

Review Article

Economic Importance of Integrated Farming System for Livelihood Promotion among Tribal Communities of BTR (Assam)

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ABSTRACT

Agriculture is the mainstay of livelihood for the people of the Bodoland Territorial Region (BTR) comprising of Kokrajhar, Chirang, Baksa, Udalguri. Approximately 80% to 90% of the population are engaged in farming. Agriculture in this area is the lifeline of both the rural and urban population and constitutes to be a major source of income for livelihood in rural BTAD. Apart from agriculture, the economy of BTAD also depends on other allied activities like livestock and poultry farming, sericulture, fishery, khadi and village industries, tourism *etc.* In the recent past, small tea gardens & rubber plantations also contribute in a big way to the economy in certain locations of BTAD. The livestock farming has been an integral part of traditional life among rural households in BTAD which contribute considerable amount to the economy of rural population in these areas. Almost all the households in the villages are engaged in the livestock farming like piggery, dairy, poultry, duckery, goatery, fishery *etc.* BTAD is endowed with a rich repository of biological diversity, valuable genetic resources of agricultural & horticultural crops and a plethora of natural resources. The production system is characterized by low cropping intensity, subsistence level and mono cropping. Therefore, integrated farming system (IFS) approach is not only a reliable way of obtaining fairly high productivity with considerable scope for resource recycling and ecological soundness leading to secure household food and nutritional security. Location specific farming components (rice-fish-vegetable, poultry-fish-vegetable, pig-fish-vegetable, fish-vegetable, fish-duck-vegetable, fish-rabbit *etc.*) are required to be carefully integrated to harness complementarities between enterprises to achieve optimum productivity per unit area, ensuring food and nutritional security and getting higher returns and bio-resource flow within the system.

Keywords

IFS, bio-resources, recycling, nutritional security, BTR

Introduction

Integrated Farming System is an integrated set of elements or components and activities that farmers perform in their own farms under their resources and circumstances to maximize the productivity and net farm income on a sustainable basis (Singh and Ratan, 2009). Therefore, integrated farming is a mix of farm enterprises to which farm families allocate its resources in order to efficiently utilize the existing enterprises for increasing the productivity, and profitability of the farm. These farm enterprises are crop, livestock, aquaculture, agro-forestry and agri-horticulture. It is a multi-disciplinary whole-farm approach and can be effectively employed in solving the problems of small and marginal farmers. IFS aims at increasing employment and income from small holdings by integrating various farm enterprises and recycling crop residues and by-products within the farm itself through the concept of synergism. Agriculture constitutes a major source of income for livelihood in rural areas of BTAD. Some, of the major agricultural crops in BTAD include rice, wheat, jute, sugarcane, buckwheat, millets, mesta, potato, rape and mustard, pulses and oil seed and cash crops including plantation crops like banana, pineapple, assam lemon vegetables, ginger, turmeric, tapioca, arecanut, coconut, black pepper etc.

Agriculture in BTAD area is dominated by rice-rice mono cropping system. The farmers are mainly small and marginal and about 80% of the population depends on agriculture for their livelihood. The basic problem faced by agriculture in the districts are small land holdings, low cropping intensity, low productivity, inadequate access to appropriate technologies, improper nutrient management, low adoption of HYVs of crops and livestock etc. The situation is further weakened due to repeated failure of monsoons on one side and

on the other side, due to ever increasing population there is decrease in per capita availability of land. Under such situation, there is hardly any scope for horizontal expansion of land and only vertical expansion is possible by integrating various farm enterprises as opined by Behera, *et al.*, (2001). Therefore, a holistic approach is the need of the hour in order to sustain a positive growth rate in agriculture, (Manjunath *et al.*, 2014).

Development in agricultural sector has been the urgent need of hour, since it is the backbone of rural economy in BTAD. Presently, the farmers concentrate mainly on crop production or on fish production or any one livestock or poultry farm which is subjected to a high degree of uncertainty in income and employment to the farmers. Integration of various agricultural enterprises viz., cropping, animal husbandry, fishery, poultry, piggery, dairy, goatery, agro-forestry etc. in the farming system has great potentialities in agricultural economy of BTAD. Jayanthi *et al.*, (2002) also observed that these enterprises not only supplement the income of the farmers but also help in increasing the family labor employment throughout the year.

Integration of different allied enterprises with crops also provides ways to recycle products and by-products of one component as input of another linked component which reduce the cost of production and thus raises total income of the farm. Moreover, the expenditure on fertilizers also declined due to availability of a good amount of manure, which resulted into a saving of 50% expenditure on fertilizers as compared to arable farming (Faroda *et al.*, 1978 and Tomer *et al.*, 1982). There is lack of awareness and information about the IFS system and its adoption by the tribal communities and also the benefits obtained

from IFS. Hence, the present study is the review of the sustainability of Integrated farming System (IFS) over the long run among the tribal communities with the economic appraisal of pig based IFS.

The productivity from crops and livestock are at very low level, though the area has very high potential unless properly managed and technology with input support is extended to the tribal communities. Besides crop farming, animal husbandry is another important support activity adopted by the tribal communities, where pigs are the key components and plays a major role in rural livelihood security. Cows are kept basically for milk, and Bullocks as draft animal and that too at subsistence level. Similarly poultry is also a domestic activity.

Fishery is basically for homesteads and this sector also contributes in the economy of rural people of BTAD as the areas is surrounded by many small and medium size rivers and water bodies and swamps like ponds, tanks *etc.* Most of the families have small ponds ranging from 0.03 to 0.1h and the families earned below 7000.00 from fisheries. Some local species of fish were naturally available in the pond which was used for home consumption. Although, the livestock farming is not a primary source of income, such farming is practised by the rural folks to enable occasional capital supports to their household needs and during their urgent needs in time of financial crisis. Agriculture and allied sectors are practised by farmers in the backyard of their household without any integration and the bio-inputs generated by one production system is not utilized by the other system.

Operation of a single commodity farm such as fish, poultry or livestock and crop may not

be sustainable in the long run because of high input costs as well as risk involved and cumulative impact of waste disposal on the environment. Scientific integration of different farm components such as livestock-fish-crops *etc.* can be a viable option for sustainable production of different commodities with lower investment, mitigation of risk factors and environmental impact. This system incorporating fish, livestock and crops in an ecologically balanced proposition may be an ideal example for economically sustainable small scale agri-enterprise through utilisation of available resources (Chetia Borah & Bhuyan, 2017).

The IFS system incorporating fish, livestock and crops is found to be an ecologically balanced proposition and economically sustainable for small scale agri-enterprise through utilisation of available resources (Chetia Borah & Bhuyan, 2017). Gogoi, *et al.*, 2014 also opined that livestock-fish-vegetable integration system is an economically sustainable IFS module for the rural livelihood in the long run.

Pig-Fish-Vegetable IFS systems

Keeping in view the local traditions of food habits and culture, this module has an immediate attraction of the tribal farmers.

This IFS system involves integration of the following component:

Introduction of exotic male pig (Hampshire-one number) to cross with 2 numbers of female pig (Indigenous)

Pig sludge as fish feed and pond water quality management for fish farming.(450 m² pond area)

Table.1 Economics of Pig- Fish - Vegetable Farming

Sl. No.	Items	Traditional Practice			IFS with Improved practice		
		Production	Cost (Rs.)	Income (Rs.)	Production	Cost (Rs.)	Income (Rs.)
1	Piglets (nos./ 2 cycle/2 female piglets)	16	8,000.00	19200.00	36	24208.00	72000.00
2	Piglets as charge for servicing	-	-	-	6	-	12000.00
3.	*FFEW (q)	-	-	-	2.5	-	4125.00
4.	Fish Production (q) from pond area of 450m ²	-	-	-	2.7	2320.00	32400.00
5.	Vegetable production						
i)	Cabbage (q) in 1000m ² area	-	-	-	2.5	1923.50	4500.00
ii)	Okra (q) in 1000m ² area	-	-	-	2.4	1450.00	8000.00
6.	Total	16	8000.00	19200.00	36	29363.00	133025.00
7.	Benefit cost ratio	1.4:1			3.5:1		

(Source: Livelihood promotion through integrated farming system in Assam, NAIP, Component-3, AAU, Jorhat, 2009-2014)

Fig.1



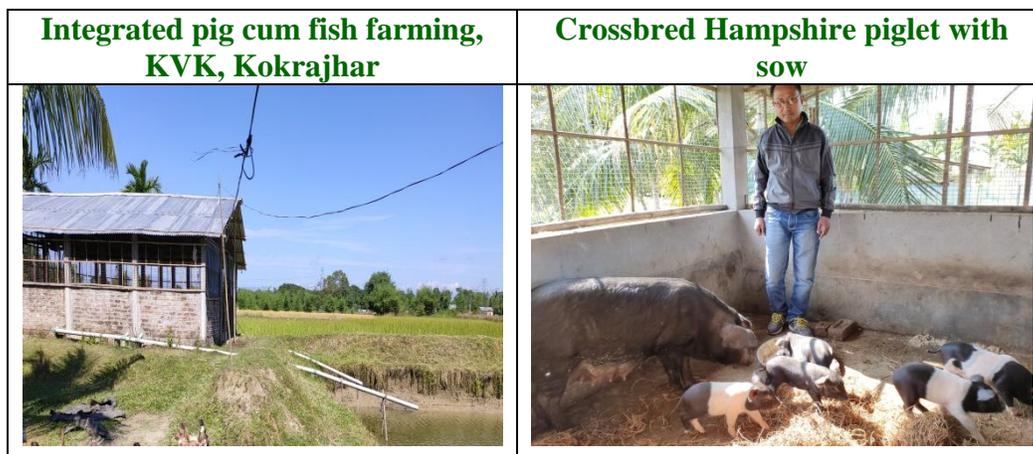
Table.2 Economics of Pig-Fish Farming

Sl. No.	Items	Traditional Practice			IFS with Improved practice		
		Production	Cost (Rs.)	Income (Rs.)	Production	Cost (Rs.)	Income (Rs.)
1	Piglets (nos./ 2 cycle/2 female piglets)	15	8,000.00	18000.00	32	22000.00	64000.00
2	Piglets as charge for servicing	-	-	-	5	-	1000.00
3.	*FFEW (q)	-	-	-	2.4	-	5000.00
4.	Fish Production (q) from pond area of 1300m ²	-	-	-	2.6	2320.00	35000.00
6.	Total	15	8000.00	18000.00	-	24320.00	105000.00
8.	Benefit cost ratio	1.3: 1			3.3: 1		

(Source: Success story of KVK, AAU, Kokrajhar, Assam under TSP Project, 2015)

*FFEW: Fish Feed Equivalent Waste

Fig.2



Cultivation of vegetables like Okra and Cabbage in marginal area near the fishpond and Irrigation of crops with fertilized and Blue Green Algae (BGA) enriched pond water.

Introduction of additional horticultural crops like Assam lemon, Pineapple and Banana) on the unutilized bank of the ponds

The above IFS of pig- fish-vegetable (pig unit of 1 male Hampshire: 2 female indigenous pig, fish pond 450 m² and vegetable-cabbage

1000 m² and okra 1000 m²) can produce an income of Rs. 1,33,025.00 with benefit-cost ratio of 3.5:1 against income of Rs. 19,200.00, benefit-cost ratio of 1.4:1 under traditional practice of rearing pig with indigenous breed indicating 85.56% increase in income under IFS.

Pig-Fish IFS systems

This system involves integration of the following components. Introduction of exotic male pig (Hampshire-one number) to cross

with 2 numbers of female pig (indigenous)

Pig sludge as fish feed and pond water quality management for fish farming.(450 m² pond area). In this type of intervention, the two female pigs (sow) gave birth to 15 (7+8) numbers of piglets compared to the conventional system of rearing using indigenous pig. In addition the male Hampshire pig can be hired for servicing by the other nearby farmers in exchange of one piglet born from each farrowing. In the next cycle, the female pigs (sow) gave birth to another 17 (9+8) piglets. The IFS of pig- fish (pig unit of 1 male Hampshire: 2 female indigenous pig and fish pond 1300m² produced an income of Rs. 1,05,000.00 with benefit-cost ratio of 3.3:1 against income of Rs. 18000.00 and benefit-cost ratio of 1.3 :1 under traditional practice of rearing with indigenous pig indicating 82.85% increase in income under IFS.

It is revealed from the present review that IFS can be a viable option for increasing the productivity and sustaining the income flow for livelihood improvement of the tribal communities in the long run. Livestock-fish-crop *i.e.*, pig- fish -vegetable, is an ecologically sustainable integrated farming technology suitable for small and marginal farmers belonging to the tribal communities of BTAD. It is a low cost technology and facilitates maximum utilisation of available biological resources and recycling of organic wastes. Pig waste is recycled in fish ponds, whereas the nutrient rich pond water and excess livestock waste were used for fertilisation of horticultural crops. Exclusion of external feed and manure for fish reduces the cost of production of fish to the tune of 60 - 70% and production cost of horticultural crops are also reduced to around 60% through utilisation of organic wastes as manure as

well as mulching material. Hence integrated farming is the only solution to get assured production of multiple commodities per unit area through nutrient flow from one commodity to other with low external input.

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