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MANGO INTEGRATED FARMING SYSTEMS – AN ECO-FRIENDLY APPROACH FOR SUSTAINABLE PRODUCTION AND CLIMATE RESILIENCE

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ABSTRACT

Mango is an important fruit crops grown throughout India. It is popularly known as King of fruits. However, due to seasonal nature in which fruits are harvested only once in a year in most of the commercial varieties makes challenging especially small and marginal farmers to rely solely on mango crop for their livelihood. Mango integrated farming systems consisting at least two separate but logically interdependent parts of a crop and livestock enterprises involved. In this system waste of one enterprise becomes the input of another thus it makes more efficient use of resources from the farm. Integrated farming system is an effective sustainable approach for replacing mono cropping mango. It helps in soil health improvement, input cost reduction, risk mitigation, biodiversity enhancement and provides livelihood security especially to small and marginal farmers. By integrating activities like intercropping, livestock, aquaculture and other agriculture related activities farmers can diversify income sources and improve farm resilience as well as climate. Mango integrated farming involves diversified systems is more adaptable to changing climatic conditions as they can rely on different crops and practices to sustain production in extreme climatic conditions.

Keywords **:** Mango integrated farming system, climate resilience, sustainability.

Introduction

Mango *(Mangifera indica* L.) is one of the most important tropical and subtropical fruit crops grown in India. It is popularly known as "King of Fruits" due to its delicious taste, excellent flavour, attractive colour, huge variability and varied end usage. It is rich in vitamin A and C. Raw fruits are used for making chutney, pickles, raw mango dried flakes and dried powder (amchur). The ripe fruits besides being used for table purpose are also utilized for preparing several value-added products like jam, jellies, squash, cordial, syrup, nectar *etc*. The mango kernel also contains 8-10 percent good quality fat which is used for soap making and also as a substitute for cola in confectionery.

Although mango is a potential crop, due to seasonal nature in which fruits are harvested only once in a year in most of the commercial varieties makes challenging especially small and marginal farmers to rely solely on mango crop for their livelihood. Further, mono-cropping of mango is considered to be the main factor contributing to lower farm income, poor soil health and susceptibility to various biotic and abiotic stresses (Jakhar *et al*., 2022). Besides this, mango cultivation is becoming non remunerative in recent years due to severe pests and diseases incidence and the environmental factors like unpredictable weather pattern particularly unseasonal rains and extreme temperatures adversely effecting flowering, fruiting and hence yield. In addition to this pests like black thrips and diseases like anthracnose can significantly impact the fruit quality and quantity. Water scarcity and inconsistent irrigation during fruit growth also reducing fruit number and size leads to lower yields. Mango is being cultivated as mono crop which is a regular practice in India facing the following problems.

Drawbacks of mango mono cropping system

Soil Degradation

Continuous mango cultivation as mono cropping depletes the majority of soil nutrients and organic matter leading to loss of soil fertility, reduced yields. Soil erosion could also be possible due to the lack of diverse root systems in mono-cropping of mango (Tiwari, Rajesh and Baghel, 2014).

Susceptibility to Pests and Diseases

The single mango crop over large areas creates a big target for pests and diseases and they can spread rapidly and develop resistance. Further, the unfavourable weather conditions during mango crop period leads to pest and disease incidence which may significantly impact the farmer's income.

Market Risks

Mono cropping increased the production cost, risk of crop failure and lowers the market price (Manjunath *et al*., 2017). The price fluctuations during the crop period also affect the mango farmers financially.

Environmental Impact

Using high dose of chemical fertilizers for nutrient management and indiscriminate use of pesticides to manage pest and diseases can negatively impact the environment. Further, reduced biodiversity due to the lack of diverse crops can harm ecosystems.

Keeping in view of above limitations, it is highly essential to integrate the other agricultural practices along with mango cultivation as integrated farming (Nagarjun and Anjali Kumari, 2024).

Mango Based Integrated Farming System

Mango integrated farming system involves combining mango cultivation with other complementary agricultural practices to enhance the productivity, sustainability, and climate resilience. This system not only maximizes the resource utilization but also reduces risks associated with mono cropping. By integrating activities like intercropping, livestock and aquaculture etc. farmers can diversify income sources and improve farm resilience as well as climate (Behera and Mahapatra, 1999; Jayanthi, 2006). This system helps in boosting employment opportunities and income of farmers by integrating various farm enterprises, recycling crop residues and by products within the farm itself (Belal *et al.,* 2023). The Integrated Farming System is a mixed farming approach where crop and livestock elements are harmoniously integrated to supplement and complement each other. In this system, an interrelated set of enterprises is utilized where the "waste" from one component is transformed into an input for another part of the system, resulting in reduced costs and enhanced production and income (Yadav *et al*., 2024). Integrated Farming System (IFS) is the system in which integration of natural resources and regulatory mechanisms into farming activities to achieve sustainable production, maximum utilization of natural resources, food security through ecologically preferred technologies, maintain farm income, eliminates or reduces sources of current agricultural pollution, amid climate resilience (Behera and Mahapatra 1999; Jayanthi, 2006).

Components of Mango Integrated Farming System

Intercropping:

Intercropping is the cultivation of short-duration crops like legumes, vegetables including leafy vegetables, short duration fruit crops like papaya, phalsa, guava in between the rows of mango trees. Intercropping can improve soil fertility, enhance biodiversity, and provide additional income from the inter crops while attaining better yields from the main crop of mango. The mango trees are capable of pumping nutrients from deeper soil layers and also scavenge leached nutrients through horizontal root expanse which cannot be tapped by agriculture crops. Thus, when the mango trees got associated with the intercrops, the system as a whole was more productive than the respective sole crops according to Anop Kumar and Mahesh Choudhary (2022). They have also reported that cowpea and roselle + French bean systems could be the most suitable crops while pineapple and turmeric too can be suitably practiced to enhance income and better resource conservation at East Kawlchaw village in Saiha district of Mizoram, North-East India. Intercropping in rainfed mango orchards provided net returns of Rs. 1,73,000/ha, significantly higher than mono-cropped rainfed mango and continuous intercropping in mango orchards effectively enhanced soil organic carbon and nitrogen levels (Manjunath *et al*. 2025). Growing intercrops in mango orchard can optimize microclimate conditions, thereby enhancing the overall productivity and sustainability (Tetarwal *et al.,* 2023). Chauhan *et al*., (2024) proved that growing marigold as inter crop in mango is viable option to get higher returns in subtropical hill regions of Himachal Pradesh.

Livestock Integration

Raising dairy animals, poultry, goat and sheep in the mango orchard can provide manure to soil, reduce pest population and also generate additional income. In an integrated system the by-product or waste of one system becomes the input for the other

systems and decreases the expenditure on external inputs like fertilizers and pesticides (Sheikh *et al*., 2021). By recycling by-products and leftovers from various system components, integrated farming system helps to increase net income while reducing production costs. According to Saikia and Anusha (2023) the constant labour demand for a system of numerous crops and livestock keeps farm families actively involved in farming activities, offering a possibility for more employment generation. Yadav *et al.,* (2024) conducted a study at Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola and revealed that Integration of multiple components including crop + dairy + poultry + horticulture + vermicompost + kitchen garden + boundary plantation resulted in maximum employment generation. The system has attained a higher sustainable yield index value which indicates greater sustainability. The various products and by products that are recycled and reused within the different components have reduced the overall expenditure incurred on production costs and increased the efficiency of the farming system. The intervention has not only diversified the cropping system but also improved soil health, and ecosystem as the addition of animal component has facilitated the recycling of farm wastes (Jakhar *et al*., 2022). Integrating two dairy cows with brinjal intercropping in mango garden, recycling farmyard manure (FYM), and maintaining a vermicompost unit resulted in a mean net return of Rs. 4,96,000 /ha/year (Manjunath *et al*., 2025). The integrated farming system play a major role in biodiversity conservation through adoption of diversified cropping system and through integration of indigenous livestock breeds (Paramesh *et al.,* 2022).

Aquaculture

Fish farming in ponds or tanks within the orchard can provide a source of protein food, reduce water waste and potentially improve irrigation water quality. Jayanthi *et al.* (2003) observed that 25% higher economic returns due to crop integration with fish and poultry under lowland conditions of Tamil Nadu. Similarly Rautaray *et al.* (2005) reported that the rice fish system under low land ecologies of Assam with vegetables, fruits, ornamental plants, and agro-forestry components on dyke area has potential to produce 2.8 times higher income over rice alone.

Apiculture

Bee keeping in mango orchard can enhance pollination of mango thus helps in increased yields as mango trees rely on cross-pollination, mainly carried out by insects like honey bees. These bees significantly increase pollination efficiency, resulting in better fruit formation, higher yields, and more uniform mango quality. Bee keeping in mango orchards supports biodiversity and encourages natural pest control. It offers extra revenue through honey and other bee products. By integrating honeybees into mango farming, growers can achieve higher productivity while maintaining ecological harmony. This approach not only benefits mango trees but also strengthens sustainable agriculture for future generations.

Sericulture

Rearing of silk worms by planting Arjuna and mulberry trees on the boundaries of mango orchards as a subsidiary enterprise adds the additional income to farmers (Nagarjun and Anjali Kumari, 2024). Mango, coconut, and Sapota are the three horticultural crops that can be easily combined with mulberry production (Kerutagi *et al.,* 2019). The integration of sericulture with diverse agricultural activities opens new avenues for entrepreneurs, supports rural livelihoods, and contributes to environmental conservation (Ravikumar *et al.,* 2024)

Compost unit

Mango integrated farming with a compost unit involves creating a self-sustaining system where farm organic waste is converted into valuable compost, which then fertilizes the mango orchard, improving soil health and reducing the need for chemical inputs. Recycling on-farm generated resources through vermin-composting contributed significantly to the sustainability of the system by enhancing soil fertility and reducing the dependency on external inputs (Newaj *et al*., 2016) as well as generates additional income to the farmers by marketing the vermicompost (Nagarjun and Anjali Kumari, 2024).

Benefits of Mango Integrated Farming System

Increase in productivity

Integrated Farming System increases economic yield per unit area per unit time by virtue of intensification of crop and allied enterprises (Rathore and Bhatt, 2008). Mango productivity can be increased by using byproducts like decomposed organic matter of livestock like cattle and poultry. Dutt and Thakur (2004) found when combining the returns from both intercrop and tree, the agroforestry system produced higher net returns than a solitary crops. The use of recycled pond silt, poultry manure, cow dung as FYM and plant residues as vermin-compost created a favourable environment for yield enhancement (Kumar *et al.,* 2022). The synergistic benefits of integrating horticulture, poultry, and organic inputs, showcasing their potential to maximize

productivity and profitability while efficiently utilizing limited land resources (Sanjeev Kumar *et al.,* 2025).

This increased profitability in Integrated Farming System is due to the efficient use of land and time in producing short-duration vegetables, fruits, and livestock (Kashyap *et al.,* 2022), as well as the efficient recycling of resources within the system, which enhances resource use efficiency and overall productivity (Biswas *et al.,* 2013). Integrating with other crops like vegetables, short duration fruit crops, flower crops, shade loving ornamentals and medicinal crops as intercrops; livestock like cattle raring, poultry; fisheries etc. for efficient use of land and resources thus leading to increased productivity (Rathore and Bhatt, 2008).

Diversified Income Sources

Mango integrated farming system allows farmers to generate income from different sources rather than a single crop. It provides regular income for the farmers throughout the year by way of the sale of a variety of farm produce (eg, fruits, vegetables, milk, eggs, compost, etc. (Kumar *et al.*, 2013).

Risk Mitigation

Integrated Farming System provides a stable and sustainable production system through diversified crops and enterprises thus helps in risk minimization (Ayyappan and Arunachalam, 2014). Extended monocropping is less profitable than diversifying with high-value vegetables, fruits, and livestock. In case of crop failure, livestock like dairy and poultry serve as a financial buffer (Sanjeev Kumar *et al*., 2025).

Soil Health improvement

Intercropping with leguminous crops, raring cattle and composting its organic waste in mango orchards improves soil health by improving soil structure, fertility status and water retention capacity of soil. Manjunath *et al*. (2025) reported that their six-year study in rainfed mango orchards with inter cropping increased the soil organic carbon from 0.54 % to 1.51 % in mango basins. Similarly in inter space of mango there was an increase in organic carbon from 0.42% to 0.90% with intercropping. Sujatha and Bhat (2015) and Ramesh *et al.* (2021) also showed that integrating livestock and fisheries with crops improved nutrient use efficiency and enhanced nutrient recycling.

Input cost reduction

Integrated farming system can reduce the dependency on chemical fertilizers and pesticides thereby reduce the production costs. This could be treated as environment friendly approach of farming. The IFS is the best resource management strategy to reduce dependency on market for inputs (Hens and Begossi, 2008; Hu *et al*., 2016; Paramesh *et al*., 2019).

Biodiversity enhancement

By integrating different farming components, integrated mango farming system creates habitat for a variety of plant and animal species, promoting biodiversity and a more resilient ecosystem. The addition of trees (fruit and timber trees) to the farming system able to provide both income and nutritional security to the farm family and also attracts honeybees, and other insects, in a broader set increases biodiversity, act as windshield, and adds aesthetic value to the farm (Sunderland, 2011). Hence, the Integrated Farming System with multiple enterprises encourages biodiversity conservation, provides feed, fodder, and fuel, and also reduces risks associated with crop failure (Paramesh *et al.,* 2021).

Climate Resilience

Mango integrated farming involves diversified systems is more adaptable to changing climatic conditions as they can rely on different crops and practices to sustain production in extreme climatic conditions. The estimated mean GHG emissions were negative or neutral for IFS models in 11 agro-climatic zones (ACZs) out of the 15 ACZs studied reported by Panwar *et al*., 2021). This system also played important role in improving soil organic carbon from 0.75 to 0.82%. Due to increased carbon sequestration, biomass production by trees, reduced consumption of fertilizers, and pesticides the greenhouse gas emission could be reduced significantly and making it sustainable and climate-resilient (Paramesh *et al.,* 2022).

Sustainability

Integrated farming system of mango conserves water resources, promotes soil health and reduces pollution thus contributing sustainable production of mango (Kumar *et al.*, 2011). Highest sustainable yield index (SYI) value was recorded from integrated farming system of crop + horticulture + dairy+ poultry + vermicompost + kitchen garden + boundary plantation (Yadav *et al*., 2024).

Economic Benefits

Increased productivity and diversified income streams can lead to higher farm incomes and improved livelihoods of farmers especially small and marginal farmers. Jayanthi *et al.* (2003) showed 25% higher economic returns due to crop integration with fish and poultry under lowland conditions of Tamil

Nadu. The coconut-based IFS at ICAR-CPCRI, Kasaragod, produced 19125 nuts, 9275-liter milk, 526 kg poultry, 50 kg Japanese quail bird, and 400 kg fish from 1.04 ha. Further, this IFS system revealed a gross and net return of USD 2762 and USD 889 per annum, respectively (Reddy and Biddappa, 2000). Integration of different enterprises / crop by utilizing farmer's available resources is one of the best multidisciplinary approaches to double the farmers' income (Reddy *et al*., 2021). Mahapatra and Behera, (2011) also reported an increase in net income through integrated farming systems that utilized recycled products within the system.

Livelihood security

Integration of various crops in rain fed mango orchards yielded an average net return of Rs. 1,73,000 /ha compared to Rs. 39,000 /ha from mono croping. Integrating dairy and vermicompost units with brinjal intercropping resulted in mean net returns of Rs. 4,96,000 /ha/year, indicating the economic advantage of a diversified integrated system approach. This approach not only enhances farm income but also ensures a sustainable and resilient farming system by diversifying farm activities, reducing climate risks, and providing multiple sources of income and employment (Manjunath *et al.,* 2025). The highest average net income achieved through crops + dairy + vegetable farming systems as reported by Sahu *et al.,* (2021). Integrated farming system improves economic condition of the small and marginal farmers which enhanced the education, health and social obligations and overall improvement in livelihood security Gupta *et al.,* (2020). Mango + Sweet corn + Dairy system gave higher productivity (15,303 kg/ha/year), net returns (Rs. 2,61,870/ha/yr) with Benefit Cost ratio of 2.43. This system results in periodic returns to the family with the distribution of income from 3 months to 12 months in the year with a minimum of Rs.6520/ to maximum of 7500/ per month thereby suggesting the sustainable livelihood opportunity for the farm family (Manjunath *et al.,* 2021). Integrated farming system is the most promising option for small and marginal farmers as it not only enhances the nutritional and economic status of farm families but also increases employment opportunities and makes optimal use of farm resources which results in more productivity (Shweta *et al.,* 2021). The farming system provides flow of capital round the year by way of disposal of milk, eggs, honey, edible mushroom, meat, etc. Moreover, generation of biogas can be utilized for household energy requirement (Belal *et al*., 2023). Multistoried cropping system opens a new door to earn whole round the year as well as there is less risk of complete crop failure (Asheesh *et al*., 2020).

Employment generation

The employments of 287 days per year were generated through crops + dairy + vegetable mix enterprises (Sahu *et al.,* 2021). The improvement in employment potential under IFS varied from 30% (Shankar *et al.,* 2018) to 485% (Behera and Mahapatra, 1999).

Combining crop cultivation with enterprises like fish, poultry, ducks, cattle, and horticulture increases labour demand, ensuring year-round employment and minimizing downtime. This continuous labour need keeps farm families engaged in productive activities, which significantly improves their income and livelihoods (Das *et al*., 2013).

Food and nutritional security:

Integrated mango farming system provides food and nutritional security to the farm family through eggs, milk, and meat from the livestock component (Devendra and Thomas, 2002). This system might assist to achieve food and nutritional security through the better use of available resources, introduction of legumes, vegetables, oilseed crops, or through agroforestry systems (Altieri *et al*., 2012; Wezel *et al.,* 2014).

Conclusion

Mango integrated with agricultural crops, livestock, sericulture, apiculture, poultry offers a sustainable and climate resilient farming model that can enhance productivity, improve soil health, mitigate risks, and generate multiple income streams for farmers and improves livelihood of small and marginal farmers.

References

Altieri, M.A., Funes-Monzote, F.R. and Petersen, P. (2012). Agroecologically efficient agricultural systems for smallholder farmers: contributions to food sovereignty. *Agronomy for Sustainable Development*, **32**(1), 1–13. https://doi.org/10.1007/s1359 3-011-0065-6.

Anop Kumari and Mahesh Choudhary (2022). Annual Intercrops: An Alternative Pathway for Sustainable Horticultural Production. *Ecology Environment and Conservation,* S244-S251.

Asheesh Sharma., Narendra Chaudhary., Rajnee Sharma and Shobharam Anjanawe (2020). Multi storied cropping system in horticulture - An approach for more crop per unit area of land. *Journal of Pharmacognosy and Phytochemistry*, **6**: 25-28.

Ayyappan, S. and Arunachalam, A. (2014). Crop diversification for social security of farmer in India. In: Rana, D.S., Singh, A.K. (Eds.), Souvenir. *Indian Society of Agronomy*, New Delhi, pp. 1-6.

Behera, U.K. and Mahapatra, I.C. (1999). Income and employment generation for small and marginal farmers through Integrated Farming Systems. *Indian Journal of Agronomy*, **44**: 431-439.

Belal, A.M., Janardan, S. and Saqib, A. (2023). Integrated Farming System: Trends, Advantages and Constraints - A review. *RASSA Journal of Science for Society,* **5(2&3)**: 65-69.

Biswas, S., Goswami, B. and Sahu, N.C. (2013). Fish-duck and dyke vegetable cultivation practices in rural integrated farming system. *Indian Research Journal of Extension Education,* **13(1)**: 72–76.

Chauhan, S., Vipin, G., Sharma, P., Divyanshu and Vashishta, R. (2024). Bioeconomic Appraisal of Marigold under Mangifera indica Based Agroforestry System in Submontane and Low Hill Subtropical Zone of Himachal Pradesh. *International journal of economic plants*, **11**:480-483.

Das,, A., Choudhury, B. U., Ramkrushna, G. I., Tripathi, A. K., Singh, R. K., Ngachan, S. V., Patel, D. P., Layek, J. and Munda, G. C. (2013). Multiple use of pond water for enhancing water productivity and livelihood of small and marginal farmers. *Indian Journal of Hill Farming,* **26(1):** 29–36.

Devendra, C., and Thomas, D. (2002). Smallholder farming systems in Asia. *Agricultural Systems*, ***71*(1–2)**:17–25. https://doi.org/10.1016/S0308 -521X(01)00033 -6.

Dutt, V. and Thakur, P.S. (2004). Bio-economics of cropping systems combining medicinal and aromatic herbs with commercial timber tree species. *Indian Journal of Agroforestry*, **6(1)**:1–7.

Gupta, A.K., Yadav, D., Dungdung, B.G., Paudel, J., Chaudhary, A.K. and Arshad, R. (2020). Integrated Farming Systems (IFS) – A Review Paper. *International Journal of Engineering Applied Sciences and Technology.* **4 (9)**: 134-137.

Hens, L., and Begossi, A. (2008). Diversity and management: from extractive to farming systems. *Environment, Development and Sustainability*, **10(5)**: 559–563. https://doi.org/10.1007/s1066 8-008- 9147-2.

Hu, L., Zhang, J., Ren, W., Guo, L., Cheng, Y., Li, J., Li, K., Zhu, Z., Zhang, J., Luo, S., Cheng, L., Tang, J. and Chen, X. (2016). Can the co-cultivation of rice and fish help sustain rice production? *Scientific Reports*, ***6*(1)**: 28728. https://doi.org/10.1038/srep2 8728.

Jakhar, D.S., Vinita, R., Sunil, K. and Narender, K. (2022). Integrated farming system for sustainable farmers income in Haryana. *Indian Journal of Agriculture and Allied Sciences*, **8(4):**220-222.

Jayanthi, C. (2006). Integrated farming system: A path to sustainable agriculture. 2nd edition, Published by department of Agronomy, Directorate of Soil and Crop management studies, Tamilnadu Agricultural University, Coimbatore, pp. 1.

Jayanthi, C., Balusamy, M., Chinnusamy, C. and Mythili, S. (2003). Integrated nutrient supply system of linked components in lowland integrated farming system. *Indian Journal of Agronomy*, **48(4):** 41–46.

Kashyap, P., Prusty, A. K., Panwar, A. S., Paramesh, V., Natesan, R., Shamim, M., Verma, N., Jat, P. C. and Singh, M. P. (2022). Achieving food and livelihood security and enhancing profitability through an integrated farming system approach: A case study from Western Plains of Uttar Pradesh, India. *Sustainability,* **14(11):** 6653. doi:10.3390/su14116653.

Kerutagi, M. G., Talavar, M. and Pavitra, A. S. (2019). Impact of horticulture based integrated farming system on farmer's income and welfare in Northern Karnataka. *Journal of Pharmacognosy and Phytochemistry.* **8(3):** 1010-1019.

Kumar, S., Shivani and Singh, S.S. (2013). Sustainable food and nutritional security through IFS. *Indian Farming,* **63(7):** 30-36.

Kumar S, Singh SS, Shivani and Dey A (2011). Integrated faming system for eastern India. *Indian Journal of Agronomy,* **56(4):** 297-304.

Kumar, S., Shivani., Dey, A., Kumar, U., Kumar, R., Mondal, S., Kumar, A. and Manibhushan (2022). Location-specific integrated farming system models for resource recycling and livelihood security for smallholders. *Frontiers in Agronomy,* **4:** 938331. doi:10.3389/ fagro.2022.938331.

Mahapatra, I. C. and Behera, U. K. (2011). Rice (*Oryza sativa*) based farming system for livelihood improvement of Indian farmers. *Indian Journal of Agronomy,* **56(1)**: 1–9.

Manjunath, BL., Paramesh, V., Mahaan, G.R., Das, B., Reddy, K.V., Chakurkar, E.B. and Singh, N.P. (2017). Sustainability through resource recycling, soilfertility and carbon sequestration from integrated farming systems in west coast India. *The bioscan*, **12**:1-6.

Manjunath, B. L., Laxman, R. H., Puneeth Raj, M.S. and Kamam Veeresha (2021). System approach in rainfed mango for a sustainable productivity, profitability and livelihood security. *Indian Journal of Horticulture*, **78 (4):**417-422.

Manjunath, B.L., Laxman, R.H. and Ramesha, G.K. (2025). Integrated farming systems improves climate resilience and productivity of rainfed mango (*Mangifera indica*) orchards. *Indian Journal of Agronomy* (1st International Farming Systems Conference, Special Issue), **70**: S112 - S116.

Nagarjun, P. and Anjali Kumari (2024). Mango Based Integrated Farming System – A Way to Enhance Farmers Income. *Agriculture & Food: E news Letter*, **6 (8):**314-315.

Newaj, R., Chaturvedi, O.P. and Handa, A.K. (2016). Recent development in agroforestry research and its role in climate change adaptation and mitigation. *Indian Journal of Agroforestry,* **18(1):** 1–9.

Panwar, A.S., Prusty, A.K., Shamim, M. and Ravisankar, N. (2021). Nutrient Recycling in Integrated Farming Systems for Climate Resilience and Sustainable Income. *Indian Journal of Fertilizers*, **17 (11)** : 1126-1137.

Paramesh, V., Arunachalam, V. and Nath, A. J. (2019). Enhancing ecosystem services and energy use efficiency under organic andconventional nutrient management system to a sustainable arecanut based cropping system. *Energy*, **187**:115902. https://doi.org/10.1016/j.energy. 2019.115902.

Paramesh, V., Chakurkar, E. B., Bhagat, T., Sreekanth, G. B., Kumar, H. B. C., Rajkumar, S., Gokuldas, P. P., Mahajan, G.R., Manohara, K. K. and Ravisankar, N. (2021). Impact of integrated farming system on residue recycling, nutrient budgeting and soil health. *Indian Journal of Agricultural Sciences*, **91(1):** 44–48.

Paramesh, V., Ravisankar, N., Behera, U., Arunachalam, V., Kumar, P., Solomon Rajkumar, R., Dhar Misra, S., Mohan Kumar, R., Prusty, A. K., Jacob, D., Panwar, A. S., Mayenkar, T., Reddy, V. K. and Rajkumar, S. (2022). Integrated farming system approaches to achieve food and nutritional security for enhancing profitability, employment, and climate resilience in India. *Food and Energy Security*, **11, e321**: 1-16.

Ramesh, V., Chakurkar, E. B., Bhagat, T., Sreekanth, G. B., Kumar, H. B., Chetan,, R., Solomon and Gokuldas, P.P. (2021). Impact of integrated farming system on residue recycling, nutrient budgeting and soil health. *The Indian Journal of Agricultural Sciences,* **91(1):** 44–48.

Ravi Kumara, R., Harish Kumar, J. and Mohan Kumar, G. P. (2024). Integrated farming systems in mulberry sericulture. *Futuristic Trends in Agriculture Engineering & Food Sciences,* e-ISBN: 978-93-5747-347-7 IIP Series, Volume 3, Book 17, Part 3, Chapter 1:PP149-160.

Rathore, S.S. and Bhatt, B.P.. (2008). Productivity improvement in Jhum fields through an integrated farming system. *Indian Journal of Agronomy,* **53**: 167-171.

Rautaray, S.K., Das, P. C., Sinhababu, D.P., Sinhababu, D.P. and Singh, B. N. (2005). Increasing farm income through rice-fish based integrated farming system in rainfed lowlands of Assam. *Indian Journal of Agricultural Science*, ***75*(2):** 79–82.

Reddy, K.M.M., Shekar, K. and Manjulatha, G. (2021). Integrated farming system (IFS) is a possible way out for doubling of farmers income (DFI): A case study of an innovative farmer. *The Pharma Innovation Journal,* **10(12):** 1127-1130.

Reddy, D. V. S. and Biddappa, C. C. (2000). Coconut based cropping/farming systems in India. *Journal of Plantation Crops*, ***28*(1):** 1–18.

Sahu, R.K., Kumar, B., Yadav, B., Rohit and Kumar, A. (2021). Integrated Farming System in District Banda: A Micro Analysis. *International Journal of Social Science,* **10(04):** 369-373.

Saikia, A.R. and Anusha (2023). Livelihoods and Food Security of the Rural Poor. Current Trends in Agricultural Sciences & Technology pp.240-253.

Sanjeev Kumar., Abhishek Kumar., Shivani., Santosh Kumar., Rakesh Kumar., Rachna Dubey., Kumari Shubha., Kirti Saurabh., Manibhushan and Anup Das (2025). Enhancing farm productivity, profitability, sustainability and livelihood of small farm holders through integrated farming system. *Indian Journal of Agricultural Sciences,* **95 (3):** 272–279.

Shankar, D., Banjare, C., and Sahu, M. K. (2018). Tuber Crops Based Integrated Farming System Studies in Bastar and Kondagaon Districts of Chhattisgarh. *International Journal of Current Microbiology and Applied Sciences*, **7(9):** 1650–1658.https://doi.org/10.20546/ ijcmas.2018. 709.199.

Sheikh M., Riar T. S. and Kanak Pervez, A.K.M. (2021). Integrated Farming Systems: A Review of Farmers Friendly Approaches. *Asian Journal of Agricultural Extension, Economics & Sociology,* **39(4):** *88-99.*

Shweta, K., Sanghamitra, M.M., Mahananda., Aarti Singh and Anita Singh (2021). Integrated Farming System (IFS): A Review. *International Journal of Economic Plants,* **8(3):**181-187.

Sunderland, T. C. H. (2011). Food security: Why is biodiversity important? *International Forestry Review*, **13(3):** 265–274.

Sujatha, S. and Bhat, R. (2015). Resource use and benefits of mixed farming approach in arecanut ecosystem in India. *Agricultural Systems,* **141**:126–37. https://doi.org/10.1016 /j. agsy.2015.10.005.

Tetarwal, J.P., Ram, B., Bijarnia, A. and Singh,, P., (2023). Performance of diversified cropping sequences for productivity, profitability and land use efficiency under south-eastern Rajasthan, India. *Indian Journal of Agronomy,* **68(1):** 77–82.

Tiwari Rajesh and Baghel, B.S. (2014). Effect of intercropping on plant and soil of Dashehari mango orchard under low productive environments. *Asian Journal of Horticulture*, **9(2):** 439-442.

Wezel, A., Casagrande, M., Celette, F., Vian, J.-F., Ferrer, A. and Peigné, J. (2014). Agroecological practices for sustainable agriculture. A Review. *Agronomy for Sustainable Development*, **34(1):** 1–20. https://doi.org/ 10.1007/s1359 3-013-0180-7.

Yadav, V., Deshmukh, J.P., Paslawar, A.N. and Morwal, B.S. (2024). Integrated farming system for resource recycling sustainability, and employment generation among the small and marginal farmers in Vidarbha region of Maharashtra. *International Journal of Research in Agronomy,* **7(11):** 28-32.