Indian Farming 76 (10): 47-49; October 2026

Integrated organic farming system for true-value accounting of ecosystem services and SDGs

Jayanta Layek, Niraj Biswakarma*, Pankaj Baiswar and Debasish Chakraborty

ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya 793 103

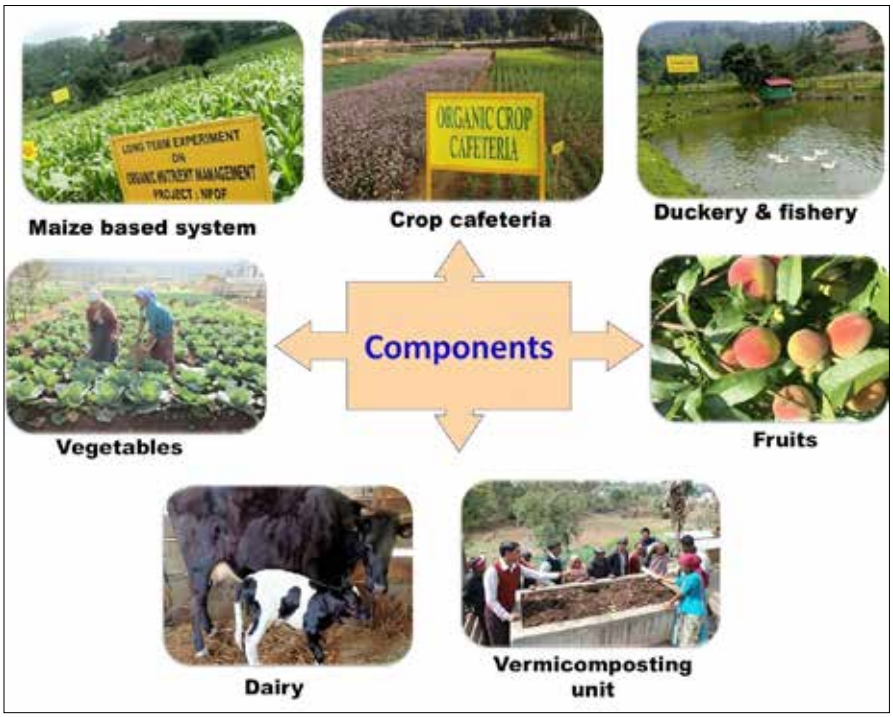
Conventional farming mainly measures crop production, input costs and income, while many environmental, social and nutritional benefits remain outside the farm account. Integrated Organic Farming System (IOFS) offers a practical approach to capture these wider benefits by integrating organic crop production with livestock, fishery, horticulture, water harvesting and recycling of farm wastes. Such integration promotes efficient use of farm resources, nutrient recycling, soil health, water conservation, biodiversity and diversification of farm production. The Economics of Ecosystems and Biodiversity for Agriculture and Food framework provides a broader approach to assess these benefits through four forms of capital: natural, produced, human and social capital. Using this framework, IOFS can be assessed not only for production and income but also for its contribution to ecosystem services, food and nutritional security, farmer knowledge, employment, livelihoods and collective action. Linking these outcomes with the Sustainable Development Goals provides a comprehensive way to demonstrate the wider environmental, economic and social value of IOFS and its potential to support sustainable, resilient and resource-efficient farming systems.

Keywords: Resource use efficiency, Soil health, Water harvesting

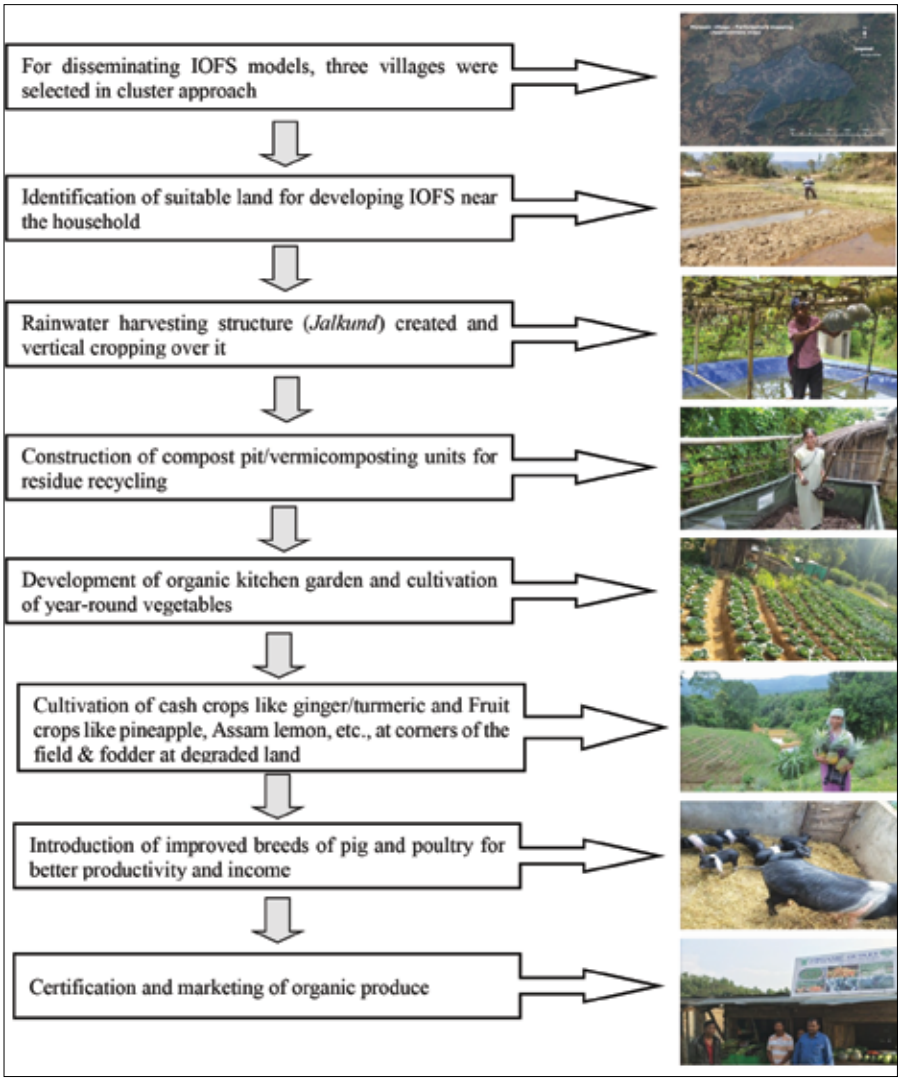
INTEGRATED Organic Farming System (IOFS) is a holistic and sustainable agricultural approach that integrates complementary farm enterprises such as crops, livestock, fishery, poultry, horticulture, fodder production, water harvesting and composting within a single production system. The fundamental principle of IOFS is the efficient recycling of available on- and off-farm resources, thereby reducing dependence on external inputs, improving soil fertility, enhancing resource-use efficiency and maintaining ecological balance. The approach is particularly relevant to small and marginal farmers, where limited land and resources necessitate efficient integration of different farm enterprises. The IOFS model developed at the ICAR Research Complex for NEH Region, Umiam, Meghalaya, represents an effort to operationalise these principles under the hill agro-ecosystem.

A model was established in 2005 on 0.43 ha of valley land, integrating cereals, pulses, oilseeds, vegetables, fruits, dairy, fodder, a farm pond, leguminous hedgerows, farmyard manure and vermicomposting. The system was further strengthened through fishery, duckery, water harvesting and vertical intensification using bamboo structures for climbing vegetables. The strength of IOFS lies in the synergy among its components. Crop residues, weeds and animal wastes are recycled as organic inputs; livestock manure is converted into farmyard manure and vermicompost; and washings from livestock units can be diverted to fish ponds to support plankton production. Harvested rainwater is utilised for life-saving irrigation during the winter season. Thus, resources that would otherwise be considered waste are converted into productive inputs, creating interconnected flows of nutrients, biomass, water, food and income within the farming system. The system has demonstrated considerable potential for improving farm productivity and profitability. The 0.43 ha IOFS model recorded an annual net return of about ₹88,820 (₹2,06,558/ha/year), while approximately 95.4% of nitrogen, 83% of phosphorus and 98.2% of potassium requirements could be met through resources generated within the system. Such results demonstrate that IOFS is not merely a method of organic crop production but a resource-cycling production system capable of generating economic, ecological and livelihood benefits simultaneously.

The technology was subsequently evaluated and demonstrated in farmers' fields through a cluster-based approach, initially covering Mynsain, Pynthor and Umden Umbathiang villages of Ri-Bhoi district,



Components of IOFS models developed at
ICAR Research Complex for NEH Region, Umiam, Meghalaya



Stepwise interventions made in IOFS model dissemination

Meghalaya, involving 340 farm households. The approach was subsequently expanded to other districts through multidisciplinary interventions under programmes such as the Network Project on Organic Farming, Tribal Sub-Plan (TSP), National Mission on Sustainable Hill Agriculture (NMSHA), and other ICAR initiatives. The 2023 study further demonstrated the potential of IOFS to enhance farm diversification, promote sustainability, and improve the livelihoods of hill farming communities.

The success of IOFS demonstrations in the villages of Meghalaya received national and international recognition. This was included in the 'Compendium of Country Case Studies' presented at the United Nations Climate Change Conference of the Parties (COP26), highlighting its relevance as a climate-resilient and resource-efficient farming approach.

Integrated organic farming system and true value accounting of ecosystem services

The benefits of IOFS extend beyond those captured by conventional indicators such as crop yield, farm income and input-use efficiency. The integration of enterprises influences soil fertility, nutrient cycling, water conservation, biodiversity, waste recycling, employment, farmer knowledge, nutrition and collective action. Many of these benefits are ecosystem services or changes in different forms of capital and therefore remain largely invisible in conventional farm accounting. This creates a need for a broader framework capable of capturing the multiple values generated by an integrated farming system. In this context, True Value Accounting (TVA) and the Economics of Ecosystems and Biodiversity for Agriculture and Food (TEEBAgriFood) framework provide a useful perspective for assessing IOFS.

The framework allows agricultural systems to be viewed through changes in natural, produced, human and social

capital, linking resource use and ecosystem services with outcomes and human well-being. Applying this approach to IOFS can help quantify not only the food and income generated by the system but also the value of soil health, nutrient recycling, water regulation, biodiversity, knowledge, nutrition, employment and social cooperation. Therefore, IOFS provides an appropriate field-level platform for demonstrating how agricultural production can be linked with ecosystem services and the Sustainable Development Goals (SDGs). A true-value assessment can make these often-unaccounted benefits more visible and provide a more comprehensive basis for evaluating the contribution of IOFS to sustainable agriculture, livelihood resilience, nutritional security and ecological sustainability.

True value accounting in farming system

Agricultural performance is often judged through yield, gross return, net return and input-use efficiency. These indicators are important, but they do not fully capture the wider consequences of farming. A production system may generate marketable food while simultaneously degrading soil, depleting water, reducing biodiversity or transferring health and environmental costs to society. Conversely, a diversified system may create benefits that are poorly reflected in farm income, such as carbon storage, nutrient recycling, soil biological activity, pollination, water regulation, improved diets, skills and social cooperation. The TEEBAgriFood Evaluation Framework addresses this limitation by adopting a systems-thinking approach. It considers four key capital stocks of natural, produced, human, and social; and evaluates the associated flows, outcomes, and impacts across the broader eco-agri-food system. UNEP describes the framework as a comprehensive approach that moves beyond production-only measures and supports true cost or true value accounting for agriculture and food systems. For IOFS, this perspective is especially relevant because the system is built around interactions. Manure becomes an organic nutrient resource; crop residues become compost or mulch; farm ponds provide water and fish; fodder supports livestock; livestock provides food and manure; and diversified production supports household nutrition and income. The value of the system is therefore greater than the sum of individual crop yields.

Aligning integrated organic farming system with the SDGs

The IOFS serves as a powerful catalyst for achieving the United Nations Sustainable Development Goals (SDGs) by integrating resource recycling, water conservation, biodiversity management, and diversified production at the farm level. Through the recycling of compost and manure, IOFS enhances nutrient cycling and soil fertility while reducing dependence on external chemical inputs, thereby contributing directly to SDGs 2, 12, and 15. Rainwater harvesting techniques, including ponds and *Jalkunds*, improve water regulation, support dry-season irrigation, and strengthen long-term climate resilience, contributing to SDGs 2, 6, and 13. By integrating crop, livestock, and fish enterprises, the system promotes circular resource use, reduces agricultural waste, and supports SDGs 2, 12, 14, and 15. Diversified production of cereals, pulses, fruits, dairy products, and fish enhances dietary diversity and nutritional security while generating more reliable livelihood opportunities, contributing to SDGs 2 and 3. Continuous farmer training and capacity building further strengthen human and social capital, supporting SDGs 4, 8, and 17. Overall, IOFS demonstrates how circular resource management at the farm level can convert ecosystem services into tangible and sustained contributions to global sustainability.

The evidence from IOFS provides a strong basis for policy mainstreaming by demonstrating benefits beyond crop yield and farm income. The Meghalaya experience can be aligned with ongoing programmes such as the Network Project on Organic Farming (NPOF), Tribal Sub-Plan (TSP), and National Mission on Sustainable Hill Agriculture (NMSHA), under which IOFS interventions have already been evaluated and expanded. Through the TEEBAgriFood True Value Accounting framework, natural capital captures soil, water, biodiversity and nutrient cycling; produced capital reflects diversified farm enterprises and productive assets; human capital includes knowledge, nutrition, skills and employment; and social capital covers collective action and community institutions. Integrating these outcomes into programme planning and monitoring can strengthen the mainstreaming of IOFS.

SUMMARY

IOFS represents a diversified organic farming model in which different farm enterprises are linked through the recycling of biomass, nutrients, and water. The experience from Meghalaya demonstrates its potential to improve resource-use efficiency, farm diversification, soil health, livelihood opportunities and household food security. A true-value approach broadens the assessment beyond conventional farm returns by considering natural, produced, human and social capital, thereby recognising ecosystem services and wider benefits that are often not reflected in farm accounts. Overall, IOFS provides a basis for understanding the environmental, economic and social contributions of organic integrated farming, while linking these benefits with the SDGs and supporting more sustainable, resilient and resource-efficient agri-food systems.

*Corresponding author email: nirajiari@gmail.com

! Attention !

Want to try your hands at the ICAR textbooks released recently! No Worries! We got you covered.
Now shop the latest textbook collection of ICAR online from the convenience of your home.

SCAN QR Code