

Evaluation of Horticulture Based IFS Models for Providing Nutritional Security to Small and Marginal Farmers of Western Plain Zone of Uttar Pradesh, India

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Abstract

The farm holding size of India has been declining over years as a result of indiscriminate fragmentation of land holding, industrialization and urbanization. Small farm holders including the small and marginal farmers constitute more than 86% of Indian farm families. Under such situation horticulture plays a significant role in contributing to food and livelihood security along with the employment generation. Three horticulture based modules *viz.* fruit tree based (CS-1, 0.3 ha), vegetable crops based (CS-2, 0.22 ha) and field crop based (CS-3, 0.4 ha) were evaluated. In CS-1 mango, guava and banana were grown as the main crops whereas cucumber, radish, carrot and onion as intercrops in mango, brinjal, vegetable pea and okra as intercrop in guava and turmeric as intercrop in banana. In CS-2, turmeric, bottlegourd-cauliflower-tomato and brinjal-potato were grown while under in CS-3 system Rice-wheat and sugarcane-sugarcane ratoon-wheat were grown. Results obtained from the study revealed that among the three modules, vegetable based system has been found most effective in terms of net returns for the first two years. The net returns ha⁻¹ from the vegetable based system was INR 151640 followed by CS-3 (INR 68765) followed by CS-1 being INR 44660. Vegetable based system also resulted in higher employment generation. Fruit based system gave lowest net returns hectare⁻¹ as low yield was recorded from the fruit trees during the initial years. Initial results of the study revealed that through diversification of existing farming system livelihood of poor farmers can be improved significantly.

1. Introduction

Agriculture continues to be a major source of livelihood in India. However, due to poor crop management practices, limited resources and lack of know-how the productivity and income from farms is low as evident from baseline survey reports. Therefore, major effort has been on identification and introduction of suitable crop varieties with location specific management practices and diversification to vegetable crops for better remuneration. The major crop interventions include introduction of improved crop varieties, intercropping, crop diversification and seed production. The horticulture sector includes fruit crops, vegetable crops, potato and tuber crops, ornamental crops, medicinal and aromatic crops and spices and plantation crops. It contributes in poverty alleviation and nutritional security. Presently horticulture contributes 28% of agricultural GDP. The national goal of achieving 4.0% growth in agriculture can be achieved through major contribution from horticulture growth. Introduction of improved technology of

vegetable production became an important component in overall livelihood improvement of the respective region. Vegetable crops are highly income intensive if improved management practices are adopted along with development of appropriate market linkages. They are also rich source of nutritional security. Horticulture is not only an integral part of food and nutritional security, but also an essential ingredient of economic security. Vegetable cultivation is considered one of the major sources of food security and income generation among the rural community. The role of horticulture is changing rapidly from traditional to high income generating activity. The process of transition from low-input largely subsistence horticulture to a more intensive market-oriented version presents many challenges.

India's share in world fruits and vegetables production is 10% and 13.28%, respectively. India is the second largest producer of horticultural crops in the world after China, but the productivity is very low. Since, fruits and vegetables are



perishable in nature the losses are very high. However, despite all adversities such as falling farmland and scarcity of water, the country is still able to produce a major share of food crops to feed its population. Marginal and small categories of farmers, representing more than 86% of Indian farm families with holding size below 1.2 ha are living in risk prone diverse production conditions. Small and fragmented land holdings do not allow farmers to have independent farm resources like draught animals, tractors, bore wells or tube wells and other sophisticated farm machineries for various cultural operations. In the past, the focus had been on maximization of crop yields only and that to for well-endowed resource rich farmers. To fulfil the basic needs of households including food for humans, feed, fodder, fuel and fibre, a well-focused attention towards Integrated Farming System Research is warranted.

IFS is necessary to improve livelihood of a rural household, wherein more than one source of livelihood is practiced (Mahapatra, 1995). Hence, other additional livelihood options needs to be created for a farmer depending on demand and available resources with him. Accordingly, interventions in the following study were carefully planned.

2. Material and Methods

Sugarcane-Ratoon-Wheat system is the most widely adopted cropping system in Uttar Pradesh. Despite enormous growth of this cropping system in the country during the past few years, reports of stagnation in the productivity of these crops, with possible decline in production in future and declining water tables have raised doubts on its sustainability. There are challenges to produce more from shrinking land and declining water in the scenario of climate change. Horticulture sector besides, improving income through increased productivity, employment, nutritional security, produces higher biomass resulting in efficient utilization of natural resources. Adequate agro climatic conditions and market accessibility of the area, giving ample opportunity to intensify traditional system with horticulture based system for more income and livelihood. Keeping these facts in view the present research proposal is being conceived with the following objectives.

Experiments were conducted at Project Directorate for Farming Systems Research, Modipuram, Uttar Pradesh, India in 2011-12 to develop horticultural crop based model for improving profitability, enhancing productivity and nutritional security of small and marginal farmers particularly of western plain zone of Uttar Pradesh. Three modules, viz. Fruit based (CS 1, 0.3 ha), vegetable crops based (CS 2, 0.22 ha) and field crop based (CS 3, 0.4 ha) were evaluated under this project by using randomised block design replicated for years. Under fruit crop based system (CS-1), mango, guava and banana were grown as the main crops whereas cucumber, radish, carrot and onion as

the intercrop in mango, brinjal, veg pea and okra as intercrops in guava and turmeric as intercrop in banana respectively. In vegetable based system (CS-2) turmeric, bottlegourd-cauliflower-tomato and brinjal-potato were grown while under crop based system (CS-3), Rice-wheat and sugarcane-ratoon were evaluated. The comparison has been made to find whether the horticultural crop based farming systems gives more returns to the famers of the region who are cultivating rice- wheat or sugarcane-wheat systems for years.

3. Results and Discussion

It has been reported from the results (Figure 1) that vegetable based system is capable of giving higher returns and benefit to the farmers of western plain zone of Uttar Pradesh as compared to the cropping of sugarcane- wheat or rice- wheat system .Among the modules, vegetable based system has been found most effective in terms of net returns as evident from Figure 1. The net returns ha⁻¹ from the vegetable based system (CS-2) was found to be INR 151640 followed by crop based system (CS-3) being INR 68765 followed by fruit crop based system (CS-1) being INR 44660 in the second year of its establishment. The higher returns from vegetable based system were mainly due to contribution by cash crops. Fruit based system gave lowest net returns ha⁻¹ as there was no return from fruit plants in its initial years. Returns obtained from the system were achieved from the intercrops only. These results are in conformity with the findings of Singh et al. (2006), who concluded a survey of 108 farm household in the south west semi-arid plain of Uttar Pradesh and found that vegetable component provided highest net returns in vegetable based farming system (₹ 137112) followed by sugarcane (INR 60634) in sugarcane based farming system (Figure 1). Similar results were reported by Singh et al. (2009) when they included growing of high yielding vegetable crops in their IFS model.

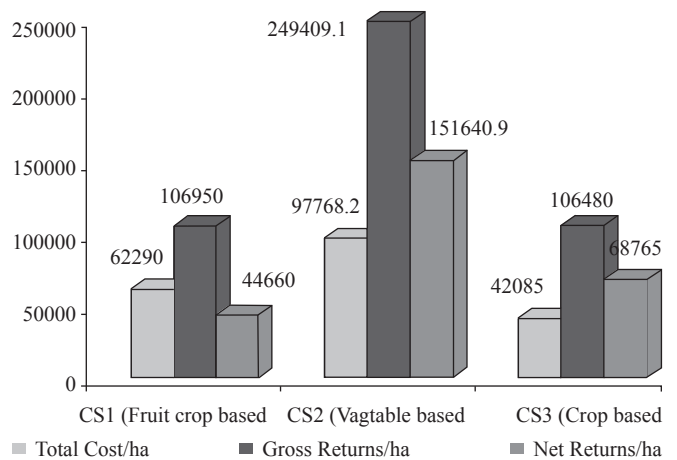


Figure 1: Comparative performance of different farming systems in terms of profitability

They reported that rice-pea-okra was the most remunerative cropping sequence with highest rice equivalent yield of 17.88 t ha⁻¹ and net returns than the conventional rice-wheat sequence. The rice based integrated farming system comprising of crop components, dairy, poultry and fishery was the most suitable and efficient farming system model giving the highest system productivity and ensured the multiple uses of water. This model generated significantly higher levels of employment than rice-wheat system.

The cost of cultivation for growing vegetables was recorded to be very high because of engagement of labour all-round the year in carrying different inter-cultural operations. Similar results have been reported by Kumar and Singh (2002) and Naik (1998) who have conducted study in Kannada district of Karnataka with an overall objective of identifying and analysing the optimality under different situations for different farming systems. He concluded that with the introduction of new technology, the net farm returns would increase in the range of 25 to 150% over existing plan. Further, with the availability of additional resources for inclusion of new technologies, the net farm returns would enhance by 40 to 170%. The productivity of the crop was recorded to be higher by growing the vegetables as compared to other. Highest productivity was recorded for sugarcane (39 tonnes ha⁻¹) followed by carrot (26.5 t ha⁻¹) and bottlegourd (20.71 t ha⁻¹). Similar results have been reported by Singh et al., 2008 who have undertaken Integrated farming (IFS) comprising the components like crop, dairy, fishery, horticulture and apiary rearing at the Project Directorate on Farming System Research, Modipuram, Meerut, Uttar Pradesh, India, during 2004-05 to 2009-10. The Integrated farming system approach recorded higher productivity, profitability and employment generation. Among the components evaluated, the relative share of different component in the order of merit were from dairy (48%), crop (41%), horticulture (6%) followed by fish (3.0%) and apiary (2%) The net returns obtained from different components were INR 87029, INR 74435, INR 10263, INR 4947, INR 4204, respectively of which total return from IFS unit year⁻¹ (1.4 ha) was INR 135826.

Thus it is apparent from the study that Integrated Farming System is the result of complex interaction among a number

of interdependent components, where an individual farmer allocates certain quantities and qualities of four factors of production, namely land, labour, capital and management to which he has access.

4. Conclusion

The vegetable based system is capable of giving higher returns and benefits to the farmers of the western plain zone of Uttar Pradesh and hence monoculture of Rice-wheat or sugarcane-wheat system which is practised in this region over years can be replaced with horticulture based farming system. Through horticulture based farming system a farmer can fulfil the demand of fruits and vegetables which are of immense importance in a balanced diet and hence forth provides nutritional security apart from the monetary gains.

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