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Evaluation of Integrated Horticulture-cum- Fish Farming in Malwa Region of Madhya Pradesh, India

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ABSTRACT

In India, the farming community accounts for 80% under marginal and small farmer's category[1]. Farmers under these categories are economically poor working in diverse, risk prone environments and with hardly sufficient to sustain their family. The declining trend in land holding per capita poses a serious challenge to the sustainability and profitability of farming. Considering the efficacy of this viable production system, the study was conducted in purposively selected ponds of farmers which had available space of the pond bundh used for production of horticulture produce. The trial was conducted minimum 06 replications were taken under farm field condition. Vegetable growing in the trellis and dykes is an additional component which helps in maximizing profit from unit area. The data were collected from each treatment for consecutively 03 years to judge the economic profitability and sustainability of the practice. It was observed that better production and sustainable economic return can be achieved through integrated production technology or with dyke vegetable cultivation in pond based integrated farming practices.

Key words: Integrated Farming, Horticulture cum Fish Culture, Sustainable, Profitability, Fish.

INTRODUCTION

The production system adopted during Green Revolution has been explorative and the natural resources like soil and water were subjected to exploitation, as a result sustainability of agricultural production system has been jeopardized. This suggests the integration of land-based enterprises viz. dairy, fishery, poultry, duckery, apiary, field and horticultural crops within the farm, with the objective of generating adequate income and employment for the small and marginal farmers and thereby improves their livelihoods[2]. Integrated farming is a multi-commodity farming system which can be defined as an innovation in which two or more commodities are farmed together on a common infrastructural base with the objective to optimize upon use the operational cost. To this end, when a commodity is farmed in combination with fish it is termed as integrated farming or fish based integrated farming. In integrated fish farming, one or several farm commodities are integrated with fish culture keeping the pond as the nucleus of the farm. Integrated farming has immense potentiality to emerge out as an effective tool for improvement of rural economy due to low investment and high profitability[3]. 80-85% farmers are small & marginal and have less than 1 ha land, and 15-20% are large farmers with larger land holdings. Integrated farming has bright prospects in India. This is largely because fish culture in India is basically in the hands of people who are the most down-tradden lot of our rural community. It is a means of diversifying farm out puts and producing food for the farmers family. The labour requirement can easily be shared between family members.

Integration of horticulture and fish is an ecofriendly & very income generating practice, not only applicable but also a profitable practice for a small & marginal farmer. This is an example of best integrated system because it does not require any additional infrastructure in terms of input cost, we can use the available space of embankment for grazing horticulture crop. Essential

inputs of horticulture crops like seed & seedling of fruits & vegetable are less costly & are available everywhere. This horticulture practice is not so technical. A small farmer is very familiar with this practice. The marketing of horticulture produce is very approachable & easy. Very little risk in terms of disease & natural hazards. Keeping this fact in a trial, was conducted by the Krishi Vigyan Kendra, Dewas to implement in field level of the Malwa region of district Dewas, M.P since 2011-12 to 2013-14. The study was conducted to evaluate the performance of integrated farming system for 03 years.

METHODOLOGY

The study was conducted in purposively selected ponds of farmers which had available space of the pond bundh used for production of horticulture produce. The integration of fish with horticulture has emerged as an effective alternative, highly sustainable farming system with maximum reduction of production cost. Pond was an essential and viable component of the trial with vegetable production system. Regarding horticulture component, though several options prevail in field level only those horticultural practices suited in the dyke of pond were considered in the trial as. The trial was formulated in terms of 02 treatments in which the first treatment or technology option was disintegrated farming practices i.e. fish culture without integration with agri-horticulture crops or no systematic utilization of dyke without appropriate combination of vegetables round the year (farmers practice). The integrated technology II- was fish culture (Stocking Density is 8000/ ha) and round the year dyke vegetables on trellies and on ground. Bitter gourd & ridge gourd in the trellies and pumpkin and bottle gourd were cultivated as dyke vegetables. The data were collected in regular interval such as plankton density, growth rate of fish, weight, length of fish and vegetable production, overall management return and farmers's assessment for consecutive 03 years. The data, thus generated, were computed and analysed by statistical tools for better interpretation of results.

RESULTS AND DISCUSSION

It was found that the integrated Horticulture-fish farming system is a ecofriendly and superior to the traditional system of fish culture & production in terms of economic benefits, as well as in its effect on environment. It is very income generating practice, not only applicable but also a profitable practice for a small & marginal farmer. Integration of these components in rural production system definitely increases the overall productivity and economic return along with sustainable environment friendly production system. Table 2 describes the data on fishery component under integrated farming system. In the integrated technology, no external fertilizer or manures were supplemented. The data were collected throughout the experimental period for different trials under fields condition on different parameters of fishery along with gross economic return of the system.

The yearly variations in physico-chemical and biological aspects of fish culture ponds under the study are presented in Table -2. The dissolved oxygen content showed appreciable difference in IPT pond due to sprinkling of incoming water. In the present study, air temperature ranged from 11.2 to 42.1°C whereas water temperature varied from in case of farmer pond 16.1-35.6 and in IPT pond 15.3-33.8 °C. water temperature ranging between 20 °C to 30°C is considered to be most suitable for the growth and survival of fishes[4,5]. Water temperature range of 18°C to 32°C is suitable for carps[6] whereas the temperature range of 26 and 32°C to be optimum for growth of fish under composite carp culture[7]. Carps usually fed between 16 and 32°C, and recommends stoppage of feeding[8] above 27°C. pH is an important factor and determines the solubility and chemical nature of most substances in natural waters. Better fish production could be possible in pond water with pH value ranging between 6.5 and 9.0[4,9]. It has direct effect on fish growth (appetite and food conversion ratio) as well as on the growth and survival of fish food organisms[10]. The pH values in the present study were on the alkaline side throughout the culture period. The average values recorded as 7.50 to 8.90 fall within the desirable limits for carp culture.

Dissolved oxygen is the most important factor, influencing fish life. Low oxygen concentration may be responsible for the death of fish in ponds. For better growth the range of DO may be maintained above 4 mg/l. The dissolved oxygen values recorded in the present investigation were within

the recommended levels in IPT Pond, ranging from 6.17 to 12.4 mg/l, and in farmers pond 4.50 to 7.45 mg/l.

Among the parameters studied, the water temperature, pH, dissolved oxygen, free carbon dioxide, and plankton concentrations were within the optimal range for growth of carps.

The fish production detail was depicted in table 3. The production rate in the integrated production technology depends on various factors namely, the method of production (Extensive or intensive), cultured species, water quality and soil fertility etc. The weight and growth of fishes were significantly better in integrated production technology.

Table 4: revealed the data on horticulture (vegetables) component under integrated farming practice. The data were assembled throughout the trial period for 03 years on production parameters of various vegetables, i.e. pumpkin, bitter gourd, ridge gourd and bottle gourd round the year under the dyke vegetables cultivation practices. The results significantly showed that all the vegetables production in IPT was significantly better than farmer's practice. The gross return, net return and B:C ratio were also higher in IPT

The diversified nature of multifarious activities related to different enterprises included in integrated farming system provide a lot of opportunities of employment and keeps farmers and their family members engaged more time and help

Table 1: Details of horticulture cum fish culture

Crop/Enterprises	Horticulture cum fish culture
Farming situation	Seasonal domestic pond based small farming situation
Problem diagnosed	Poor farm income efficiency from pond based farming situationFP- (T_1)
Technology Options	Farmers practice- fish culture with no systematic utilization of dykes with appropriate combination of vegetables round the yearIPT-(T_2) Integrated production technology- fish culture+ round the year dyke vegetables on trellies and on ground.
No. of trials	06

Table 2: Mean values of physico-chemical characteristics of water in integrated-horticulture fish farming

Parameters	Farmer's pond	IPT pond
Water temperature (0C)	16.1-35.6	15.3-33.8
pH	6.80-8.30	7.50-8.90
Dissolved oxygen (mg/l)	4.50-7.45	6.17-12.4
Free carbon dioxide (mg/l)	0.00-19.0	0.00-11.5
Plankton density (ml/m^3)	1.2-10.25	8.14-21.80

Table 3: Data on individual fishery component in 02 different Technology

Treatment	Production (q/ha)	Gross return (Rs/ha)	Cost of cultivation (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer's practice (T_1)	11.02	88160	30460	57700	2.89
IPT (T_2) Integrated production technology	19.86	158880	34460	124420	4.61

Table 4: Data on vegetable production under field condition

Vegetables	Production (q/ha)		Gross return in lakh/ha		Net Return in lakh/ha		B:C Ratio	
	FP	IPT	FP	IPT	FP	IPT	FP	IPT
Pumpkin	122.5	190.2	1.2250	1.9020	0.9350	1.5420	4.22	5.28
Bottle guard	100.0	140.5	1.3000	1.9766	1.0275	1.6366	4.77	5.81
Bitter gourd	55.0	81.0	0.9900	1.4580	0.7000	1.1380	3.41	4.56
Ridge Gourd	30.10	106.1	0.6020	2.1220	0.3320	1.7420	2.23	5.58

in improving the employment for rural poor. Similar results were reported[11,12,13].

CONCLUSION

Compared to many Farming technologies, horticulture cum fish culture is low cost technology. It saves farmers time, allowing them to undertake double benefit from the same field or area. Data from the horticulture pond shows the increment in yield of fish as well as vegetable production. It is expected that the higher productivity from the horticulture pond is due to the enrichment of water due to presence of nutrient in the form of organic manure. This is a viable option for augmenting overall farm productivity and better economic return of rural pond based farming community. There are lots of options in integrated farming system, but in Dewas district scenario, huge numbers of seasonal ponds so, pond based integrated farming practice may be one of the significant, efficient and viable option for small and marginal farmers.

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