International Journal of Agriculture Sciences
ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 13, 2018, pp.-6547-6549.
Available online at https://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

POTENTIALITY OF INTEGRATION OF DIFFERENT COMPONENTS UNDER FISH BASED FARMING SYSTEM FOR INCREASING FARMERS INCOME

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Received: July 04, 2018; Revised: July 10, 2018; Accepted: July 11, 2018; Published: July 15, 2018

Abstract: An on-farm trial (OFT) was conducted by integrating the different components under fish based integrated farming system (IFS) in some of the adopted villages of Rathindra KVK, Birbhum district of West Bengal during the summer season of the year 2014 and 2015 by using different components surrounding a fish production pond. The district has lateritic soil with a sandy loam texture with low pH (6.2) low O.C (0.39%) low phosphate (17 kg P_2O_5/ ha) and medium to high K content (182 kg K_2O/ ha) The Trial were conducted with 3 treatments (1 farmer's practice and 2 technology options) and 7 replications. In the farmers' practice, they do not follow the integration method of different components as required for increasing income. For this trial Technology Option I [Composite fish culture (IMC+ Exotic Carps) + Duck farming (20 nos) + Azolla + Pulse (red gram-Black gram)], Technology Option II [Composite fish culture (IMC+ Exotic Carps) + Duck farming (20 nos) + Azolla+ Veg (Lady's finger + Capsicum)] were tested for increasing income of farmers by recycling of left over materials within the System.

Keywords: OFT, IFS, components, B:C ratio, Man-Days, Fish based, Duck, Pulse, Vegetables

Citation: Krishna Mitra, *et al*., (2018) Potentiality of Integration of Different Components under Fish Based Farming System for Increasing Farmers Income. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 10, Issue 13, pp.- 6547-6549.

Introduction

Integration of fish farming with components like crops and livestock aims for increased efficiency of resource utilization and additional resource of food and income to farmers [1, 2]. In West Bengal, 81.17 percent and 14.38 percent of total operational land holding fall in marginal and small holding respectively (Agriculture Census Report, West Bengal, 2005-2006). Majority of the farmers Birbhum District have small and fragmented land holdings. Therefore, integrated farming system or mixed farming in a multidisciplinary whole farm approach is the only solution for the small and marginal farmers to increase their food sufficiency as well as income. Based on the above situation, efforts were made to develop a low-cost farming system suitable for this district. It was found that integrating fish farming with duck, Azolla, pulse and vegetables proved quite promising and this has lead to increased efficiency and resource utilization with additional income for the small and marginal farmers. Many scientists searched an IFS model consisting of horticulture crops, field crops, Vermi-composting and poultry in Orissa [3]. This type of farming approach aims at increasing income and employment from small land holdings by integrating various farm enterprises and recycling of crop residues and animal wastes within the farm. By this, the input cost is much reduced and as a result the net income of the farmers increases. On the other hand, as income is diversified from different sub-systems, therefore the risk of loss is much reduced. It was also reported that the diversification of farming activities definitely increases the labour utilization, unemployment reduction in that areas where there is an underutilized surplus of labour. It is also considered as a source of living for households that operate their farm mostly with full time occupation [4, 5].

Materials and Methods

The trial was conducted in Summer season in the year 2014-15 and 2015-16 respectively. The lateritic soil of Birbhum, West Bengal, is sandy loam in nature with low pH (6.2), low organic carbon (0.39%), low phosphorus (17 Kg P_2O_5/ha) and medium to high potassium content (182 Kg/ha).

The components used in this system are fish (IMC & Exotic carps), Duck (Khaki Campbell) Pulse (*redgram*, *blackgram*,) azolla and vegetables (such as capsicum, broccoli, cauliflower, cabbage, green chili, pumpkin, lady's finger). Fish fingerlings of IMC & Exotic carps (each 40-50 gm in weight) were stocked in the ratio of Catla: Silver: Grass carp: Mrigel: Cyprinus (*i.e*., 200: 100: 300: 100: 150: 150 in 0.13 ha pond area). Khaki Campbell ducklings (28 days) were kept in properly built houses beside the pond (30 ducks/0.13 ha pond). Likewise, vegetable & pulse cultivation was done surrounding the pond in the maximum area. As for Azolla cultivation, it was kept in dug out shallow trenches (6' X 4' X 1') with polythene sheets and these trenches were made in shady places inside the farm. For this trial 3 treatments were undertaken with seven replications, the design adopted was randomised block design. The first treatment was taken as the farmers practice with no integration of components with traditional fish farming. The second technology option was composite fish culture with duck culture, Azolla culture and production and pulse such as red gram and black gram. The third technology option was taken as composite fish culture (IMC + Exotic Carps) with duck (Khaki Campbell) Azolla culture and vegetable production (such as Lady's finger, capsicum, pumpkin etc.).

The pond area of 0.19 ha was selected for the integrated farming system with 30 members of khaki Campbell ducks and 0.13 ha land was utilised for pulse production. In another technology option the pond area was again 0.19 ha integration of duck (in the same number as mentioned earlier) and 0.13 ha land surrounding the pond was utilised for growing vegetables. The total data was compiled on the basis of the findings of 2 consecutive years.

Results & Discussion

The perusal of the data [Table-1] revealed that the Technology option-I i.e. composite fish culture + duck farming + Azolla + pulses exhibited higher income *i.e*., B:C ratio (2.28) than those of Technology option-II (2.08) and farmers practice (1.14). The results corroborate with the findings of other scientists [6].

Fig-1 Fish Based Farming System

Table-1 Potentiality of fish based integrated farming system

Technology option	Man days utilized per year	Cost of cultivation (Rs./unit)	Gross return (Rs./unit)	Net return (Rs./unit)	BC Ratio
Farmer's practice: Traditional fish farming	15	39,860.00	45,320.00	5,460.00	1.14
I. Composting Fish Culture (IMC) + Duck farming (20 nos) + Azolla + Pulses (Redgram, Blackgram)	250	60,950.00	1,38,673.00	77,723.00	2.28
I. Composting Fish Culture (IMC) + Duck farming (20 nos) + Azolla + Vegetable (lady's finger, capsicum)	265	90,640.00	1,88,500.00	97,860.00	2.08

Recently other scientist [7] observed that IFS always fetched not only sustainable livelihood but also fetched double income for small holdings of farmers. It was also observed that gross return and net return was higher in integrated farming system where vegetable cultivation was one of the components (Technology option-II) due to higher value of vegetables than pulse crops. But cost of cultivation was also higher in vegetable cultivation than that of pulse cultivation in Technology option-I. For this reason, B:C ratio was higher in integrated farming where pulse is one of the components. It was found that droppings of ducks were also used as manure and feed of fishes in both the Technology option- I & II. However, in Technology option- I, the left-over materials of pulses are also used as nutrition's feed of fishes and ducks. Beside that the common component azolla was also used as most nutrition's feed of fish and ducks and also used as manure in pulses and vegetables. Similar types of results were found by different workers [8]. In this way all the outputs of each components are used to produce the other components and thus each component is integrated as a system approach in farming with more income. Beside that it was also noticed that integrated farming system in both the technology options exhibited more man days utilization than farmer practice *i.e.*, only traditional fish farming. Man day's utilizations (265 per year) was slightly higher in Technology option- II than Technology option- I (250 per year). It might be due to higher labour requirement in vegetable cultivation than pulse. In farmers practice, man-day's utilization was very low (15 per year). Thus, the integrated farming system always increased the employment opportunities. Earlier it was [9] noted the similar type of employment opportunities in integrated crop- livestock- fish farming systems. Pictorial presentation of atrial from different angel is given below.

Conclusion

From the trial it was found that the Technology Option I, *i.e.*, Composite fish culture+ Duck farming +Azolla + Pulse exhibited higher B:C ratio (2.28) than those of Technology Option II (2.08) and farmer's practice (1.14).

Here it is to be mentioned that gross return and net return was higher in integrated farming system where vegetable cultivation was one of the components. It might be due to higher value of vegetables than pulse. But due to low cost of cultivation, B:C ratio was higher in IFS where pulse was the components. Dropping of ducks were also used as manure for increasing plankton production in both Technology Option I & II. In Technology Option I, the leftover materials of pulses were also used as feed for fish & ducks. So, integration was observed more among the components in Technology Option I. Moreover, Azolla was also used as feed of fish & ducks. Besides that, Azolla was also used as organic manure and bio-fertiliser in pulses and vegetables. Further, man-days utilization (265 per year) was slightly higher in Technology Option II than in Technology Option I (250 per year). In farmer's practice, man-days utilization was very low (15 per year) and B:C ratio was also very low (1.14). Therefore, it may be concluded that integrated farming system with components like fish, ducks, azolla and pulse cultivation is very effective to integrate in a profitable manner in Birbhum district.

Summary

From the above trials, it may be concluded that the integrated farming system is always a promising enterprise to increase annual income for the marginal and small farmers particularly who has less farm holdings. Among the different models, integrated farming system with composite fish culture, duck farming, azolla cultivation and pulse cultivation in bank of the pond is very effective to integrate the components in profitable manner along with satisfactory employment opportunities in Birbhum district of west Bengal.

Application of research: Seeing the results of the trial many rural youths are showing interest to be self-employed through this system. It is very much applicable for development of entrepreneurship in villages.

Research category: Integrated farming System

Acknowledgement/funding: Authors are thankful to the farmers who supported by giving pond, land etc for the trials and the other staffs of ICAR-Rathindra Krishi Vigyan Kendra, Institute of Agriculture, Visva-Bharati, Sriniketan, Birbhum, 731236, for their support. Authors are also thankful to the Indian Council of Agricultural Research (ICAR) for providing fund for the OFT.

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Research project name or number: Integration of farming components for maximum profit

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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