

Diversified Farming Systems in Indian Agriculture: A Sustainable Approach to Enhance Productivity and Resilience

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OPEN ACCESS

Keywords

Diversified Farming Systems, Sustainable Agriculture, Small and Marginal Farmers, Integrated Farming, Agricultural Resilience

How to cite this article:

Seemakowsar, N., Ramu, M. S., Sharif, M. and Sadhana, H. S. 2024. Diversified Farming Systems in Indian Agriculture: A Sustainable Approach to Enhance Productivity and Resilience. *Vigyan Varta* 5(4): 1-5.

ABSTRACT

Indian agriculture faces formidable challenges, including climate change, resource depletion, and diminishing productivity, jeopardizing the livelihoods of small and marginal farmers who constitute over 86% of the farming community. This paper advocates for a paradigm shift towards diversified farming systems to address these multifaceted issues. The study emphasizes the integration of crops with complementary enterprises such as dairy, sheep, poultry, horticulture, and fisheries. Diversification offers numerous advantages, including risk reduction, resilience to climate change, soil health improvement, biodiversity conservation, and cultural value preservation. The research analyzes various farming systems in different regions of India, demonstrating that integration leads to higher net income and employment generation. Despite potential challenges like limited market demand and infrastructure issues, the benefits of diversified farming outweigh the drawbacks. This paper underscores the importance of tailoring diversified farming systems to be socially acceptable, environmentally friendly, and economically viable, promoting

sustainability and contributing to the well-being of farmers and the broader community.

INTRODUCTION

Climate change, dwindling natural resources, and declining agricultural productivity pose significant threats to the profitability of Indian farming, especially for small and marginal farmers who constitute over 86% of farm families. The country's vast arable land per capita is paradoxically characterized by low landholding at a global scale. This fragmentation of land resources jeopardizes the future sustainability, food security, and profitability of Indian agriculture. Traditional agricultural technologies fall short of providing sufficient food for farm families, necessitating a shift towards circular economy-based, environmentally robust agrotechnologies. Addressing these challenges requires a holistic approach that integrates locally available farm resources, emphasizes environmental restoration, and promotes diversification of production systems.

To enhance total farm productivity and profitability, diversification is advocated, involving the incorporation of compatible enterprises such as dairy, poultry, horticulture, and animal rearing alongside dominant cropping systems. This diversified approach, informed by a farming systems perspective, seeks to judiciously use inputs and natural resources for sustainable income and employment. Emphasizing the need for preserving land and water resources, sustainability in agriculture involves producing viable crop and livestock enterprises while efficiently utilizing land and water. Integrated farming systems, as demonstrated in specific regions like Assam, showcase the potential to significantly increase income and employment, offering a pathway to ensure food and nutritional security sustainably.

The importance of a diversified farming system can be highlighted in several ways:

Risk Reduction: Diversification helps mitigate the risk associated with crop failure or disease outbreaks. If one crop fails, other crops may still thrive, providing a more stable income for farmers.

Resilience to Climate Change: Different crops and livestock have varying tolerance levels to environmental conditions. A diversified farm is better equipped to withstand the impacts of climate change, as some crops or animals may be more resilient to extreme weather events or changing climate patterns.

Soil Health and Nutrient Cycling: Diverse crops contribute to soil health by preventing nutrient depletion and reducing the risk of soil-borne diseases. Different plants have different nutrient requirements, and rotating crops helps maintain soil fertility.

Biodiversity Conservation: A diversified farming system promotes biodiversity by providing a habitat for various plant and animal species. This can contribute to ecosystem services, such as pollination and pest control, which are essential for sustainable agriculture.

Market Opportunities: A diverse range of products from a farm allows farmers to tap into different markets. This flexibility can be crucial in adapting to changing consumer preferences and market demands.

Livelihood Security: Diversified farming provides a more secure livelihood for farmers. Income is not solely dependent on the success of one crop or livestock species, reducing vulnerability to market fluctuations.

Water and Resource Efficiency: Different crops have varying water and resource requirements. By diversifying, farmers can optimize the use of water and resources more efficiently, reducing the risk of resource depletion.

Cultural and Culinary Value: Diverse farms can contribute to cultural and culinary diversity. They can produce a variety of foods that cater to local preferences and traditions, preserving cultural heritage and supporting local diets.

Sustainable Practices: Diversified farming often aligns with sustainable agricultural practices. It promotes reduced pesticide and fertilizer use, as well as improved land management techniques, contributing to long-term environmental sustainability.

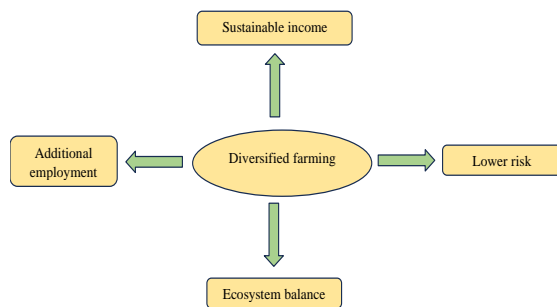


Fig. 1: Principles of diversified farming

Contribution of different enterprises to the farm net income and employment

Table 1: Enterprise-wise share in net income in different farming systems

Farming system	Enterprise	Net Income
		(₹)
C+S	Crop	60,695 (20.34)
	Sheep	2,37,657 (79.66)
	Total	2,98,352
C+D	Crop	74,536 (26.41)

	Dairy	2,07,738 (73.59)
	Total	2,82,274
C+H+D	Crop	63,984 (15.81)
	Horticulture	1,62,462 (40.14)
	Dairy	1,78,310 (44.05)
	Total	4,04,757
C+H	Crop	52,084 (23.76)
	Horticulture	1,67,096 (76.24)
	Total	2,19,180

Source: SEEMAKOWSAR N, 2024

Note: Figures in parentheses represent per centage to total net income and employment per farm.

C+S: Crop + Sheep, C+D: Crop + Dairy, C+H+D: Crop + Horticulture + Dairy and C+H: Crop + Horticulture.

The study has been conducted in central dry zone of Karnataka on four identified farming systems viz. Crop + Sheep (C+S), Crop + Dairy (C+D), Crop + Horticulture+ Dairy (C+D+H) and Crop + Horticulture (C+H) which are majorly followed in study area. The study has shown that diversification towards other enterprises like dairy, sheep enterprise and horticulture component together with the crop would generate higher income to the farmers.

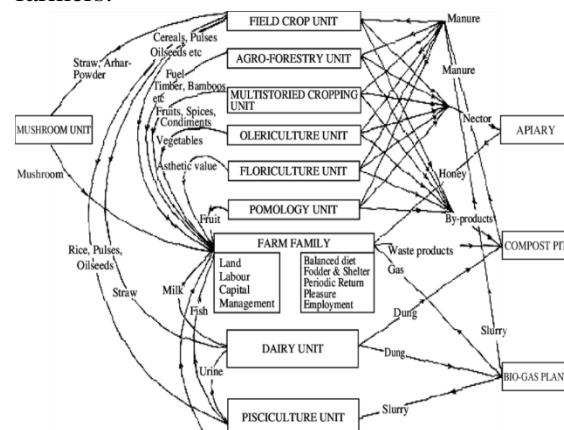


Fig.2: Interactions among different components of the farming systems (Source: Behera et al., 2008)

Table 2: Productivity and economic analysis of integrated farming system in Tamil Nadu

Farming systems	Systems rice equivalent yield (t/ha)	B:C ratio	Employment generation (Man days)
Cropping alone	13.0	2.43	369
Cropping +fish+ poultry	29.6	3.02	515
Cropping +fish +pigeon	29.2	3.06	515
Cropping+ fish +goat	37.7	3.36	576

(Source: Jayanti et al., 2001)

In general, most of the farmers get involved in at least two or three entrepreneurship, which are interrelated e.g. animal husbandry along with agriculture is perhaps the most primitive system since inception of agriculture. Now a-days this system has many more opportunities such as dairy, poultry, piggery, goat and sheep rearing, vegetable cultivation, fisheries etc. and these systems provides additional and regular income to the farmers. Many of these entrepreneurs survive on the bi-product of others. A study involving the integration of crops with fish, poultry, pigeon and goat (Table 2) resulted in higher productivity, higher economic return and employment.

Some potential challenges in diversified farming system approach are:

- Market demand may be limited by a range of factors, such as government policies, subsidies, etc.
- Lack of infrastructure for storage and transportation.
- Absence of suitable equipment.
- Price and supply of inputs.
- Lack of technical knowledge and references regarding their production practices.
- Lack of crop varieties adapted to the specific region.

- Fear of increased complexity.
- Public regulations.

CONCLUSION:

A diversified farming system offers numerous advantages, ranging from risk reduction to environmental sustainability. It contributes to a more sustainable and resilient agricultural sector, benefiting both farmers and the broader community. The significance of the diversified farming system approach is supportive in enhancing productivity to meet the food, feed, fuel and fiber requirement of the ever-increasing population. However, farm diversification will be required to be tailor-made and designed in such a manner that they lead to substantial improvement in energy efficiencies at the farm and help in the maximum exploitation of synergies through the adoption of close cycles. These systems also need to be socially acceptable, environment-friendly and economically viable.

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