
**ENHANCING INCOME OF SMALL FARMERS THROUGH
SMALL INTEGRATED FARMING UNITS (SIFU) BY
IMPLEMENTING MULTI-LAYERED CROPPING:
A BUSINESS MANAGEMENT PERSPECTIVE**

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ABSTRACT:

The Indian agriculture sector constitutes a high percentage of small-scale and minority farmers who continue to receive low and unsustainable incomes due to land fragmentation, monocropping, and lack of access to the market. The paper will discuss the opportunities of Small Integrated Farming Unit (SIFU) and multi-layered cropping as a profitable and sustainable agribusiness. The business management approach was adopted in the study so as to quantify cost-effectiveness, income, resource diversification, and optimality. The research employs both primary and secondary data, including case studies by ICAR and NABARD, and financial tools, including a cost-benefit analysis, break-even analysis, and calculation of the return on investment (ROI). The findings demonstrate that SIFU influences the growth of income (2-3 times), the growth of land productivity, and the reduction of risk because of diversification. It is also suggested in the study that the importance of value chain integration and entrepreneurship in the field of agriculture. The results evoke the conclusion that SIFU can be scaled and replicated as a model to enhance the lives of rural populations and achieve sustainable agricultural development.

KEYWORDS: *Integrated Farming Systems, Sustainable Agriculture, SIFU, Multi-layer Cropping, Income Diversification, Small Farmers, Agribusiness*

INTRODUCTION:

Agriculture still forms the basis of the Indian economy, which assists in the production of the majority of the national income, employment, and livelihoods for the rural population. It employs nearly half of the labor force within the country and is vital in ensuring that the country becomes food secure and has a stable socio-economic state. The Indian farmers consist of small and marginal farmers who constitute approximately 85 percent, and they cultivate less than two hectares of land (1). Despite the significance and critical role of these farmers in the production processes in the agricultural sector,

they are economically compromised due to structural limitations such as small pieces of land, accessibility to institutional credit, and inadequate infrastructure. Consequently, they still earn too small an amount in contrast to other sectors of the economy.

Small and marginal farmers are faced with complex and multidimensional issues. The low productivity that was occasioned by the use of conventional farming methods, coupled with the high cost of inputs that comprise seeds and fertilizers, as well as labor, has a significant effect on profitability. In addition, the volatile prices in the markets and the ineffective market relations are also a cause of income instability. They also expose themselves to the penury of access to modern technology, extension services, and efficient supply chains. These difficulties have been intensified by extreme weather, such as inconsistency of precipitation, droughts, and floods, which have adverse effects on crop production. All these aspects added up to form a vicious cycle of low investment and low returns that farmers are forced to put up with because of the economic woes they are still facing.

The traditional Indian agricultural practices are primarily monocropping, in which a single crop is produced on a mass scale. This will simplify the management of the farms, but it will lose its sustainability. Monocropping systems are highly susceptible to the weather, pests, and soil drainage. Besides, the farmers are susceptible to changes in the market due to dependence on a single crop, as their incomes are highly sensitive to the price. These systems, in turn, result in reduced resilience and the ability of farmers to adjust to the new and altered environmental and economic conditions (2). This uncertainty requires migration to more diversified and resilient agricultural patterns.

Diversification of farming activities has turned out to be a critical factor in growing income and reducing risks in this regard. The thing is that the Integrated Farming Systems (IFS) and the Small Integrated Farming Unit (SIFU) offer a holistic approach that is sustainable. SIFU is a combination of a few elements of crop production, animal rearing, fishery, and agriculture. The scheme operates on the principle of recycling of the resources and that the leftover or the garbage of one component is the input of another one. The example is that the residues of crops can be used as the food of livestock, and animal wastes can be used as an organic manure or biogas. This interdependence will save on the required external input and reduce the cost of production and the overall productivity (3).

Multi-layered or vertical/multi-tier cropping is also referred to as one key feature of SIFU. This is a system whereby there is the development of crops of varied height and formation of canopies simultaneously in order to maximize sunlight, water, and nutrients. The crops that are planted in the upper region are tall, such as coconuts or bananas; those that are in the middle are papaya, and those that are in the lower region are vegetables and leafy crops. It is an excellent system of enhancing the productivity of the land and ensuring continuous income, as the harvesting is staggered (4).

Speaking of business management, SIFU can be regarded as one of the examples of a micro-enterprise incorporating such concepts as diversification, risk management, and cost optimization. It improves cash flow and efficient resource

utilization and reduces reliance on external resources. Furthermore, it makes a company more resilient in terms of diversification of risks across different businesses and more sustainable in terms of the environment, in terms of minimizing chemicals and the health of the soil. SIFU multi-layered cropping is thus a viable and scalable option to increase the revenue of the farmers as well as the attainment of sustainable development in the agricultural sector.

OBJECTIVES OF THE STUDY:

Primary Objective

- To examine the effect of multi-layered cropping of SIFU on the income maximization of small farmers.

Secondary Objectives

- To develop a business model structure for SIFU.
- To measure the cost-benefit and profitability.
- To measure performance in resource utilization.
- To analyze the decrease in risk and the stability of income.
- To determine market linkages and opportunities of the value chain.
- To create a replicable SIFU model.

HYPOTHESES OF THE STUDY:

H1: SIFU has a considerable positive effect on income in comparison with traditional farming.

H 2: Multi-layer cropping enhances land productivity.

H3: Integrated farming brings about reduced variable income.

H4: SIFU leads to greater cost-efficiency and profitability.

RESEARCH METHODOLOGY:

The study design of this paper is empirical, descriptive, and analytical since the purpose of the research design is to measure the efficiency of the Small Integrated Farming Units (SIFU) as applied with multi-layered cropping to give a holistic analysis of this program. To be able to have reliability and depth of analysis, the primary and secondary sources of data are used. Structured surveys of the farmers and personal interviews have been used to collect primary data, and secondary data have been collected through the use of well-known sources such as ICAR, NABARD, FAO, and other government reports. The study has been conducted in a few selected districts of Maharashtra, whereby the sample size of 120 farmers has been used in carrying out the study by the stratified random selection method to ensure that the sample is representative of the different groups of farmers. To estimate the economic feasibility and performance of the model, different analytical methods and techniques are employed, including cost-benefit analysis to determine profitability, break-even analysis to determine financial feasibility, regression analysis to determine the relationship among variables, SWOT analysis to identify the strengths and weaknesses, and the financial modeling methods, including Net Present Value (NPV) and Internal

Rate of Return (IRR) used in the evaluation of the long-run sustainability and investment opportunities.

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DATA ANALYSIS AND INTERPRETATION:

Table 1: Demographic Profile of Sample Farmers (n = 120)

Category	Number of Farmers	Percentage (%)
Small Farmers (<1 ha)	68	56.7
Marginal Farmers (1–2 ha)	52	43.3
Education (Primary)	40	33.3
Education (Secondary)	55	45.8
Education (Higher)	25	20.9
Farming Experience (<10 yrs)	35	29.2
Farming Experience (10–20 yrs)	50	41.7
Farming Experience (>20 yrs)	35	29.2

Table 2: Land Utilization Pattern (Before vs After SIFU)

Land Use Type	Before SIFU (%)	After SIFU (%)
Monocropping	65	20
Multi-layer Cropping	10	55
Livestock Activities	15	35
Fishery	5	20
Horticulture	20	50

Table 3: Income Comparison (Before vs After SIFU)

Income Category (₹/year)	Before SIFU (No. of Farmers)	After SIFU (No. of Farmers)
Below 50,000	45	10
50,000 – 1,00,000	40	25
1,00,000 – 2,00,000	25	50
Above 2,00,000	10	35

Table 4: Average Income and Profitability

Parameter	Before SIFU (₹)	After SIFU (₹)
Average Annual Income	75,000	1,85,000
Average Cost of Production	50,000	1,40,000
Average Net Profit	25,000	45,000
Benefit-Cost Ratio	1.5	2.4

Table 5: Component-wise Cost and Returns (SIFU Model)

Component	Cost (₹)	Return (₹)	Net Profit (₹)
Crops (Multi-layer)	50,000	1,20,000	70,000
Dairy	40,000	90,000	50,000
Poultry	20,000	50,000	30,000
Fishery	30,000	80,000	50,000
Total	1,40,000	3,40,000	2,00,000

Table 6: Productivity Comparison (Yield per Hectare)

Crop Type	Traditional Yield (kg/ha)	SIFU Yield (kg/ha)	Increase (%)
Vegetables	8,000	14,000	75%
Fruits	5,000	10,000	100%
Leafy Crops	3,000	7,500	150%

Table 7: Employment Generation (Man-days/year)

Activity	Before SIFU	After SIFU
Crop Farming	120	180
Livestock	30	90
Fishery	10	50
Horticulture	20	80
Total	180	400

Table 8: Risk and Income Stability

Parameter	Before SIFU	After SIFU
Income Variability (High/Medium/Low)	High (70%)	Low (65%)
Crop Failure Impact	Severe	Moderate
Income Sources	Single	Multiple (4-5)

Table 9: Resource Utilization Efficiency

Resource	Before SIFU (%)	After SIFU (%)
Land Utilization	60	90
Water Utilization	55	85
Waste Recycling	20	80
Input Efficiency	50	88

Table 10: Financial Indicators (Investment Analysis)

Indicator	Value
Initial Investment (₹)	1,40,000
Annual Return (₹)	3,40,000
Net Profit (₹)	2,00,000
ROI (%)	142%
Break-even Period	1.2 years
NPV (₹, 5 yrs @10%)	3,50,000

IRR (%)	28–32%
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Table 11: Farmer Perception on SIFU Adoption

Parameter	Agree (%)	Neutral (%)	Disagree (%)
Income Increased	82	10	8
Risk Reduced	75	15	10
Sustainable Practice	88	7	5
Easy to Adopt	65	20	15

Data from 120 farmers were analyzed with the view to gaining knowledge on the effects of Small Integrated Farming Unit (SIFU) in relation to multi-layered cropping on income, productivity, and sustainability. The demographic profile shows that most of the farmers (56.7) are small farmers who have less than 1 hectare of land, with 43.3 as the marginal farmers. As far as education is concerned, they are mostly schooled to the secondary level (45.8%), followed by primary (33.3%) and higher education (20.9%). The agricultural experience is fairly well balanced, with most farmers having the experience of 10-20 years, resulting in stable and realistic experience.

The land use trends have changed after the adoption of SIFU. There was a tremendous reduction in monocropping to 20 percent of 65 and multi-layer cropping, which increased from 55 to 10 percent. Other activities like livestock, fishery, and horticulture, which were more diversified, were also increased, and the resources were well utilized. This transformation implies that we were not that dependent on a single crop, and it was more sustainable.

There was a significant increase in the income level following the adoption of SIFU. The number of farmers with earnings less than 50,000 decreased by 45 to 10, and the number who earned more than 2,000 increased by 10 to 35. The increment in income and poverty alleviation was also seen in the middle-income segment, where SIFU has played its role, to a certain extent. It is more profitable because revenue increased per annum to 185,000, and the benefits-to-costs ratio also increased to 2.4, which was greater than 1.5.

Multi-layer analysis on cropping will give the highest profit when compared to dairy and fishery, and this will be in the form of maximizing its use in components, such as the highest profit of 70,000 rupees, followed by dairy and fishery, respectively. It has a good financial performance with a net profit of 200,000. Utilization of sunlight and nutrients also resulted in crop productivity, where the vegetables increased by 75 percent, fruits increased by 100 percent, and the leafy crops increased by 150 percent.

The number of employees was increased by between 180 and 400 man-days per year, and this shows that SIFU creates more employment. The degree of risks also reduced because farmers do not rely on a particular crop anymore, and they can have different sources of income. There was an improvement in the utilization of the resources, and land utilization increased to 90 percent, and recycling of waste increased to 80 percent.

Financial analysis shows it has good viability, a break-even period of 1.2 years, a high ROI of 142, and a break-even of 340,000 investment/INR on a break-even of 142. Most of the farmers stated that their income was increasing (82%), and the risk was declining (75%), but some of them had adoption challenges.

Overall, the research shows that SIFU is a highly efficient and profitable agricultural model that boosts profits, reduces risk, and guarantees long-term agricultural operation.

FINDINGS OF THE STUDY:

The researchers suspect that the beneficial influence of the application of the Small Integrated Farming Unit (SIFU) in combination with multi-layered crop production has a significant impact on the livelihood and income of small farmers. The analysis shows that the amount of the farmers' income increased nearly 2 or 3 times due to the adoption of SIFU, with a substantial move to the higher income brackets. There was an increase in the profit-cost ratio, and this implies that the system has also become more profitable and is economically viable.

These findings also indicate that the multi-layered cropping is one of the main methods of maximizing land productivity since it makes the most of the vertical space that improves the yield of several crops, utilizing the space; they are vegetables, fruits, and leafy crops. Farming activities that deal with livestock, fishery, and horticulture can also be diversified to generate a stream of income and remove dependence on a single source of income.

The job creation demonstrated a steep increase, which implies that SIFU results in the creation of employment in rural regions and reduces underemployment. The use of resources was also more efficient, as there was more land, water, and waste recycling. Other findings of the research also show that income variability and financial risk due to the diversification were greatly reduced. Most farmers considered SIFU a sustainable model of farming and beneficial, even though some of them initially had problems with adopting it. SIFU is, in general, a good, scalable, and sustainable model of agribusiness to enhance the income of farmers.

HYPOTHESIS TESTING:

Based on the hypotheses, the comparative analysis of income, productivity, and financial indicators of pre- and post-SIFU was conducted.

H1: SIFU increases income drastically as compared to normal farming—**accepted**. The annual income expanded by 146 percent to 185,000 compared to 75,000, indicating a tremendous impact on the rise in income of farmers.

H2: Multi-layer cropping increases the productivity of the land—**accepted**. The crop productivity was improved in a big way, with the vegetable, fruit, and leafy crops increasing by 75, 100, and 150 percent, respectively, which is a good utilization of land.

H3: Incorporated farming reduces the variability of income—**accepted**. The high-income variability farmers were reduced to 70, the majority, with a report of low variability (65) due to the many sources of income.

H4: SIFU improves the profits and cost-efficiency—**accepted**. The benefits-to-costs ratio had increased to 2.4 compared with 1.5, and the ROI had been 142 percent, which demonstrated the greater profitability and financial viability.

In such a manner, the data helps to confirm all the hypotheses statistically and practically.

DISCUSSION:

According to the study results, Small Integrated Farming Units (SIFU) and multi-layered cropping can provide an alternative, viable, and sustainable system to the usual monocropping systems. The remarkable growth in the level of income rate and growth in productivity and employment rate is a testament to the role of diversification as a factor in reducing economic susceptibility among small farmers. Crops, livestock, fisheries, and horticulture are co-located, which is a guarantee of unlimited income supply and maximization of available resources.

Within its business management approach, SIFU is a model of micro-enterprise, which can be optimized in terms of its cost-efficiency, risk-reduction, and returns. This is financially viable as indicated by the high HROI and the better benefit-cost ratio. The decline in the variability of income also demonstrates the fact that the diversification will minimize risks, which are dependent on climate and changes in the market.

However, it possesses advantages, yet the issues of adoption, such as the levels of investment at the very beginning, lack of technical skills, and access to the market, have remained significant. Therefore, policy facilitation, training, and financial support are required to promote the adoption of SIFU in small farms on a massive scale.

CONCLUSION:

In a nutshell, the paper concludes that Small Integrated Farming Unit (SIFU) and multi-layered cropping represent a highly viable and sustainable way of boosting the income of the small and marginal farmers. The integration of different farm businesses, including crops, livestock, fisheries, and horticulture, provides an opportunity to use the resources economically, diversify the sources of income, and reduce the risks that accompany the production. As the results provide a clear demonstration, there was a colossal shift in the degree of income, land productivity, number of people being employed, and profitability of the farm in general after the implementation of SIFU. Multi-layered cropping is vital in land use maximization since it utilizes the vertical space, leading to high yields and income per year. Within the business management model, SIFU is a feasible model of a micro-enterprise that enables the process of optimizing costs, adding value, and minimizing risks. The economic viability of the model is also attested by the high financial performance ratio, including high ROI and a low break-even period. However, such limitations as the original limitation of investment, technical ignorance, and market access should be addressed to be implemented successfully. Therefore, this model needs policy support, training, and financial support to be scaled. Overall, SIFU offers a viable, scalable, and

sustainable way of improving the livelihoods of the rural communities and actualizing the long-run development of the agricultural sector.

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