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Bio-Economic Approach for Sustainable Agriculture- Integrated Farming System

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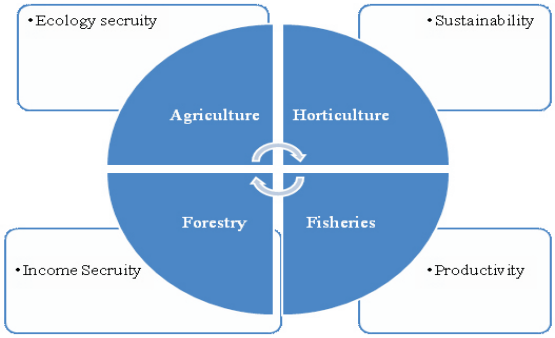

FIGURE 1. Bio economic Model

KEYWORDS: Bio economy, Circular bio economy, Integrated farming system, Sustainability

SUMMARY

By integrating water, nutrient, and energy, multi-enterprise farming increases productivity and profitability in small farms. By recycling byproducts and residuals from different components within the system, it has the potential to reduce cultivation costs for farmers and ensure a stable source of income and employment.

INTRODUCTION

As the world's population grows, many resources are depleted quickly, environmental pressure increases, and climate change is manifest, our country needs a radical overhaul of the way that it produces, consumes, processes, stores, recycles and discards biological resources. Research and innovation progress in the bioeconomy will lead to improved management of its renewable biological resources and to new and diverse markets in food and biobased products. The production of biomass relies on several essential and limited resources in agriculture, forestry, fisheries, and aquaculture. The environment comprises land, the sea, fertile, functioning soils, water, and healthy ecosystems, as well as minerals and energy used to make fertilisers. To achieve sustainable resource use and minimize environmental stress, the Bioeconomy Strategy is designed to enhance the knowledge base and foster innovation. In the case of forestry and fisheries, a decline in biodiversity can lead to significantly reduced yields of primary production. As a consequence of the Strategy, ecosystem-based management will be promoted. A more sustainable approach to resource use will be enabled by the Bioeconomy Strategy. A major component of this will be developing international best practices and understanding of biomass sustainability for the purpose of opening new markets, diversifying production, and addressing long term food security issues.

Dimension of Integrated Farming System

The idea of sustainable agriculture has been explored in many ways. Among them are agro-climatic zones, various farming methods, like crop rotations and mixed farming, soil and nutrition management, and Integrated Farming Systems (IFS). The first two aspects of sustainable agriculture are economically profitable, and the third is socially and environmentally sustainable. Considering each of these components, let's examine how IFS enhances the sustainability of agriculture.

Economic Profitability

Sustainable agriculture is most concerned with the profitability of farmers Incentives must be backed by good returns to encourage farmers. With IFS, productivity can be multiplied many times over. The pollination services of bees have been shown to significantly enhance productivity in oilseed crops when apiculture (beekeeping) is practiced. In addition, mix-farming also provides producers with other marketable products, such as honey, wax, bee venom, and pollen. Farmers are therefore able to increase their profits The Mission for Integrated Development of Horticulture is promoting beekeeping for this reason.

In India, some 80% of the farmers are small and marginal farmers, as already outlined. Subsistence agriculture is the main practice among these farmers; only a few can upgrade to commercial agriculture. In addition to increasing crop productivity, IFS boosts farmers' productivity. Additionally, small farmers have the ability to generate handsome revenues through better productivity and more marketable products. Farmers produce timber, fruits, and herbs with agro-forestry on the edges of farms and fallow fields. Under the agro-forestry initiative 'Har Med pe Ped' of the Sub-Section for Agro-forestry, a sub-section of Mission for Sustainable Agriculture, agro-forestry is promoted among farmers As a fast-maturing plant, bamboo can survive a variety of climates and that is why it is being promoted as part of the National Bamboo Mission.

Social Impact

Food and nutritional security are assured through the enhanced production of crops and other agro products, which contribute to the overall well being of the nation. Milk and honey are produced by animal husbandry, while fruits and medicines are harvested in agro-forestry. Rural areas typically face unemployment and underemployment problems, which are solved by practices like agro-forestry. The fact that IFS increases access to agro products in rural areas encourages the development of related industries of agriculture. Based on the findings of this study by, multiple farm enterprises integrated in an integrated manner will provide a substantial income to farmers that will allow them to sustain their livelihood over the maigre income from self-standing enterprises. A systemic approach should be taken to promote the adoption of IFS through institutional, extension, policy, as well as marketing interventions.

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(a) Ecological balance

When implemented correctly, IFS methods have a positive impact on the ecology of a region. Manure from livestock is used in areas that practice animal husbandry alongside crop cultivation. By doing this, we decrease the need to use chemical fertilizers, promote organic farming at a low cost, and improve soil fertility. Various organic farming models, such as the IFS system, encourage the diversification of species in a local area, which increases the complexity of the food chain. This leads to a more stable ecosystem that supports more wildlife in the long run.

(b) Resource and Knowledge Centers

It is imperative that farms are managed properly, even with the many benefits that come with IFS. Food and medicine for one element can harm the other due to their proximity to each other since they are all in proximity. IFS models covering 15 agroclimatic zones of the country have been developed by the Indian Council of Agriculture Research (ICAR) to enable farmers to make informed decisions. Krishi Vigyan Kendra (KVKs) is the district's centres of knowledge and information in the area of agriculture and are the repository for information about these models.

Circular Bio-economy- A way forward for sustainability

Linear production and consumption are the foundation of our economic system. This weakens our policy and social welfare measures. A number of science and technology initiatives have been undertaken with regard to the environment and the transition to a circular economy. In order to achieve sustainable development goals, the circular economy is emphasized. In recent years, circular bioeconomy has been given a greater value in governmental amenities, trade, environment and economic growth, since it is expected to create more employment opportunities, fuel economic growth and contribute to social welfare. Bringing our economy and environment in balance, innovation is the key to achieving a circular economy. New business models can create additional jobs through the circular bioeconomy. As a part of achieving the global sustainable goals, it is advantageous to achieve a circular bioeconomy through recycling waste products for re-use.Circular bioeconomy is to play a significant and dominating role in reducing consumption of raw materials, synthetic fertilizers, agricultural inputs, food waste, and infrastructure components.

It is a web of subtle interactions between plants (crops, livestock, and microbes) and the soil, water, and air (soil, water, and air).Food system is composed of the production, processing, distribution, and consumption of food. This process encompasses all the elements involved in food production, distribution, and consumption. Technology that can support the development of a circular bioeconomy with an emphasis on sustainable resource use requires more attention. Further efforts need to be made to encourage the safe utilization of water, including recyclability, as well as the use of manure and its by-products.By combining livestock and crops, through annual pastures and organic farming, a farming system can increase profitability as well as help build a circular bio economy for the soil. By restoring a symbiotic equilibrium between plants and animals, organic farming ensures the welfare of farming societies and investments since synthetic fertilizers cannot be used; it improves the productivity of smallholder farmers and encourages the circular bio economy. To achieve precision in production and marketing and consequently profitability and sustainability of farms and the nation, developing a database on produce paradigms, technology development, and business collaborations are important to shift from linear to circular bio economy. Any higher goal in the supply chain requires a transition. An analysis of predominant scenarios, combined with updated technical solutions, is necessary to enable the development of circular systems on a technical level. In such a context, an integrated approach to assessing the agro-food value chain, encompassing multiple sectors, is essential to creating new value chains that can make optimum use of their products.

An agricultural system is a combination of farm enterprises in which households allocate resources so that existing enterprises may be efficiently utilized to increase farm efficiency and profitability. Models included in bio-economic farm assessments should have a generic design and be flexible enough to be adapted for evaluating different policies under various socioeconomic and bio-physical conditions (different farm types and different regions, for example) so that resources can be re-used for new questions and applications without complicating the development process. A farming system with livestock could double the income of the farmers within a five-year period and provide social and ecological benefits at the same time. In order to evaluate the cropping system models ability to simulate critical phenological, growth, and morphological variables using experimental data as input, a very important problem concerns the availability and quality of data concerning soil, climate, crops, and crop management needs to be considered.

CONCLUSION

In a sense, Integrated farming system replicates the natural environment. Complexity is a result of the diversity and interdependence of agricultural and allied methods. In addition to its ecological benefits, IFS also has enormous social impacts on food security and jobs production. Small farmers will benefit most from it since they will become more profitable and productive. Therefore, Integrated Farming Systems will play a major role in the vision of doubling farmers' income and in ensuring the sustainability of agriculture. By developing innovative business models, natural resources can be reused more efficiently. There is a real challenge in implementing the circular bioeconomy, in creating and administering the alternative processes effectively, as well as entering the market and establishing new businesses. A circular economy strategy must become more appealing for small- and medium-sized businesses in order to discover markets for their by-products by which a competitive market can be made for growth in rural economies through creating jobs through sustainable employment. By advocating the circular bioeconomy concept and educating people of different cultures, we can achieve sustainable development goals by reducing the generation of waste.

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