

## HORTICULTURE BASED INTEGRATED FARMING SYSTEMS: A VIABLE OPTION FOR DOUBLING FARM INCOME

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Horticulture crops such as vegetables, fruits, plantation, spices, floriculture, medicinal and aromatic plants have greater role in farming systems in meeting the objectives of better soil, family nutrition, round the year production and income besides environmental improvement. Through Horticulture based farming systems, the resources are effectively utilized, resources are conserved well and environment is improved. In all the Integrated farming system models being developed through AICRP-IFS, two components viz., boundary plantation and kitchen garden are integrated with an aim to supply the fresh quality fruits and vegetables for the family especially to children who are the future human resource of this country. Among the 38 On-station farming system models developed through AICRP on Integrated Farming Systems network, eight horticulture-based farming system models have been developed for the country.

Farming system has the in-built mechanism of sustainability due to presence of many inter-linked complementary and supplementary enterprises. In the event of aberrant weather and market price, integrated farming system insures the farmers, thereby increases the sustainability. Further, wastes from one components are recycled as input for other components and thereby it also contributes positively to the soil health, crop growth and environment. Our results clearly indicate that IFS models are more sustainable than the practices of cropping system or dairy alone. The prevailing farming situation in India calls for an integrated effort to address the emerging issues / problems. The integrated farming systems approach is considered to be the most powerful tool for enhancing profitability of farming systems, especially for small and marginal farm-holders to make them bountiful. In fact, our past experience has clearly evinced that the income from cropping alone is hardly sufficient to sustain the farmers' needs. With enhanced consumerism in rural areas, farmers' requirements for cash have also increased to improve their standard of living. This is especially true in case of small and marginal farmers. Therefore, farmers' income and food requirements would have to be augmented and supplemented by adoption of efficient secondary/ tertiary enterprises like horticulture (vegetables/ fruits/ flowers/ medicinal and aromatic plants), apiary, mushroom cultivation, fisheries etc. However, these integrated farming systems 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 maximum exploitation of synergies through adoption of close cycles. These systems also need to be socially acceptable, environment friendly and economically viable.

## DEVELOPMENT OF HORTICULTURE BASED FARMING SYSTEMS FOR LIVELIHOOD SECURITY OF SMALL AND MARGINAL FARMERS

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Our country is facing a critical challenge to produce more from shrinking land and declining water in the scenario of climate change. We need farms to ensure global food security, protect the natural environment and end poverty and malnutrition. Adequate agro climatic conditions and market accessibility of the area, gives ample opportunity to intensify traditional system with horticulture based system for more income and livelihood. Under ICAR-FARMERS FIRST PROGRAMME, efforts were made to promote the development of horticulture based farming systems in the adopted villages of Bhayangi-Bhangela, Sathedi and Sonta. The farmers were advised through demonstrations, trainings, exposure visits and technical guidance to diversify their farming systems. Exotic vegetable based farming system model were developed for income enhancement and sustainability of small farmers of Western Uttar Pradesh. The farming system comprising of 0.4 ha of land with 1 buffalo and 1 cow along with sugarcane- s.ratoon-wheat system, when diversified with exotic vegetables, increased net returns from Rs 92,575 to Rs. 2,03,170. The benefit cost ratio was enhanced from 2.11 (existing farming systems) to 3.23 (diversified system). Similarly developing multi-tier fruit cum vegetable based farming system module for profitability and scalability in horticultural crops for marginal farmer (0.24 ha) was able to increase the net returns from Rs. 28,200 to Rs. 2,21,375 when compared with his earlier farming system. The benefit cost ratio was enhanced from 2.24 in the existing system to 3.20 in the diversified system. Hence, horticulture based farming systems have the potential to increase income besides providing nutritional security to farmers.



## **Sustainability of horticultural modules in integrated farming systems as influenced by inter-annual rainfall variation in various agro-ecosystems of India**

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Integrated Farming System models (IFS) have been developed for ensuring food and nutritional security for marginal and small farmers. The horticultural modules of these models were also assessed for sustainability under arid, sub-humid, humid and coastal agro-ecosystems. The highest gross return (Rs. 5,46,600 ha<sup>-1</sup>) from horticultural module was recorded at Jorhat in humid agro-ecosystem which was significantly higher than the gross return recorded in sub-humid, arid and coastal agro-ecosystems whereas, least gross return (Rs. 1,16,455) was obtained from horticultural module of IFS model developed at Pantnagar under sub-humid agro-ecosystems. In terms of net return also from horticultural module of IFS model Jorhat performed better than all other horticultural modules of IFS model. However, the Sustainability Value Index (SVI) was recorded as lowest (8.9%) among all the horticultural modules of various IFS models. The horticultural modules with guava+banana and seasonal vegetables within the row in IFS model developed in humid agro-ecosystem at Kalyani, West Bengal was found to be the most sustainable with 27.7% SVI. Comparative analysis of the variations in rainfall and sustainability value index of the horticultural modules of various IFS model developed under arid, subhumid, humid and coastal agroecosystems indicated that the average amount of precipitation need not necessarily be a constraint to successfully carrying out an agricultural activities but it is the yeartoyear variation in the rainfall (coefficient of variation, CV) of a locality determine the sustainability of the horticultural modules/farming systems practiced in a particular agro-ecosystems. A strong and negative correlation ( $r = -0.42$ ) between the CV of rainfall and sustainability value index was calculated, which supports the robustness of the horticultural module of IFS model with coefficients of variation (CV) in rainfall of 15.0% developed at Kalyani, West Bengal. As the CV of annual rainfall is an index of climatic risk, indicating a probability of fluctuations in crop yield from year to year. From farming system point of view, it is perhaps, a more decisive statistic in marginal areas than in either very dry areas, where farming practices have adapted to variability, or in wet areas, where relatively lower inter-annual erraticism are generally anticipated.