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Adoption of Integrated Rice Fish Farming System in Agrarian Reform Communities Cluster

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ABSTRACT

Rice commodity is a primary component in global food security, as it is the main ingredient in the daily diets of around 3 billion people, especially in Asia. Like other agricultural production, rice cultivation depends on scarce natural resources. This Study outlines the utilization of land and water in rice production, and suggests an approach for optimizing use efficiency, namely through the combination of Integrated Rice - Fish Farming System (IRFFS) and Integrated Pest Management (IPM). The author argue that the utilization of land and fresh water is optimized through integrated and complementary production of rice and fish - two basic foods items in daily local diets. The study reviews currently available scientific literature on integrated rice-fish farming systems. IRFFS are characterized, and respective yield potential and interactions between rice and fish are discussed. Socio-economic surveys regarding the adoption of integrated rice-fish farming system will be summarized. The study also reviews literature on the impact of fish culture on rice field ecology as outlined in studies on weed infestation, insect populations, and greenhouse gas emissions. The study concludes that rice-fish culture can be an option to help rice producing countries keep pace with soaring domestic demand for food, especially fish. Integrated rice and fish farming system

optimizes the benefits of land and water resources through complementary use and exploits the harmony between fish and plant.

KEYWORDS

Food Security, Sustainability, Income, Rice Fish Farming System, descriptive, Philippines

INTRODUCTION

In West Africa, the introduction of Asian-based rice-fish farming system through an eco-technology approach has opened a new frontier for diversification of the rice-based cropping system. The objectives of the study were to evaluate the effect of fish on performance of rice and to assess relative economics of concurrent rice–fish culture and rice monoculture under lowland. The results indicated that the presence of fish did not significantly depress the yield of rice. The net return from the rice–fish culture ranged from US$ 1,106.90 to 1,233.80 whilst that of rice monoculture ranged from US$ 1,046.40 to 1, 1108.60. Percentage increase in revenue from the rice–fish system over the rice monoculture ranged between 5 and 11%. These results suggest that rice–fish integration could be a viable option for diversification for smallholder rice farmers in lowlands with soil and water conservation structures and reliable source of water for irrigation.

In Ghana, a study estimated the potential household nutritional impact of the adoption of an integrated aquaculture and agriculture by smallholder farmers. It was concluded that considerable economic and nutritional benefits could be gained by the farmers in the inland regions away from the coast, which has an ample supply of marine fish, but with favorable water availability and soil quality to enable pond construction and operation. Required intakes could be met through the inclusion of the fish-vegetable enterprise

In Bangladesh the net returns from rice-fish was over 50 percent greater than that from rice monoculture. The higher net returns were probably due to the lower mean costs of rice cultivation and higher rice yields in addition to the fish yield from integrated farms. In China, the increase varied from 45 to 270 percent. Growing fish was almost three times more profitable than rice alone (Yan et al. 1995a). Lin et al. (1995) related the economic benefits of rice-fish farming to an increase in rice yields and savings in labor and material inputs. Rice yields in rice–fish culture were 8 percent higher, labor input 19 percent lower, and material costs were 7 percent lower (savings in the cost of controlling diseases and pests). Additionally, fish production increased the net income.

Indonesian figures show that having two crops of rice-fish and using the rice field for a short intermediate crop or *penyelang* of fish has a 116 percent higher return than having two crops of rice and leaving the rice field fallow for two months or so. Purba

(1998) concluded that the integrated rice-fish farming system is a profitable technology and that its adoption is likely to increase farm household income, labor generation, and better local economy.

In the Philippines, fish are traditionally allowed to enter the rice fields with the irrigation water and are later harvested with the rice. The earliest mention of stocking fish in a rice field in the Philippines was made in 1954 (Villadolid and Acosta 1954), but it was not until 1974 when Integrated rice-fish farming system became priority research program of Central Luzon State University (CLSU). In spite of the lower rice yields (on average 3.8 percent), in 1979 the government proceeded to promote rice-fish farming nationwide. The decision was based on the results of the economic analysis that even with a reduced rice production, the farmer would still be economically ahead due to the additional income from the fish. After a peak of 1,397 hectares involving 2,284 farms in 1982 the program was discontinued in 1986. At that time it covered only 185 hectares (Sevilleja 1992) despite the fact that the average production of rice from rice-fish farms was above the national average.

The success adoption, implementation and institutionalization of IRFFS-IPM depend on how the process presented in agrarian reform communities cluster with the stakeholders, NGOs and line agencies.

FRAMEWORK

The study will start with the data gathering by developing questioner/tool and guidelines, securing a copy of the list of target respondent/farmer. Logistic support and communication will be considered prior the actual conduct of baseline survey and FGD. It followed by the actual conduct of survey and processes the results to come up findings, analysis and recommendations. Finally, adoption of Integrated Rice Fish Farming System in VETREBUNS ARC Cluster through MOA Signing among MLGU and Farmers Cooperators.

Table 1. The Framework of Adoption of IRFFS in ARC

INPUT	PROCESS	OUTPUT	OUTCOME
Baseline Survey Questioner/Tool	Actual Conduct of Baseline Survey, FGD, Consultation and Meeting	Available Capture Data Form Baseline Survey, FGD, Consultation and Meetings	MOA Signing among MLGU and Farmers Cooperators
Guidelines on Baseline Survey Questioner/ Tool	Encoding of Raw Data into Excel Data Capture Form and Consolidation	Analysis, Findings and recommendations are Based on the Environment, Social and Economic Context of the Study	Adoption of the Study in VETREBUNS ARC Cluster

Final List of Respondents	Consultation for the Implementation of the Study
Schedule of the conduct of FGD, Consultation and Meetings	
Logistic Support	

OBJECTIVES OF STUDY

Small-scale farmers in intensive rice-based farming systems in the VETREBUNS ARC Cluster are facing a set of three interrelated problems: Low household income, food security and malnutrition of family members and degradation of natural resources base for future agricultural production.

The Province of Agusan del Sur has the highest rice production in the CARAGA Region. From the period 2008-2012, the province realized an increase of 42,813 MT or 21.67% in its rice production volume and an increase of 21,152 has or 36.42% in the areas planted. Despite that however, a study conducted by the Integrated Food Security Phase Classification (IPC) in 2012 established that approximately 65-70% of the population of Agusan del Sur particularly in VETREBUNS ARC Cluster are threatened by food insecurity. Over 30% of the families in the province scarcely survive below the food poverty level and have no access to means to afford their basic needs. On the other hand, because of the rampant illegal fishing activities, fish production in natural waterways affected. Declining marine catches emphasize the need to look for alternative sources of animal protein for an ever growing population.

Farmers have increasingly become dependent on external inputs such as fertilizers and pesticides for a growing cropping intensity. These developments have led to the degradation of the rice field environment and to increasing ecological and human health costs due to the injudicious and unsafe use of pesticides.

To combat these problems, a number of strategies have been proposed. This study has concentrated or focused on two alternative technologies to intensive rice monoculture, namely rice-fish farming system and Integrated Pest Management (IPM).

METHODOLOGY

The study employed a qualitative research specifically Focus Group Discussion (FGD). The focus group discussion is an explicit use of group interactions to produce data and insights that would be less accessible without the interactions found in a group. The focus group discussion to be participated by the key informant form from Municipal Local Government Units within the VETREBUNS ARC Cluster covered

municipalities, Government National Agencies, Non-Government Organization representatives and chairman from people's organization, women organizations, etc.

The scope of the study focus in the VETREBUNS ARC Cluster composes four municipalities that are contiguously situated in the southern part of the province of Agusan del Sur, the following: Veruela, Trento, Bunawan and Sta. Josefa. It covers the establishment of four (4) demonstration farm (one hectare per farm) to be establish in Veruela, Trento, Bunawan and Sta. Josefa (one demonstration farm per municipality). These serve as a showcase for the rice farmers for possible replication.

The respondent of the baseline survey will be forty (40) rice farmers (monoculture), ten (10) rice farmers who practiced IRFFS-IPM and four (4) MLGUs, and four (4) people's organizations. To identify the participant's simple random sampling is used. The total number of ARB respondents/farmers shall be 5% of the total ARB population who engaged in rice production in the municipality. Selection of ARB respondents/ farmers (40 respondent/farmers) shall be done using stratified random sampling per municipality. The following procedures shall serve as its guide:

1. Generate masterlist of the total ARB population who engaged in rice production in the municipality
2. Validate the ARB respondent/farmers in the master list
3. The number of respondents should be 5% of the total ARB population who engaged in rice production in the municipality
4. Use Stratified Random Sampling in the selection of respondents per municipality

In cases where identified ARB samples cannot be located, any household member of the chosen respondent who can satisfactorily provide the information in behalf of the chosen respondent may be interviewed. In extreme cases where even the household member is absent, the interviewer should bring with him/her a list of possible replacement to the ARB respondent who can no longer be located. The list of substitute respondents should be drawn systematically, e.g., if the interval is every 21st respondent, then the 22nd would be the replacement.

On the other hand, the 10 respondent/farmers coming from Linabo, Malaybalay City, Province of Bukidnon are members of the Linabo Multi-Purpose Cooperative are 50 percent of the members who engaged in rice fish farming system.

The procedure in primary data gathering is made through baseline survey and focus group discussion. Before the primary data gathering are made, communications have been delivered to target respondents/farmer with the date, time and venue have been specified. The conduct of baseline survey and encoding into excel data capture form will be done by hired enumerators. After the encoding, statistical analysis will be done. Reviewed and validation will be facilitated through focus group discussion participated by the key informant and participants.

The secondary data is also captured through educational material available and by mass media network. The capture data and information will be properly analyzed as to technical, financial and environmental as well as health aspect.

Table 2. Data collection methods and sample Size for target proponent

Target Proponent	Farming System	Sample Size	Data Collection Method	Captured Information
Rice-Fish farmers	Integrated	10	Questionnaire Interview	Integrated farming system, Cultural practices, productivity, farming constraints and Socio-economic benefits
Rice farmers	Rice Monoculture	40	Questionnaire Interview	Rice farming system, Rice productivity and overall constraints to be involved in rice-fish farming system
Key Informants		16	FGD	Validation of collected information

The collection data method and sample size to collect desired information relevant to the study specifically on Integrated farming system, Cultural practices, productivity, farming constraints and Socio-economic benefits and validation of collected information.

The captured data and information were analyzed as to technical, financial and environmental as well as health aspect. Results of the analysis were presented to the municipal and barangay consultations for possible adoption of study in VETREBUNS ARC Cluster.

RESULTS AND DISCUSSION

Rice-fish farming offers tremendous potential for food security and poverty alleviation in rural areas. It is an efficient strategy of using the same land resource to produce both carbohydrate and animal protein concurrently or serially. Water resources is similarly used to simultaneously produce the two basic foodstuffs.

Fish in the rice field has been shown to be capable of eradicating weeds by eating or uprooting them. It also devours some insect pests not the least of which are stem borers. Experience has shown that the need for chemical pesticides is greatly reduced and in many instances even eliminated. Fish also add to the rice field's fertility and can reduce fertilizer requirements. Integrating aquaculture with agriculture results in an efficient nutrient use through product recycling since many of the agricultural by-products can serve as fertilizer and feed inputs to aquaculture. This in turn leads to more fish for the household and can put more cash in the pocket. An important and significant side effect is a cleaner and healthier rural environment.

Other economic impacts can be expected. Rice field modifications may need extra labor beyond what is available within the family, leading to rural employment. Increased fingerling demand may spur the growth of the hatchery and fingerling production business and all other ancillary activities, such as making of hapa nets, harvesting seines, fabrication of hand tools, installation and repair of pumps, among others. Fish need to be marketed fresh and perhaps even processed before marketing. Thus, there is a potential to generate additional employment and improve local economy.

The prospects for integrated rice-fish culture development in Bangladesh are considerable but determination is required to exploit the potential fully. A range of public and private sector investments and initiatives are needed to realize the potential for growth of this integration. Public-private partnerships offer potentially important opportunities for pro-poor agricultural development. Such collaborations have already contributed to food security in many developing countries. Moreover, applied research in areas such as small indigenous fish farming in rice fields may need to be given particular attention, considering nutritional benefits among household members including children and women. In addition, further research would be required on social, economic, environmental, and livelihood issues for the adoption of rice-fish farming in rural Bangladesh.

To realize this potential, there is a need for a fundamental shift in attitude towards rice-fish farming in all sectors involved in rice production, from policy-makers to extension officers and farmers. At present rice-fish farming at best is considered a novelty and at worst a fringe activity that does not merit serious consideration in the formulation of national rice production strategies, and is often relegated to a limited set of projects. Further, fishery technologists and scientists are not the appropriate people to best reach out to rice farmers, or to whom rice farmers would listen. The message must be understood by the rice people.

An analysis of what inputs are needed is of importance considering that high input costs will exclude the poorer sections of rural areas. Detailed cost and returns of rice monoculture with the rice-fish system are available for Bangladesh, Indonesia, the Philippines and Vietnam. Except for Indonesia, all the other cases consistently showed an increase in the overall labor requirement when fish are raised in the rice field, with the amount of increase varying from only 10 percent to as high as 234 percent. This was mainly due to the need to prepare the rice field for fish stocking as well as for fish harvesting. However, in some specific activities connected with the rice crop such as fertilizing, weeding and pesticide applications, the presence of fish actually lessened the labor required. Again the amount varies from activity to activity and from one area to another.

In terms of fertilizer expense Bangladesh, Indonesia and the Philippines showed from 4 to 14 percent lower fertilizer costs in rice-fish fields, while Vietnamese figures indicate a 96 percent increase. The same countries showed significantly lower costs of chemical pesticides in rice-fish farms (44-86 percent). However, in Vietnam pesticide

applications were higher in homesteads practicing rice-fish farm.

The immediate beneficiaries of the production of fish and often improved rice yield in rice-fish farming are the farmers who adopt the technology. Although it seems obvious have pointedly stated, "The existence of such a relationship has not been demonstrated unequivocally." However, the fact that many farmers in different countries continue to practice it year after year, even without any government program, would seem to be proof enough of the benefits derived from this type of rice farming.

CONCLUSION

To meet the soaring demand for food, there is a need for increased rice and fish production in Bangladesh. This paper concludes that rice-fish integration could be a viable option for diversification. Such farm diversification will enhance food security. Integrated rice-fish farming system increases rice yields and makes the rice field ecosystem an efficient and environmentally sound production system for rice and fish. Rice monoculture cannot alone provide a sustainable food supply, while integrated rice-fish farming is the best in terms of resource utilization, productivity and food supply. It is therefore suggested that integrated rice-fish farming system is a sustainable alternative to rice monoculture.

Overall integrated rice-fish farming system should play an important role in contributing to food security in Philippines. However, a number of significant challenges exist for the adoption of integrated rice-fish farming, particularly the lack of technical knowledge of farmers, and risks associated with flood and drought. These will need to be overcome if the benefits of rice-fish farming are to reach the millions of rural poor. A community-based approach could be an option to overcome constraints to the development of integrated rice-fish farming system. If rice-only farmers were persuaded to switch to integrated rice-fish farming, their food supply would increase, and thus, the overall food security situation would be enhanced.

Although integrated rice-fish farming increases the supply of food, this type of farming has not yet been attempted on a large scale in the country. It is, therefore, suggested that integrated rice-fish farming should be extended with the help of government organizations, NGOs, donor agencies, and other key stakeholders. To increase food supply, the government should promote integrated rice-fish farming system throughout the country with policy support. Considering the role of integrated rice-fish farming system, a much greater benefit could be obtained if future government policies encourage the expansion of integrated rice-fish farming system, as well as the implementation of a workable strategy to bring it about. It is also necessary to provide institutional and organizational support, training facilities and technical and policy support for sustainable integrated rice-fish farming. Training of latest technology and technical support would help to increase the knowledge and awareness of farmers, improve productivity and reduce risks.

RECOMMENDATION

To integrate fisheries and agriculture, multi-sectoral integration between various government agencies involved in river basin and coastal development and various government agencies that may be involved in fisheries and agriculture. However, the authors also acknowledged the difficulty involved in such integration. While ideal, the case of promoting a more widespread adoption need not involve too many agencies, in fact it should involve only those involved in agriculture.

The various sub-sectors in agriculture need to recognize integrated rice-fish farming system as a distinct and viable farming system that farmers can choose to adopt wherever the physical conditions are appropriate and significant. If rice-fish farming is seen as a viable agronomic practice, many of the expenses that go into raising fish in rice fields will be part of legitimate expenses where supervised credit is involved. Fisheries agencies have an important role to play, in seeing that good quality fingerlings are available at the time required by farmers.

Proper guidelines should also be in place to safeguard that the fish culture component not be overdone to the detriment of rice production. With good fish production and high prices farmers tended to enlarge the refuge areas in Viet Nam. In Indonesia an increase in fish demand and price would decrease rice production, as the ratio of the refuge to the rice planting area becomes excessive. It should be clear that the objective of raising fish with rice is to increase fish production without lowering rice yields.

With such a shift at the top management level, agricultural extension workers can be properly trained to promote and demonstrate the "new viable" technology. In this manner, the popularization of rice-fish integration will not be limited to a few farmers under a special project, although it may be initiated in such a manner. Widespread introduction of rice-fish concepts to communities, coupled with demonstrations in farmers' own fields, and linking of the rice-fish approach with the IPM Farmer Field Schools is likely to result in sustained adoption. The farmers themselves are the most effective agents of change. For improved contact with adopters, person-to-person channels are the best mechanisms to obtain information about new technologies. These channels directly contact with other farmers, extension workers and technical specialists. In India, about 85 percent of the farmers mentioned other farmers as their sources of information.

Finally, to popularize rice-fish culture, the concept should become part of the agricultural system rather than the fisheries system. The fisheries agencies will need to put further efforts in the establishment of viable national fish seed production and distribution system operated by the private sector so that fingerlings of the desired species are readily available to the reach farmers. Only then can more fish be found in the rice fields.

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