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Organic Farming for Sustainable Agricultural Production

Dr. Dillip Kumar Swain, Associate Professor

Agricultural and Food Engineering Department

Lecture 07 : Sustainable Agriculture

What is “Sustainable Agriculture”?

“The management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such development conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable.”

(Food and Agriculture Organisation (FAO))

What is “Sustainable Agriculture”?

It is defined as the farming systems and government policies that develop long-term positive impacts on the following: agricultural profitability; environmental quality; food sufficiency, quality and affordability; and rural family and community vitality.

A farm is sustainable if it is able to (pick any or all):

- **Maintain a high level of production**
- **Preserve and enhance natural capital**
- **Provide a livelihood for a farm family**
- **Sustain a rural culture**

The Center for Integrated Agricultural Systems (CIAS)

What is “Sustainable Agriculture”?

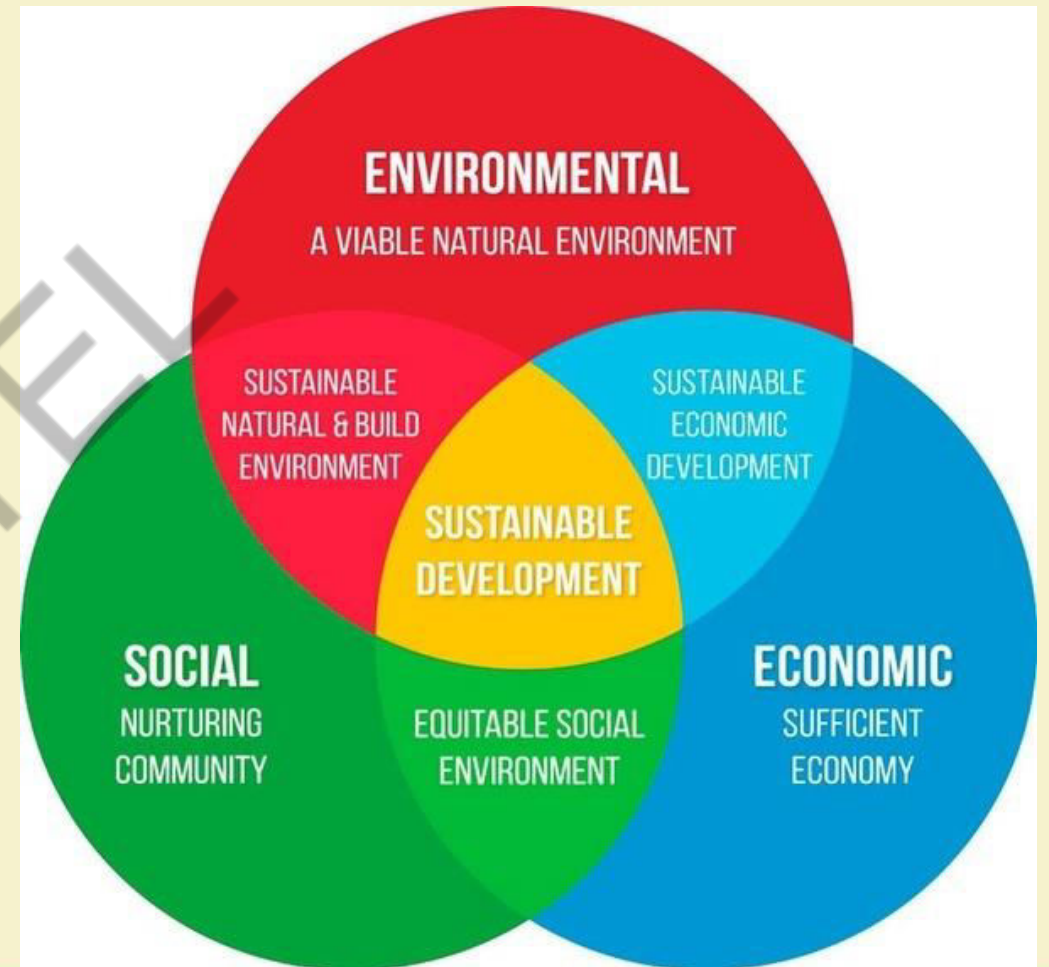
- The successful management of resource for agriculture to satisfy the changing human needs, while maintaining and enhancing the natural resource base and avoiding environmental degradation.
- The ability of an agricultural system to maintain production over time in the face of social and economic pressure.
- One that should conserve and protect natural resource and allow for long-term economic growth by managing all exploited resources for sustainable yield.



(Board of International Food and Agricultural Development, 1988)

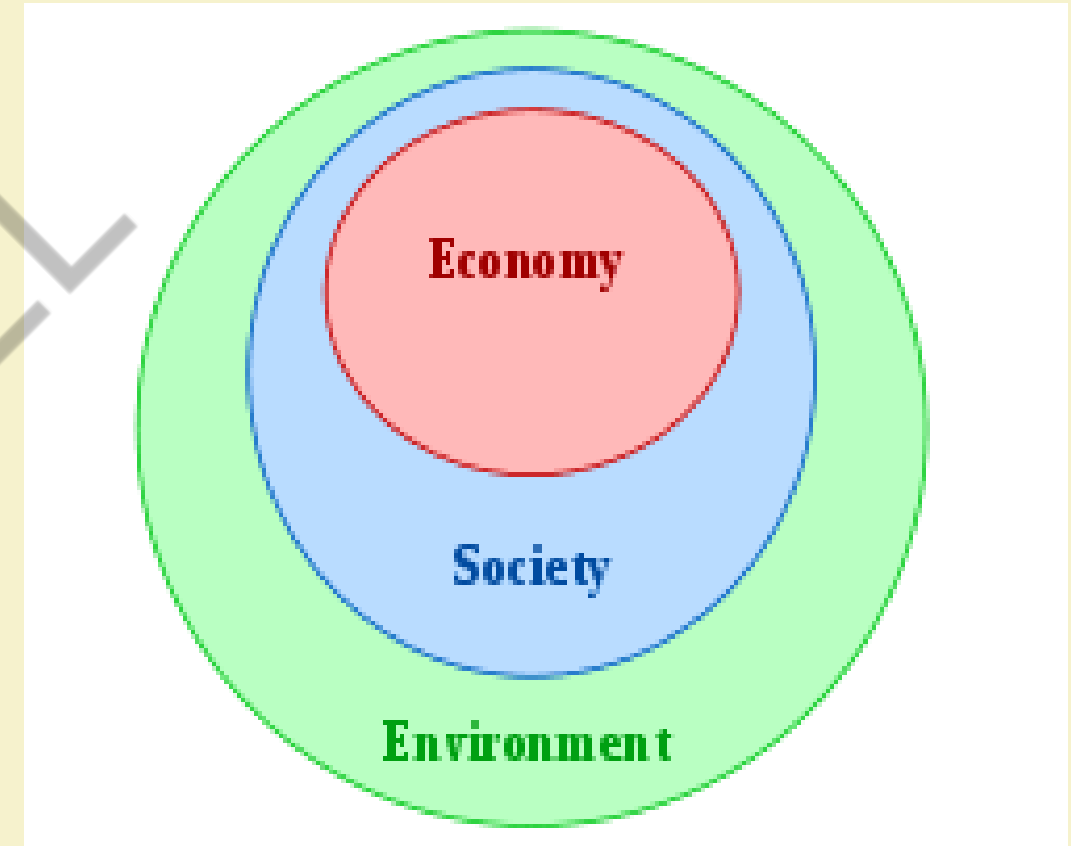
Goals of Sustainable Agriculture

1. Environmental health
2. Economic profitability
3. Social equity



1. Environmental health

- **Environmentally Sustainable Agriculture** should aim
 - **Minimizing greenhouse gas emission**
 - **Conservation of ecosystem**
 - **Protection of public health**
- Produce the **best quality food** for the consumer, **nurture the environment & preserve energy**.



2. Economic Profitability

- Economic profitable Sustainable Agriculture should ensure that the **farm families as well as the society** as a whole should **benefit** from the agricultural practices **keeping** in view the **sustainability** approach.
- Economic viability is a necessary condition for sustainable agricultural and food systems. But economic viability is about more than profitability.



3. Social equity

- **Adam Smith**, the father of contemporary economics, said, “**No Society can surely be flourishing and happy, of which the far greater part of the members are poor and miserable.**”
- Hence for an approach to be literally sustainable it should look into the feasibility and social justice first.
- This is achieved by
 - **Supporting farmers** who are committed to protecting the natural environment
 - Helping to make **ecologically sound food and fiber systems economically viable**
 - Our responsibility to help **build food and farming systems** that are **socially** acceptable
 - Generating **employment equity** for farmers, farm workers, and others employed in the system
 - Ensuring **adequate food, clothing, and shelter** for all people have

Factors affecting Agricultural Sustainability

a) Land/soil related problems

- Soil degradation/ Accelerated soil erosion
- Deforestation
- Siltation of reserves

c) Indiscriminate use of agro-chemicals

- Environmental pollution (Fertilizer and pesticides)
- Greenhouse effect

b) Irrigation related problems

- Rise in groundwater table & water logging
- Soil salinization & alkalization
- Over- exploitation of groundwater

Factors determining sustainability

Considering the population pressure and availability of arable land, the world can be classified under four classes:

- **Class I:** Regions having low population pressure and abundant per capita arable lowland (North America and Oceania)
- **Class II:** Regions having low population pressure but a shortage of per capita arable land (Europe)
- **Class III:** Regions having high population pressure and abundant per capita arable land (Africa and South America)
- **Class IV:** Regions having high population pressure, but low per capita arable land (Southeast Asia)

How Sustainable Agriculture?

How can the world adequately feed more than 9 billion people by 2050 in a manner that advances economic development and reduces pressure on the environment?

Answering it requires a “**great balancing act**” of three needs—each of which must be simultaneously met.

First: The world needs to close the gap between the food available today and that needed by 2050.

Second: The world needs agriculture to contribute to inclusive economic and social development.

Third: The world needs to reduce agricultural impact on the environment.

Case Studies

Rodale Institute

Rodale Experimental farm of USA projects that the planet's **3.5 billion tillable acres** could sequester nearly **40 percent of current CO₂ emissions** if they were converted to **organic agricultural** practices (Giants et al., 2010)

Rothamsted Field Experiment

- In a Rothamsted long term field experiment, it was reported that FYM greatly increased yields of all crops but responses were less when fertilizers were also given (Widdowson et al. 2009).
- long-term organic fertilizer applications have been reported, in a number of cases, to cause increases in water stable aggregation, porosity, infiltration capacity and hydraulic conductivity and decreases in bulk density (Haynes and Naidu, 1998).



Rodale Experimental Farm, USA

Case Studies (cont..)

India

- Organic farming shows **increases in carbon absorption by up to 55 %**, and water holding capacity of soil by **10 %**.
- Increased fertilizer consumption does not necessarily lead to higher productivity in pulses (Pillai, 1994).
- Application of Vermicompost increased ascorbic acid, beta carotene, total soluble solids and color value of tomato as compared to chemical fertilizer product (**Murmu et al., 2013**)

Contd.

- The protein, vitamins, and minerals are appreciably greater in the organically produced crops (Srivastava et al., 1982).
- Split application of organic fertilizer in rice achieved synchrony of soil N supply with crop N demand, thereby improved the grain production which was comparable with chemical fertilizer (Kumar et al., 2018).
- Nutritional quality with respect to micro-nutrients (Fe, Mn and Zn) and protein content in rice grain and cooking quality in terms of amylose content can be improved by organic nutrient management as compared to inorganic fertilizers (Keawpeng and Meenune, 2012).

Future Prospects

- Although industrial agriculture currently dominates the global food system, public awareness of the problems caused by this model has grown rapidly, building extensive support for sustainable agriculture, creating a robust market for sustainable foods, and inspiring formidable demand for agricultural policy and regulatory reform.
- Sustainable agriculture is not just an analytical question, defined in terms of environmental quality, productivity, sufficiency, but it is also a philosophy toward farming. By its nature, the concept is goal oriented and value laden.
- Although Sustainable Agriculture is profitable in the long run but for the time being farmers are more concerned with the monetary benefit. Hence proper dissemination of knowledge in this regard is required.

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