh, Madhya Pradesh, Telangana, Bihar and Karnataka.

- **Pulses**
  - India is the largest producer, consumer and importer of pulses in the world.
  - Major pulses grown in India are tur (arhar), urad, moong, masur, peas and gram.
  - All these crops except arhar help in restoring soil fertility by fixing nitrogen from the air.
  - Major pulses producing states in India are Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra and Karnataka.

- **Sugarcane**
  - It is a year-long crop.
  - It is water consuming or water intensive crop.
  - It is the most irrigated crop in India.
  - Government announces Fair and Remunerative Prices (FRP) to the sugarcane farmers.
  - Indian sugar mills give more FRP to the farmers hence cost is higher on the international scale so it is not exported usually.
  - Due to this sugar mills have been allowed to produce Ethanol from sugarcane. This is important for them to come out of the losses.

- **Tea Plantation**
  - It requires land with gentle slope to drain off water.
  - High rainfall of 200 cm and temperature between 25-27 deg C is required for the tea plantations.
  - In India, the region which is most suitable for tea plantation is Eastern Himalayas i.e., Assam, West Bengal (Darjeeling) etc.
  - India is the largest consumer of Black tea. Fermentation is the cause of black colour.

- **Oil Palm**
  - Fruit is crushed and oil is obtained from them.
  - Worldwide Indonesia and Malaysia are the leading producers of the Oil palm.
  - In India, Andhra Pradesh, Karnataka and other south Indian states are the producers of oil palm.
  - This requires tropical climate.

- **Coconut**
  - Kerala is the top coconut producing state in India.

- Worldwide Phillippines is the top country in the world for its production.
- Coconut are common in tropical areas throughout the world.
- Coconut kernel contains 40% oil on average, the general notion is that its consumption could elevate cholesterol levels. Besides coconut oil, the kernel contains 3.6% dietary fibre.

- **Cotton**

  - It is a tropical as well as subtropical crop which is also water intensive.
  - Black soil and alluvial soil are suitable for the crop.
  - It requires 210 frost free days for its crop.
  - Gujarat, Telangana and Maharashtra are the top producing states in India for cotton.
  - India is the top producer of cotton in the world.
  - Bt-Cotton is the Genetically Modified version of cotton approved in India for production.
  - It is also called White Gold.

Minimum Support Price (MSP)

- MSP is the assured price announced by the central government at which food grains are procured from farmers by the central and state governments and their agencies for the central pool of food grains.
- The central pool is used for providing food grains under the Public Distribution System (PDS) and other welfare schemes at subsidized prices and also kept as reserve in the form of buffer stock.
- The cost of procuring from farmers at MSP and distributing under PDS at subsidized prices is borne by the Department of Food and Public Distribution.
- The MSPs for all crops are **decided by the Ministry of Agriculture and Farmer's Welfare**. MSPs are notified based on the **recommendations of the Commission for Agricultural Costs and Prices (CACP)**.
- MSPs are annually announced for 22 crops and Fair and Remunerative Prices (FRP) for sugarcane.
  - **Kharif crops (14)-** Paddy, jowar, bajra, ragi, maize, tur (arhar), moong, urad, groundnut, sunflower (seed), soyabean, sesamum, nigerseed, cotton
  - **Rabi crops (6)-** Wheat, barley, gram, lentil (masoor), rapeseed & mustard, safflower
  - **Commercial crops (2)-** Jute, Copra
  - (In addition, MSP for Toria and de-husked coconut are also fixed on the basis of MSPs of Rapeseed & mustard and copra respectively)
- There are 3 kinds of production costs which are considered by CACP for evaluating the MSP for the upcoming season.
  - **A2**- It covers all the costs of the input like seeds, fertilizers, pesticides, hired labour, irrigation, fuel etc incurred by the farmer himself.
  - **A2+FL**- Family labour (FL) is added in the input cost

- **C2**- It includes rent or interest forgone on land and other capital assets

- CACP decides MSP on the basis of weighted average of Cost of Production (CoP) which is 1.5 times A2+FL.
- Farmers demand that the 1.5 times MSP formula should be applied on the C2 costs.

Soil Health and Fertilizers

- While the **Ministry of Chemicals and Fertilizers** is responsible for monitoring the production, distribution and prices of fertilizers, the **Ministry of Agriculture and Farmer's Welfare** is responsible for the promotion of balanced use of fertilizers.
- Soil health is maintained by balanced micro and macro nutrients.
  - **Micro nutrients**- Nickel (Ni), Cobalt (Co), Zinc (Zn), Manganese (Mn), Iron (Fe), Copper (Cu), Molybdenum (Mo), Chlorine (Cl), Boron (B)
  - **Macro nutrients**- Nitrogen (N), Potassium (K), Carbon (C), Hydrogen (H), Oxygen (O), Phosphorous (P), Sulphur (S), Calcium (Ca), Magnesium (Mg)
- The government subsidizes fertilizers through:
  - Subsidy for urea (N Fertilizer)
  - Nutrient based subsidy for P and K fertilizers
- The fertilizer subsidy is provided to the fertilizer manufacturers and importers so that farmers can directly buy them at affordable or subsidized prices.

Why is there an issue of imbalanced use of nutrients?

- Prices of urea are controlled by the Government, whereas prices of P and K fertilizers are market-driven. This has led to the lower prices of Urea (N) over the years whereas market prices of P and K fertilizers have remained higher. This is the reason for imbalanced use of nutrients by farmers as Urea is used more than other fertilizers.
- Recommended ratio of N:P:K is 4:2:1.
- Overuse of fertilizers can lead to deterioration of the fertility of the soil and nutrient imbalance.