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Research Article

INTEGRATED FARMING SYSTEM AT KVK PAKUR: REMUNERATIVE MODEL FOR TRIBAL FARMERS

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Abstract: 'A review on 'Pig cum duck cum fish cum horticultural enterprise' farming system approach was carried out in the year 2015-16 and 2016-17 in the demonstration unit at Krishi Vigyan Kendra Pakur, located at Maheshpur, Jharkhand working under the jurisdiction of Birsa Agricultural University, Ranchi. The main objective of this approach was to analyze the Benefit Cost Ratio of the components undertaken in that area to minimize the risk and to get maximum production through recycling process and using less external input. It was a kind of attempt to transfer the technology among farmers of Pakur so that they can easily be convinced with the complementary and supplementary aspects of enterprises added in Integrated Farming System. This unit of farming system is congenial to the socio-economic perspective of tribals (Santhals and Paharias) of Pakur. The unit occupying 0.72 ha area of a pond, a unit of pig, ducks and 400 m^2 area was meant for the vegetables on the bund of the pond. Leafy Vegetables and Cucurbits are grown in autumn-summer. Here, gourds were trailed in a height of 5 feet on trellis whereas the leafy vegetables were sown under it. Along with growing vegetables, seedlings of tomato, brinjal and other vegetables were raised in nursery of 200 m^2 area. Leguminous fodders were also sown on bunds and towards outer slopes of pond as a feed for pigs. 'Youth and Women', the most potential group of this tribal district need this model to see and adopt in their small farms. This On Station model of Integrated farming system at KVK, Pakur is self-expressed and very much helpful for capacity building as 'SEEING IS BELIEVING' for farmers of Pakur district motivating them to adopt.

Keywords: *Integrated farming system, Pig, Fish, Duck, Vegetables, Nursery, Sustainability*

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Introduction

The Integrated Farming Systems (IFS) assumes the greater importance for proper management of farm resources to enhance the farm productivity and reduce the environmental degradation, enhancing the per capita income ultimately to improve the quality of life of resource poor farmers and maintain sustainability. In order to sustain economically and ecologically positive growth rate in agriculture, a holistic approach is the need of an hour. These farm enterprises are crop, livestock, aquaculture, agro-forestry, agri-horticulture and sericulture *etc* depending upon the likeness of farm family and as per the demand in the market. With the increase in population consequently decreasing per capita land availability and conversion of cultivable land to some other commercial enterprises, the scope of horizontal expansion of land for increasing production, productivity and profitability has been checked and the only alternative left is the vertical expansion for practicing the same to feed the farm family sustainably.

Panke *et. al* (2010) [1] states that the integration is made in such a way that the product *i.e*., output of one enterprise/ component should be the input for other enterprise with the high degree of complementarily effect. Integrated farming system is the best way to manage time, space, available resources, and addition of enterprises according to the social acceptability. Institutional unit of IFS has many advantages, it was so designed that it was farmer's friendly as the multidisciplinary enterprises were picked and added according to the social acceptability and likings of farmers as well as the inhabitants of the whole specific area. District Pakur with agro-climatic zone (NARP) is Central and North Eastern Plateau and is situated in the north- eastern part of Jharkhand. It receives 1234 mm normal rainfall from June-September and annually 1550 mm. As per the 2011 census data the population of scheduled tribes in Jharkhand is 8,645,042 with 1,699,215 nos. of households and the population counts 26.21% of total population (26,945,829) of the state.

Whereas according to 2011 census data of Pakur district ST population is highest (82.13%) in Amrapara block followed by Littipara block with 72.23% and lowest population in Pakur block (13.34%) accounting total 42.09% of ST population in whole Pakur district are inhabiting at 1250 villages [2,3].

Materials ad methods

A review was carried out in the well-established farming system model at Krishi Vigyan Kendra, Pakur at Maheshpur, in Pakur district of Jhatkhand. There existed a pond of 0.72 ha area, 5 units of pig along with store room for keeping feed materials. A unit for ducks with capacity of 50 birds. 400 m^2 area for vegetable cultivation on bund and adjoining area of the pond, vegetable and papaya seedlings were grown beside pond in 200m^2. For creating awareness and skill development of farm women and youth group of rural as well as urban area, a live demonstration unit was managed by Krishi Vigyan Kendra, Pakur. The data and conditions were recorded and observed during October 2015- September 16 and October 2016-September. Gross income, cost of cultivation or costs incurred in the maintenance of enterprises were recorded during these two years and the economic analysis was done. Complementary and supplementary relationship with respect to output/ by-product of one enterprise as feed or used as fresh manures were the main objective to display through this demonstration unit. Data collected on information related to existing farming system adopted by farmers in Pakur district and compared with the resource availability, age, technology and component intensification, engagement of labours, cost of production, productivity, profitability and ultimately sustainability.

Enterprise combination under IFS

Piggery

In order to transfer of technology of the important component, pig, is preferred by

the 42.09% tribal population of Pakur, it is our prime responsibility to explore the unit as Pig based farming system.

Duckery

Rural and urban population of Pakur is very much religious and social. Some festivals like Bandana, Sohrai, Mansa Puja, Makar *etc*., they use to cook meat product of ducks, so they are interested in rearing it.

Fishery

Next to duck fisheries is the best option to add in IFS. Being the tribal culture affected with the bangali culture with respect to eating habit and likeness, fish earns remunerable profit.

Horticultural crop

Growing vegetables on the bund especially leafy and climbing vegetables can provide the farm family with mineral nutrients, vitamins ensuring nutritional security [10]. Vegetables sold, consumed by farm family and also provided as inputs for other complementary enterprises (pigs, ducks). Growing of vegetable and papaya seedlings can add a considerable out come from small unit of adjoining pond area. Local markets are best outlet for its sale. This small area as horticultural unit gains a lot when supplied in time. The activities involved take very short time period and it requires less investment too

Results and Discussions

The wellbeing of poor farmers can be improved by bringing together the experiences and efforts of farmers, scientists and extension personnel with similar eco-sociological circumstances depending upon the availability of labour, affordable capital for investment including manageable components *i.e*., through Integrated Farming System.

Table-1 *Showing the types of farming against different aspects prevailing in Pakur*

Particulars	Type of farm		
	Subsistence	Commercial	Integrated
Age of Farm	Old	Old	New
Source of irrigation	No	few	Many
Enterprise intensification	Low	Low	High
Farm Labour	Little	Much	Much
Hired Labour	Little	Much	Much
Total farm income	Little	Much	Much
Productivity/unit	Low	Medium to hogh	High
Profit/unit	Low	Medium to high	High
Sustainability/stability	Low	Low	High
Risk of failure	High	High	Low

When the comparison was done between subsistence farming, commercial farming and integrated farming it has been found that the subsistence farming has become irrelevant with respect to age, availability of water for irrigation, crop/ enterprise intensification, farm labour ultimately profitability and sustainability, while the risk of failure was low in integrated farming type. The commercial farming fetches much but is not sustainable and productivity as well as profitability is also not competent with that of contemporary integrated farming system. Diversification of farming activities improved the utilization of labour; reduced unemployment in areas where there was a surplus of underutilized labour and provided a source of living. The integrated farming system is now being re-introduced in some areas, as a sustainable alternative to the commercial farming system in marginal lands with minimum risks, with the objective of reversing resource degradation and stabilizing farm incomes [4].

This [Table-2] shows that the existing subsistence farming system can only fetch 1.55 times in aggregate while they can profit an average of 3.75 times more than their investment from recommended farming system and it will increase later as Mohanty *et. al*. (2010) [5] reported a successful a tribal integrated farmer in Orissa who was getting enhanced productivity as well as profitability and sustainability after adopting the IFS as compared to conventional farming system and earned 7 times higher net monetary return compared to traditional farming.

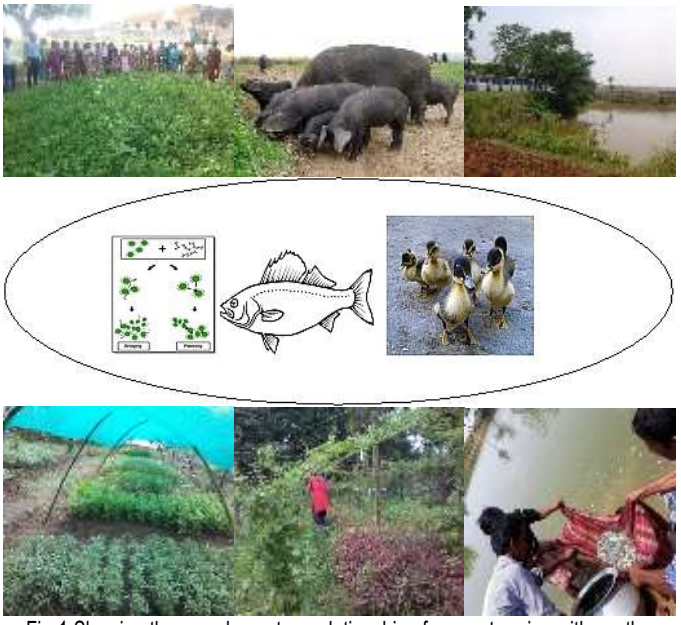

Fig-1 Showing the complementary relationship of one enterprise with another

The model clearly shows the relationship and dependence of components. Here, benefits of bio-digestion include the reduction of manure smell (From excreta of pigs and ducks), Integrated farming systems offer unique opportunities for maintaining and extending biodiversity when residues and feces are directly exploited as the input for other enterprise and helpful in the beginning of flora (planktons) that is again the input for next component(fishes and ducks). Integrated farming system approach is not only the way of obtaining high productivity and profitability by resource recycling, but it is also the concept of socio-ecological soundness leading to sustainable agriculture

The main aim of duckery here as a component is to train and motivate the pond owners to rear ducks in their aquaculture farm and allowing it to swim in the pond as they use to flatter their feathers and taking dive into water which increases the level of oxygen in water. The bits of feces released by ducks while swimming provide not only feed for fishes it enriches the micro environmental condition for planktons to grow. This in turn supports fishes to grow rapidly in more congenial environment.

From this demonstration unit it was the effort to aware farmers that out of the wastes of pigs and ducks the flora flourishes well in the pond with regular supply of fresh manure by them. Time to time lime is applied to maintain the pH of water. Vegetables of good qualities can be sold and rest consumed by farm family and also provided as inputs for other complementary enterprises (pigs, ducks). Many studies based on site experiments or farm trials revealed that trees and vegetables crops can be highly lucrative. Financial analyses in these studies indicate that the systems provide a net surplus income beyond the consumption needs of the household. Growing of vegetables and papaya seedlings can add a considerable out come from small unit of area beside pond. Local markets are best outlet for its sale.

The [Table-3] showing the economics that was observed at integrated farming system demonstrated at KVK, Pakur which is characterized by a high diversity of genetic species, enterprises and practices. This is an example for farmers which are employed to attain the household objectives out in a small (<1 ha) unit of area. It takes very less time period to be ready for sale and very low risk to grow helps monetarily to maintain the whole farming system. This unit as horticultural component gains a lot when supplied in time and takes very short time period (20-30 days) and it requires less investment too. Although our farmer earns more than double from pig and fish but with integration of all components, they can earn profit in multiples [6-9].

Conclusion

This review on IFS at KVK, Pakur clearly shows that the components are need based, socially accepted and market driven mainly handled by the farm family members and labours hired according to their need and capability to afford.

Table-2 *Economic analysis of existing vs. recommended farming system in Pakur*

Farming system	Gross cost (Rs.)/ha/year	Gross return (Rs.)	Net return (Rs.)	B:C ratio
Existing Rice - fallow	20,000	40,000	20,000	2.0
Existing Maize based	18,000	20,000	2,000	1.11
Recommended				
Piggry (5 unit-20F+2M)+	1,50,000	2,50,000	1,00,000	1.66
Duckery(50nos. Duck)+	15,000	35,000	20,000	2.3
Pond -0.72 ha(Fisheries) +	20,000	1,21,000	1,00,000	6.05
Horticultural enterprises(Vegetables+ Seedlings)	20,000	100,000	80,000	5.0

Table-3 *Economic analysis of components at Demonstration unit in 2016-17*

Enterprise /crop	Breed/ Variety	Product Sold	Qty. produced	Gross income (Rs.)	Gross Cost (Rs.)	Total Gross income (Rs.)	Net Income (Rs.)
Pig	T&D	Piglet	10	37500	75,000	2,88,500	2,13,500
Fish	IMC	Table fish	3qtls.	15000			
Ducks	Khakhi Cambel	Eggs	200	1000			
Papaya	Ranchi Honey Dew	Seedlings	2600	26000			
Tomato	Param	Seedlings	45000	91000.00			
	Priya		22000				
	Lakhsmi		22000				
	Tanushree		2000				
Brinjal	Nishu	Seedlings	23000	68000.00			
	NavKiran		23000				
	Rajkiran		22000				

In all cases, there was minimum "waste" in the system. By-products and residues originating in one component of the system became inputs for another "productive" activity and least or no risk of failure is proved in IFS whereas the subsistence farming and commercial farming faces high risk during adverse farming situation *i.e.*, failure of one enterprise means 100% loss.

In some aspects, especially when new technologies are being developed or adapted, it is advantageous if on-farm research/testing is complemented and bridged only with references to location specific "on station" research done at institutions. This supports scientists and researchers to implement and reach farmers level without any fear of its failure. It can be helpful for strengthening farmers to bear risk. This farming system improves space utilization and increase productivity per unit area with familiar enterprises achieving the ultimate goal to get remunerative returns. It provides diversified products with farmer's own choice coupled with the technologies recommended. As the IFS practicing farmers were scattered over the region, it may be desirable that cluster wise IFS farmers associations will be formed which will play a vital role in addressing the problems faced by the farmers. This may lead for developing the scale of operation that will help the farmers in accessing institutions like Krishi Vigyan Kendra, Zonal Research Stations, ICAR Research station for the region and government departments of the district for innovative technologies so, let us strengthen our shy farmers to achieve goal towards 'Doubling Their Income'.

Application of research: On-station study on the integrated farming system at KVK, Pakur is very much beneficial for tribal farmers of Jharkhand. The enterprises included were socially accepted and all has a regular demand in locality proving its incorporation remunerative with respect to the benefit at farmer end.

Research Category: Integrated Farming System

Abbreviations: IMC-Indian Mrigal Carp, T&D- Tall & Dwarf
IFS- Integrated Farming System, ha- Hectare, B:C- Benefit Cost Ratio
ICAR- Indian Council of Agricultural Research
ATARI- Agricultural Technology Application Research Institute
SAC- Scientific Advisory Committee Meeting
BAU- Birsa Agricultural University
DEE- Directorate of Extension Education

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Study area / Sample Collection: Demonstration unit at KVK, Pakur, Jharkhand

Cultivar / Variety / Breed name: Integrated Farming System Approach

Conflict of Interest: None declared

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Ethical Committee Approval Number: Nil

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