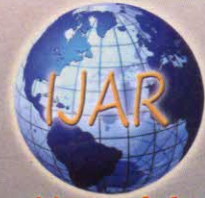


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Sustainable Agriculture: A Key to Sustainable Development

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Abstract: Indian economy is primarily agricultural economy and agriculture is pivotal in all economic activities. Development of Indian economy rests on the development of agriculture and allied activities. But this agricultural development must be sustainable to sow the seeds of development in future. Sustainable agriculture stands for successful management of resources for agricultural development to satisfy the changing human needs, while maintaining or enhancing the quality of environment. However the sustainable agricultural practices, which are being promoted, are still at experimental stages. These include seven pillars of Integrated Intensive farming System (IIFS) such as: Soil health care, Integrated Water Management, Integrated Nutrient's Management, Integrated Pest Management, Agro forestry, Animal husbandry and integrated farming. Agricultural sustainability rests on the principle that we should fulfill our present needs not at the cost of the future generations' needs. Therefore stewardship of both natural and human resources is of prime importance.

Key words: agriculture, Sustainable, human needs

Introduction:

"Everything else can wait, but not agriculture." -Jawaharlal Neheru

In the contemporary era, development has become a matter of deep concern for the governments, civil societies and economic and social planners. During the last more than 40 years, development has become a global issue and hue and cry for all nations. Development in order to be durable should be sustainable.

Sustainable development is an expanded view of conditional development and not de novo thinking. In India, Sustainable Development is rooted in the firm realization of "Dharma". Now it has been universally accepted goal of humanity.

SUSTAINABLE AGRICULTURE:

Sustainable agriculture stands for successful management of resources for agricultural development to satisfy the changing human needs, while maintaining or enhancing the quality of environment.

Agriculture is not only a way of life but also the backbone of Indian economy. It has shaped the thought, the outlook, the culture and the standard of living of people of India. Indian agriculture is known for its multi-functionalities of providing employment, livelihood, food, nutritional and ecological security.

In the sixties, due to increased demands, it had become imperative to increase the crop production. Therefore, application of new technologies in the field of agriculture had become a necessity, because most of the cultivable land was under plough. In 1968, this led



to the evolution of “**Green Revolution**”. This Green Revolution enhanced the agricultural production of the country remarkably and benefited the Indian economy in two ways. First, it build-up self-confidence in agriculture and raised its social status. Second, due to this revolution rural development took faster pace.

But the ‘Green Revolution’ became a ‘Greed Revolution’ and caused various damages. Green revolution led to the excessive use of pesticides, fertilizers and imbalanced utilization of natural resources. Hence it created various internal and external threats to agricultural processes. The most important among the internal threats are the damages to the ecological foundations such as land, water, forests and bio-diversity so essential for sustained agricultural advances. The external threats include potentially adverse changes in temperature, precipitation, sea level and ultra violet radiations.

However the sustainable agricultural practices, which are being promoted, are still at experimental stages. These include seven pillars of Integrated Intensive farming System (IIFS) such as: Soil health care, Integrated Water Management, Integrated Nutrient’s Management, Integrated Pest Management, Agro forestry, Animal husbandry and Integrated farming.

A) Soil Healthcare:

Soil healthcare is fundamental to sustainable agriculture. Ideal soil healthcare includes provision of optimum soil reactions, soil moisture content and addition of organic matter. All these factors aid in improving soil fertility and hence lead to the evergreen revolution.

Crop diversification is the most important factor in enhancing production and maintaining sustainability on all fronts. Crop diversification methods like crop rotation, mixed cropping and intensive cropping once required to improve soil fertility, enhance yields reduce erosion and the need for chemical fertilizers.

B) Integrated Water Management:

Like soil, water is a critical resource for achieving better crop production. Management of water in agriculture deals with using water efficiently under different soil and climatic conditions. To make water resources sustainable, there is need for an integrated water management system, which should include policy, and management actions like:

- Improved water conservation and storage measures.
- Incentives for selection of drought tolerant crop varieties.
- Efficient irrigation systems.
- Crops that reduce water loss.

After considering all these major factors we can say that Integrated Water Management approach should include micro-irrigation, water harvesting and watershed management.

Agricultural growth and development can become sustainable only if there is judicious use of water resources by combining both modern technologies and traditional wisdom.

C) Integrated Nutrient Management:

One of the major reasons for stagnation in the food grains production is the degradation of soil fertility due to



continuous application of excess doses of chemical fertilizers. Nutrient management is managing the amount, source, placement, form and timing of the application of nutrients and soil amendments to ensure adequate soil fertility for plant production and to minimize the potential for environmental degradation, particularly water quality impairment. Integrated nutrient management improves soil health in long run and reduces the demand for fertilizers. It ensures the concept of sustainability in agriculture. The benefits of INM approach need to be fully harnessed keeping in view the demand of food for increasing population, dwindling supplies and increasing cost of fossil fuels.

D) Integrated Pest Management:

Weeds and pests are another threat to sustainability. Weeds are undesirable plants that are competitive and adaptable to all adverse environmental conditions. They cause great loss in agricultural production. To achieve an evergreen revolution there is also a need for integrated weed management so that losses can be minimized.

Excessive use of HYVs and agrochemicals make the pest management difficult. It also causes threat of sustainability to water, soil and air. This led to the concept of Integrated Pest Management (IPM), which is highly cost effective, and environment friendly. Due to increasing awareness there is a general trend towards an ecological approach to pest management, which is indicative of the bright future of IPM. But the imposition of any pest control method upon agro system can cause serious ecological problems.

Effective implementation of IPM requires farmers' participation, government support, improved infrastructure, awareness and a favourable environment.

E) Agro-Forestry:

Agro-forestry is the fourth important pillar for sustainable agriculture. It is the cordial balance between agriculture and forestry. Technically it is a sustainable land management tool resulting into increased production.

It is a potential system that combines production of multiple outputs with resource protection and is, therefore suitable for low input conditions fragile environments. It prevents shrinkage of per capita land and involves interplay of socio-cultural values. Agro-forestry is beneficial both on short and long term basis. It is essential for maintaining the nitrogen content of the soil. Further, the shade of trees improves soil microenvironment.

F) Animal Husbandry:

The sixth pillar of sustainable agriculture is animal husbandry. This has significant role in rural economy. Animal husbandry output constitutes about 25% of the country's national income. It helps in diversifying agriculture. Livestock production is an integral part of crop farming. The returns from livestock in small and medium land holdings are large and highly sustainable. The progress in this sector results in balanced development of the rural community and improvement in the economic status of the poor people associated with it.



G) Integrated Farming:

A majority of Indian farmers are small and marginal. To improve their socio-economic condition, integrated farming system is considered suitable.

The concept of integrated farming is an integration of different interdependent enterprises for effective utilization of all reserves. As the enterprises are interacting, the byproducts of one enterprise are utilized as raw material for other and vice-versa.

Being a multi-enterprise system it also acts as an insurance against failure of any single enterprise due to unforeseen reasons. In the face of multidimensional challenges of the new millennium integrated farming can solve all problems through:

- i) Increased productivity per unit of land.
- ii) Better utilization of resources.
- iii) Recycling of farm wastes.
- iv) Employment generation.
- v) Reduction of risk.

All these integrated management systems will aid in revolutionalising Indian agriculture slowly. Unlike green revolution, an evergreen involves an integrated approach.

APPROACHES OF SUSTAINABLE AGRICULTURE:

Some of the new approaches to agricultural development programmes are:

1) Farming System Approach:

It aims at identifying problems and constraints together with farmer. International Agricultural Research

Centre first developed it in 1970s. In farming systems approach to agricultural development, practices cannot be singled out and dealt in isolation. The key elements in a farming systems approach are:

- Agricultural practices such as cultivation, methods, cropping systems and plant protection are interdependent so that change in one leads to change in other.
- The farming system is adapted to local ecological conditions.
- The farming system is partly determined by the history and culture of the economy.

The system approach has three important pre-requisites. They are:

- ❖ Survey of all the elements of existing farming systems should be conducted.
- ❖ They should have adequate research knowledge in order to allow for learning and adjustments and for gradual introduction of innovations.
- ❖ They should have flexible time schedule, organization and financial structure.

The following measures appear both ecological and economic point of view:

- a) Cropping system including mixed cropping, crop rotation and intercropping with nitrogen fixing grain legumes or leguminous trees or shrub-alley farming.
- b) Growing yield stable varieties of crops.
- c) Integrated Pest Management.
- d) Integrating trees into farming system agro-forestry.



e) Intensive water management, water harvesting, water recycling.

f) Introduction of contour ploughing, contour planting, terracing, grass buffer.

2) People's Participation Approach:

The important difference between the people's participation in social services or infrastructure programme and of agriculture programme is that the former entails primary change in organization, where as in an agriculture programme it would be meaningless unless it were based on a farming systems approach and on people's own idea and knowledge. This includes:

➤ People's right to identify their own developmental priority. This can be achieved by Participatory Rural Approach (PRA). Community planning may take more time than desk planning, since it explores the different viewpoints and interests of social groups involved. It may however not automatically include the poor, women or other marginal groups and certain preconditions have to be made. Real participation by definition implies conflicts and choices, which also involves development agencies.

➤ Farmers must be involved in actual implementation, evaluation and monitoring of the programmes.

This approach does not exclude transfer of technology. Once the local priorities and solutions have been identified, the project can provide suggestions for alternatives.

PRINCIPLES OF SUSTAINABLE AGRICULTURE:

Agricultural sustainability rests on the principle that we should fulfill our present needs not at the cost of the future generations' needs. Therefore

stewardship of both natural and human resources is of prime importance.

Stewardship of human resources includes consideration of social responsibilities such as working and living conditions of labourers, the needs of rural communities and consumer health and safety both in the present and the future. Stewardship of land and other natural resources involve sustaining or enhancing these vital resources in the long run.

Sustainable agriculture integrates three main goals:

a) Environmental health,

b) Economic profitability and

c) Social and economic equity.

DIMENSIONS OF SUSTAINABLE AGRICULTURE:

Dr.M.S.Swaminathan, the eminent agricultural scientist, identified 14 major dimensions of sustainable agriculture covering the social, economic, technological, political and environmental factors of sustainability. These dimensions are:

1) **Technology:** Agricultural technology, be it seeds, fertilizers, pesticides or post harvest must suit the social and infrastructural situation of the end users.

2) **Economic feasibility:** Capacity of the farmer to afford to incorporate the technology within his financial capacity.

3) **Economic viability:** The returns to investment to every rupee are required.



- 4) **Environmental soundness:** Whether the technologies results in enriching the environment or at least not harm the existing agro-ecological conditions.
- 5) **Temporal stability:** Whether the positive aspects of the technology remain stable over the long run.
- 6) **Resource use efficiency:** How effectively the technology can utilize the inputs to convert them into useful, productive and eco-friendly outputs.
- 7) **Local adaptability:** The extent to which the Technology is adaptable to the existing local conditions of the farmer.
- 8) **Social acceptability and social sustainability:** Social acceptability refers to the extent to which the technology is acceptable by the different sections of the society. Whereas social sustainability means fulfilling the personal needs.
- 9) **Political tacitness:** Whether the technology can be used unhampered in the existing intricacies and implications of political set up.
- 10) **Administrative manageability:** The extent to which the technology can be practically implemented under the existing bureaucratic structure.
- 11) **Cultural desirability:** The extent to which the technology fits with the cultural patterns and values of the society.
- 12) **Renewability:** The extent to which the technology can be used or reused without much additional effort and inputs.
- 13) **Equity:** How evenly the products of agro-ecosystem are distributed among the local producers and consumers.
- 14) **Productivity:** Is a quantitative measure of the rate or amount of production per unit of land or input.

By considering these dimensions of sustainability a country like ours can achieve success in promoting Sustainable Agriculture.

Policy of sustainable agriculture:

The first ever National Policy on Agriculture was announced on 28th July, 2000. The National Policy on Agriculture seeks to realize the vast untapped growth potential of Indian agriculture and strengthen rural infrastructure to support faster agricultural development on a sustainable basis. For the first time in India, the National Agriculture Policy has tried to establish a bilateral relationship between environment and agriculture.

Considering the environmental hazards associated with agricultural practices, the policy has clearly stated that the use of natural resources should be technologically sound and environmentally non-degrading. Further it also stresses on the soil conservation in addition to proper and effective use of biotechnology. Moreover it prohibits indiscriminate transfer of agricultural land for non-agricultural purposes.

The policy is aimed at creating gainful employment on a self-sustaining basis in rural areas, raise standards of living for the farming communities and preserve environment.

It aims to attain: