

Success of integrated farming system for enhancing farmer's income in Mizoram

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The article assesses the impact of integrated farming system (IFS) models against traditional mixed farming system popularly practiced by small farmers. All the four models were found to increase gross income to a range of 115.03–321.69% against traditional mixed farming systems. The best combination of farm components with highest gross income (₹1,75,000) and benefit-cost ratio (2.13) was achieved through the integration of Horticulture + Animal Husbandry + Water harvesting. The approach of IFS will not only enhance the income of farmers but also sustain farm productivity as well as improve soil and environmental health. Proper selection of farm components and allocation of farm resources following scientific models would be helpful to farmers to get maximum output from minimum investment and to utilize farm resources efficiently, so that the ultimate goal of improving farmer's income and enhancing their livelihood would be achieved.

Keywords: Benefit-cost ratio, Integrated farming system, Mizoram, Productivity, Traditional mixed farming

Traditional mixed farming is an old age practice by the farmers where farm animals are locally sourced and reared along with cultivation of crops. This practice under pleasant climatic conditions throughout the year offers great scope for intervention of a scientific integrated farming system to transform the present agricultural system of Mizoram into a productive and sustainable one. Majority of the farmers in Mizoram are still practicing jhum cultivation to support their livelihood. Although this practice is productive in initial years, but crop production gradually decreases due to loss of fertility. The need for increased food production as well as feed and fodder are constantly pushing for effective agricultural system development. Certain initiatives have been taken up by the government, research institutions and different organizations to convert jhum cultivation to permanent agriculture,

and as a result jhum lands have transitioned to permanent farms. Traditional mixed farming system has been popularly practiced in small permanent farms where animals are reared along with cultivation of crops. However, success has not been achieved by the farmers in farm production and productivity considering the amount of hard work they have invested in farming. The lack of scientific knowledge on crop cultivation and animal rearing, improper allocation of farm resources, use of poor quality seeds, lack of water harvesting structures, rainfed agriculture, lack of crop and soil health management, etc. have resulted in lower farm productivity and income. Most importantly, the resource poor farmers are not willing to replace their farming system which has been going on for generations. They are also unaware of the lucrative profits that can be earned through complementary use of natural resources to

generate income from different farm enterprises. So, the study was carried out to transform the existing farming system efficiently by integrating appropriate farm components to ensure continual flow of income to farmers. The year-round pleasant climate, traditional mixed farming system, availability of local animals, small ponds and rivers nearby farms offer great opportunity for initiation and incorporation of scientific integrated farming system (IFS) in majority of the farms. IFS is a proven technology to ensure sustainable income to farmers and generate employment to rural youth. Moreover, it is a reliable approach for obtaining higher system productivity while improving soil health and sustaining the environment.

Present farming system and scope of IFS among Mizo farmers

Agriculture is the economic background of Mizoram. About

65% of the population is engaged in agriculture even though the cultivable land is extremely limited as the majority of the land is covered by hilly ranges with steep slopes. Crop and livestock farming has been predominant among Mizo farmers with permanent land holdings. The crops are grown under a mixed cropping system without proper crop selection and are cultivated without scientific knowledge. Moreover, poor yielding local cultivars have dominated crop cultivation resulting in lower crop production. Crop and soil health management are secondary to poor resource farmers, as long as the crop produces enough yield to feed the household. The crops are grown under rainfed condition and there is a lack of water harvesting structures to supplement irrigation during winter (*rabi*) season. The lack of scientific management of animals, fishes, crops, soil and ignorance on farm integrated systems have resulted in lower overall productivity of farms. Thus, it is extremely important to choose the right farm components and allocate farm resources according to a scientific IFS model. IFS has never been a new approach but a refinement of the existing farming system into a sustainable one. So, there is a great scope for intervention of IFS into our farming system. IFS is a farming system that combines agriculture with horticulture, livestock, poultry and fish on the same farm in a complementary manner to generate periodic flow of income, improve farm productivity and maintain sustainability of the farm. This integration of agriculture, horticulture, animal husbandry, fishery along with the establishment of Jalkund, a water harvesting structure to supplement irrigation to crops during *rabi* has become a significant farming option for the farmers to improve income and generate employment with higher system productivity while maintaining the health of soil and crops.

IFS initiatives among Mizo farmers

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Table 1. Impact of farming models and components on farmer's income

Profile of selected farmers for IFS intervention	Mr. Lalparchhuana, 42 years old, Hmar Veng, Saiphai village, Kolasib district	Mrs. Rammawii, 57 years old, Venglai, Saiphai village, Kolasib district	Mr. David Malsawma, 70 years old, Hmar Veng, Saiphai village, Kolasib district	Mrs. Rinthangi, 66 years old, Venglai, Saiphai village, Kolasib district
1A. Before IFS intervention				
Farming system	Traditional mixed farming	Traditional mixed farming	Traditional mixed farming	Traditional mixed farming
Components	<i>Agriculture:</i> Rice, maize <i>Horticulture:</i> Vegetables <i>Animal husbandry:</i> Fish	<i>Agriculture:</i> Rice, maize <i>Silviculture:</i> Arecanut <i>Horticulture:</i> Vegetables <i>Animal husbandry:</i> Fish	<i>Agriculture:</i> Sweet corn <i>Horticulture:</i> Vegetables, banana <i>Animal husbandry:</i> Poultry	<i>Horticulture:</i> Dragon fruit intercropped with Vegetables <i>Animal husbandry:</i> Poultry
Gross return	₹1,01,000	₹1,93,000	₹1,74,000	₹41,500
Net return	₹54,000	₹1,14,000	₹98,500	₹25,250
BCR	1.15	1.44	1.31	1.55
Farming system	Agriculture + Horticulture + Animal husbandry + Fisheries + Water harvesting (IFS model 1)	Agriculture + Horticulture + Silviculture + Animal husbandry + Fisheries + Water harvesting (IFS model 2)	Agriculture + Horticulture + Animal husbandry + Water harvesting (IFS model 3)	Horticulture + Animal husbandry + Water harvesting (IFS model 4)
1B. After IFS intervention				
Principal crop and breeds	<i>Agriculture:</i> Wetland and upland rice, maize <i>Horticulture:</i> Vegetables (Beans, Rajma, Cabbage etc.) and sweet corn <i>Animal husbandry:</i> Pig, goat and fish <i>Water harvesting:</i> Water tank and pump	<i>Agriculture:</i> Wetland rice, maize <i>Horticulture:</i> Vegetables (Beans, pumpkin, cucumber, etc.) <i>Silviculture:</i> Arecanut <i>Animal husbandry:</i> Poultry, goat and fish <i>Water harvesting:</i> Water tank and pump	<i>Agriculture:</i> Maize <i>Horticulture:</i> Vegetables (Beans, Brinjal bitter gourd), pineapple, papaya, banana <i>Animal husbandry:</i> Pig and poultry <i>Water harvesting:</i> Jalkund and pump	<i>Horticulture:</i> Vegetables (Rajma, pumpkin), dragon fruit intercropped with sweet corn <i>Animal husbandry:</i> Poultry <i>Water harvesting:</i> Jalkund, water tank and pump
Gross return	₹3,55,000	₹4,15,000	₹4,14,000	₹1,75,000
Net return	₹2,14,000	₹2,74,000	₹2,50,000	₹1,19,000
BCR	1.52	1.94	1.52	2.13

NEH Region, Mizoram Centre, Kolasib has initiated a project on improving farmers' livelihood through scientific integration of farming components under Tribal Sub Plan programme at Saiphai village of Kolasib, Mizoram as the primary site for project intervention. After conducting participatory rural appraisal (PRA) in the selected village, the centre came up with four scientific IFS models to be implemented among the four selected farmers based on their

location and available resources. These models included components like Agriculture (wetland and upland rice, maize, sweet corn), Silviculture (arecanut), Horticulture (vegetables like beans, rajma, cabbage, pumpkin, cucumber, brinjal, bitter gourd, etc. and fruits like dragon fruit, pineapple, papaya, banana), Animal husbandry (pig, goat, poultry), Fishery (rohu, catla, grass carp, silver carp, common carp and mrigal carp) and Water harvesting structures (jalkund,



IFS model 1: Agriculture + Horticulture + Animal husbandry + Fisheries + Water harvesting

water tank and pump). The four IFS models were 1), Agriculture + Horticulture + Animal Husbandry + Fisheries + Water harvesting; 2), Agriculture + Horticulture + Silviculture + Animal Husbandry + Fisheries + Water harvesting; 3), Agriculture + Horticulture + Animal Husbandry + Water harvesting and; 4), Horticulture + Animal Husbandry + Water harvesting. The selected farmers involved were initially

given trainings on IFS approaches, system objectives, goals and field demonstration and visits were conducted on the research farm. They were also supported with farm inputs under the programme of ICAR Centre and constant technical guidance was given to the farmers to adopt the new farming system. Regular field visits and inspections were carried out for successful intervention of the IFS model.

Farmers' practice before IFS intervention

All the farmers have practiced traditional mixed farming system using locally sourced seeds, poor yielders, and without following scientific method of cultivation. The farm components were not utilized efficiently and were lacking important components for sustainability of the farm. The farmers practiced mixed cropping without crop and soil management and were grown under rainfed condition. Crop production was not carried out during *rabi* due to lack of proper water harvesting structures. Only few perennial crops were irrigated during dry spells with poor irrigation facilities from pond water or rivers nearby. Poor allocation of farm resources hampered easy resource cycling and management resulting in lowering



IFS model 2: Agriculture + Horticulture + Silviculture + Animal husbandry + Fisheries + Water harvesting



IFS model 3: Agriculture + Horticulture + Animal husbandry + Water harvesting

corn (0.1 ha), 8 goats, 20 poultry (Vanaraja), fish pond (0.2 ha), a water tank and water pump were integrated into the farming model. A gross annual income of ₹4,15,000 was earned which was 115.03% higher than traditional mixed farming system. The net annual income and BCR after intervention of the technology were ₹2,74,000 and 1.94, respectively. The incorporation of high yielding crop varieties, improved breeds of goat (ICAR Zokel) and chicken (Vanaraja) along with water harvesting structures has significantly improved the overall system productivity of the farm.

IFS model 3: In the third IFS model (Agriculture + Horticulture + Animal Husbandry + Water harvesting), the farmer integrated sweet corn (0.3 ha), vegetables (1 ha), banana (0.15 ha), 5 pigs, and 40 poultry. A well-established jalkund of 35,000 litres of water storage capacity and a water pump was installed on his farm to supplement irrigation to crops during *rabi*. The gross annual income was ₹4,14,000 which was 160.38% higher when compared to the traditional mixed farming system. The net annual income and BCR after intervention of the technology were ₹2,50,000 and 1.52, respectively. Scientific cultivation of crops using high yielding crop varieties, improved breeds of pigs, poultry, along with installation of jalkund have improved the overall system productivity of the farm.

IFS model 4: The fourth IFS model integrating components like Horticulture + Animal Husbandry + Water harvesting included dragon fruit (0.6 ha), sweet corn (0.2 ha), vegetables (0.5 ha), 20 poultry, jalkund, water tank and a water

farm productivity. Fish ponds were also not managed properly (Table 1A).

Farmers' practice after IFS intervention and their impact on farm income

With the technical guidance of ICAR centre and support through need-based inputs, the four IFS models were found to be more profitable than mixed farming systems before technology intervention. The gross income of the four IFS models was higher to the extent of 115.03– 321.69% when compared to the traditional mixed farming system (Table 1B).

IFS model 1: The first IFS model with integration of components like Agriculture + Horticulture + Animal Husbandry + Fisheries + Water harvesting earned a gross income of ₹3,55,000 annually which was 251.49% higher than gross income

before technology intervention. The net return and BCR were ₹2,14,000 and 1.52, respectively. The principal agricultural crop consists of rice (1 ha) integrated with vegetables (0.6 ha), sweet corn (0.2 ha), 5 goats, 3 pigs, fish pond (0.1 ha), water tank and a water pump. The crops are supplemented with irrigation and collected animal manures are dried and applied to crop soil. High yielding sweet corn var. Ichiban F1, improved breed of goats, pigs and fishes along with water storage structures have improved the overall income of the farm.

IFS model 2: The second IFS model, agriculture + Horticulture + Silviculture + Animal Husbandry + Fisheries + Water harvesting consists of arecanut plantation occupying 40.5% of total area, followed by rice (27.03%) and vegetables (16.22%). Apart from this, maize (0.3 ha), sweet



IFS model 4: Horticulture + Animal husbandry + Water harvesting

pump. The farmer earned ₹1,75,000 as gross annual income which was 321.69% higher when compared to the previous farming system. The net annual income and BCR after intervention of IFS were ₹1,19,000 and 2.13, respectively. The scientific cultivation practices of crops integrated with high yielding crop varieties along with dual purpose Vanaraja poultry and enough water supply have improved the farm productivity and sustainability.

SUMMARY

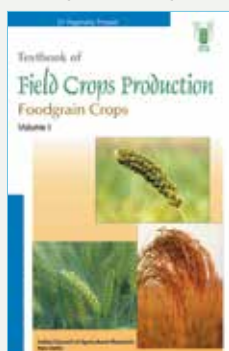
With the scientific interventions and adoption of IFS, all the farmers engaged in different models have been able to earn higher income and improve their standard of living. The integration of scientific methods of agricultural and horticultural crops cultivation supplemented with enough irrigation through water harvesting structures, introduction of new high yielding crop varieties as well as breeds of animals and poultry have improved the overall

system productivity of the farms. The success of scientific IFS can be achieved with high efficiency through proper selection of farm components and allocation of farm resources. These farming models have proved to be of great success and have impacted many other farmers to take up the IFS model on their farms.

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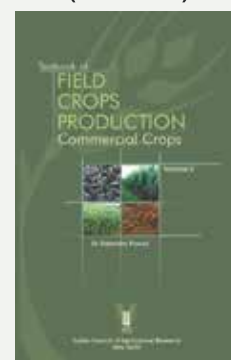
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