PRINCIPLES AND SYSTEMS OF SUSTAINABLE AGRICULTURE
Learning Outcomes

2.1. Sustainable Agriculture.
- Economic Sustainability.
- Social Sustainability.
- Environmental Sustainability.

2.2 Sustainable Agriculture Systems
2.1 Sustainable Agriculture

- The word "sustain," from the Latin *sustinere* *(sus)* from below and *(tenere)* to hold.
  - to keep in existence or maintain, implies long-term support or permanence.

- Farming systems that are "capable of maintaining their productivity and usefulness to society indefinitely.

- Meeting fundamental human needs while preserving the life-support systems of the planet
• Produces abundant food without depleting the earth’s resources or polluting its environment.

• Agriculture that follows the principles of nature to develop systems for raising crops and livestock that are, like nature, self-sustaining.

• Agriculture of social values, one whose success is indistinguishable from vibrant rural communities, rich lives for families on the farms, and wholesome food for everyone.

SUSTAINABLE agriculture is a practice of various techniques and principles.

The key issue in sustainable agriculture is that there is no single approach that can be applied all over the world in a uniform manner.

Different techniques and systems are applied, and adapted, in different ecological and socio-cultural systems.
• sustainable agriculture is not merely to produce food but provides for other needs as well.

• Uphoff (2002a) says: “Better human nutrition is a more important goal than food production alone, and will not be achieved only through greater grain output.”
SA adopts the following ecological approach:

- recycles plant nutrients
- Provide the most favourable soil conditions for plant growth
  - protects soil from erosion
  - conserves and protects water
  - uses minimum tillage
  - minimize loss of energy and other growth factors among others, through microclimate management, water harvesting and better soil management
- integrates crop & livestock enterprises on the farm (enhance beneficial biological interactions and synergies)
- promotes biodiversity - diversify species and genetic resources
Sustainable agriculture or farming means growing crops and livestock in ways that requires:-

1. a whole-system approach with a goal towards continuing health of the land and people.


3. Sustainability that can be observed and measured; indicators that a farm or rural community is achieving 3 objectives of sustainability simultaneously, i.e. :

   - **Economic Sustainability** - economic profit
   - **Social Sustainability** - social benefits to the farm family and the community
   - **Environmental Sustainability** - environmental conservation
I. Economic Sustainability

Selecting profitable enterprises to ensure economic sustainability

In terms of economic components, agroecological approaches optimize the use of locally available resources

- The farm enterprises are consistently profitable from year to year.
- Purchase of off-farm feed and fertilizer is decreasing.
- Reliance on government payments is decreasing.
II. Social Sustainability

Socially, agroecological approaches build up and take full advantage of local knowledge and practices.

- The farm supports other businesses and families in the community.
- Money circulates within the local economy.
- Young people take over their parents' farms and continue farming.
- College graduates return to the community after graduation.
III. Environmental Sustainability

- There is no bare ground.
- Clean water flows in the farm's ditches and streams.
- Wildlife is abundant.
- Fish are prolific in streams that flow through the farm.
- The farm landscape is diverse in vegetation.
Elements of Sustainable Agriculture:

- Environmentally sound
- Economically viable
- Socially just
- Humane
- Adaptable
Sustainable agriculture can be viewed as ecosystem management of complex interactions among:

- soil
- water
- plants
- animals
- climate
- people.

The goal is to integrate all these factors into a production system that is appropriate for the environment, the people, and the economic conditions where the farm is located.
Farm Acts As An Ecosystem

- On any farm, four major ecosystem processes are at work that, if functioning properly, will conserve the soil and water resources and eventually reduce the overall operating costs.
- These natural processes—energy flow, water and mineral cycles, and ecosystem dynamics—are observable and manageable.
Effective ecosystem dynamic is indicated by high diversity of plants and animals both above and below ground.

"Diversity" refers not only to numbers of species, but also to genetic diversity within species, and to a broad age structure in each population.

Greater diversity produces greater stability within the system and minimizes pest problems.
Principles of Sustainable Agriculture

1. Prevent soil erosion
   - Cover crops
2. Diversify crops
   - Crop rotation
   - Mixed cropping
3. Fertilization
   - Reduce the use of chemical fertilizer
   - Green manures
   - Composts
4. Weed management
5. Integrated Pest Management (IPM)
6. Plant Disease Management
There are various sustainable agriculture systems:

- Natural Farming
- Organic Farming
- Low-input Agriculture
- Alternative agriculture
- Regenerative
- Holistic Farming
- Biodynamic farming
- Biointensive farming
- Biological farming systems.
1. Biodynamics

- Biological dynamic agriculture, a.k.a. biodynamics, is a system of agricultural management based on a series of lectures given by Rudolf Steiner in 1924.
- Over his lifetime, Dr. Steiner became concerned with the degradation of food produced through farming practices that increasingly relied on additions of inorganic fertilizers and pesticides.
- Reputed to be the first alternative approach to agriculture,
- Biodynamics has evolved over the last century to include many organic farming practices that have demonstrable benefits on land use and crop production.
2. Natural farming

- Natural farming is an ecological farming approach established by Masanobu Fukuoka (1913–2008), a Japanese farmer and philosopher.
- It is also referred to as "the Fukuoka Method", "the natural way of farming" or "do-nothing farming". The title refers not to lack of labor, but to the avoidance of manufactured inputs and equipment.
- Natural farming can also be described as ecological farming and is related to organic farming, sustainable agriculture, agroforestry, ecoagriculture and permaculture but should be distinguished from biodynamic agriculture.
- The system exploits the complexity of living organisms that shape each particular ecosystem. Fukuoka saw farming not just as a means of producing food but as an aesthetic or spiritual approach to life.
- He suggested that farmers could benefit from closely observing local conditions. Natural farming is a closed system, one that demands no inputs and mimics nature.