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Rice-Fish Farming In Pangasinan, Philippines: A Farm Land Use Optimization Experience

Irene A. De Vera
Pangasinan State University
Binmaley Campus, Binmaley, Pangasinan
Email: idevera@psu.edu.ph

Abstract - *After 2,000 years, rice-fish farming experienced a revival in the province of Pangasinan, Philippines. The rice-fish farming, an approach to farmland use optimization, is a new experience to three initiators. This study was carried out generally to examine the rice-fish farming, its influence to bio-physical environment and the socio-economic conditions of the rice-fish farmers. Descriptive research technique through field surveys and survey questionnaire were used. From the result, it was found out that the initiators of rice-fish farming who owned the farmlands were elderly yet schooled rice farmers and members of farmers' organization. Their farmlands with varying farm type, physical, and chemical soil characteristics improved the soil fertility as influenced by the presence of fish. Rice-fish farmers experienced increase of income of about 20% from the production of both rice and fish and assurance of reliable source of protein for their families. Despite the risk and tedious task, rice-fish farming not only optimize the farmland but also protect nature's cycle. An intensive Information, Education and Communication (IEC) and training needs assessment for would be rice-fish farmers especially the younger ones should be conducted out by the local government units with the Department of Agriculture and the local farmers organizations to ensure appreciation and adoption by many, and sustainability of rice-fish farming in the province.*

Keywords –

INTRODUCTION

Cultivating rice and fish together has been a 2,000-year-old tradition in the Philippines. The increasing population which led to the introduction of "Green Revolution and Masagana 99'' in early 70's emphasized high-input monoculture using high-yield rice varieties, pesticides, and herbicides (which are toxic to fish). This beneficial cultivation system was gradually abandoned.

The establishment of environment, rice and fishery research institutes and with the passage of RA 8435 Agriculture and Fisheries Modernization Act (AFMA) in 1997, rice-fish culture as managed cultivation systems experienced a revival. In several parts of the country, rice fields as natural fisheries are more important than as places where cultured fish are raised.

Results of this research will be particularly useful to the rice-fish farmers, environmentalist, local leaders and researchers. This research will provide baseline information in terms of the status of rice-based small scale aquaculture and the condition of the bio-physical environment particularly the soil. The local community may also use the information on how rice-based small scale aquaculture could influence their way of life and how they could sustain this system.

OBJECTIVES OF THE STUDY

Generally, this study examined the rice-fish farming and its influnce to physical environment and socio-economic conditions of the rice-fish farmers.

Specific Objectives

Specifically, it aimed to determine:

1. the profile of rice-fish farmers;
2. the soil and farm characteristics; and
3. the socio-economic conditions of the rice-fish farmers;

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MATERIALS AND METHODS

Research Sites and Duration

The study was conducted in identified rice-fish farm in Pangasinan. Farms were selected based on the following criteria:

a) farmers have been practicing the specific rice-fish farming systems for 3 consecutive years;

b) secondary data and key informants on-site and off-site were available, and

c) sites were accessible and with no peace and order problems.

Research Design and Techniques

Descriptive research technique through field surveys and survey questionnaire were used.

Specifically, the following methods were applied:

a) gathering of secondary data and information;

b) actual soil sampling and analysis;

c) key informants interviews; and

d) one-one interview with the rice-fish farmer.

Secondary and Primary Data Collection Technique, Research Instrument and Respondents

Maps, sketches and documents of the Office of the Provincial Agriculturist, Municipal/City Agriculture Office, NGOs and others were secured.

Soil sampling in rice-fish farms were collected and analyzed by the soil expert in the Office of Provincial Agriculturist of the province.

A semi-structured interview schedule was used to the three rice-fish farmers of Nancamaliran East, and Sta. Lucia, Urdaneta City; and Tupa, Agno, Pangasinan, Philippines

Statistical Treatment and Analysis

SPSS software program was used in encoding data and information in a computer.

Soils were descriptively analyzed by the Office of the Provincial Agricuturist.

The differences on farmer's income before and during/after adopting rice-fish farming were also compared.

RESULTS AND DISCUSSION

Table 1. shows three elderly but educated men practicing rice-fish farming for more than 3 years in Nagcamaliran East and Sta. Lucia, Urdaneta City, and Tupa, Agno, Pangasinan. All of them are members of the farmers associations or cooperative.

Rice-Fish Farm Site	Farmer's Profile				
	Gender	Age	Civil Status	Educational Attainment	Organization
Nagcamaliran East, Urdaneta City	male	73	married	High school	Farmers cooperative
Sta Lucia, Urdaneta City	male	61	married	College level	Farmers Association
Tupa, Agno	male	60	married	College level	Farmers Association

Table 2 presents the soil characteristics of rice-fish farms. The rice-fish farms soils grey and light brown color before planting turned brown or black after harvesting. The acidic soil turned neutral after harvest and the low phosphorous became medium to high. Soil's potassium became sufficient in Urdaneta farms but in Agno, still deficient after harvest. Organic matter before and after harvest is still low.

Table 2. Soil characteristics of rice-fish farms in Pangasinan

Site/ Rice-Fish Farm	Type of Soil	Physical Characteristics			Chemical Characteristics							
		Soil Colour		Soil	Soil pH		Phosphorus		Potassium		Organic Matter	
		before	after	Texture	before	after	before	after	before	after	before	after
Nagcamaliran East, Urdaneta City	clay	Grey	black	medium	5.0	5.8	Low	Medium	deficient	sufficient	low	low
Sta Lucia, Urdaneta City	silty	Grey	black grey	medium	6.1	6.8	Low	Medium	deficient	sufficient	low	low
Tupa, Agno	sandy	light brown	brown	heavy	6.8	7.6	Medium	High	deficient	deficient	low	low

Note: before data - from the farmers, after data - from the researcher's sampling result
Soil sampling was done after harvest and before farm preparation

Table 3. Rice-fish Farm Profile

Rice-fish farm site	Size of farm (ha)	Ownership	Farming practice	irrigation	Rice cropping	Source of rice seeds	Fertilizer application	Fertilizer Applied
Nagcamaliran East, Urdaneta	3.3	Self-owned	organic	Fully irrigated	Second cropping	owned	Paddy preparation	Home prepared fertilizer plus crh
Sta Lucia, Urdaneta	2.0	Self-owned	organic	Fully irrigated	Second cropping	owned	Paddy preparation	Home prepared fertilizer plus crh
Tupa, Agno	3.0	Self-owned	organic	Supplementary irrigated	Second cropping	Bought at certified supplier	Paddy preparation	Home prepared fertilizer

As revealed in Table 4, paddy rice yield obviously increased in practicing rice-fish farming. The study of Ahmed et al, on socioeconomic aspects of rice-fish farming in Bangladesh claimed that rice-fish farming is production efficient compared to rice monoculture and cost effective.

Table 4. Rice Farming Yield and Income in one cropping

Rice-Fish farm Site	Farm Size (ha)	Area (ha)		Estimated Paddy Rice Yield (kg)		Paddy Rice for Sale		Estimated Income from Selling Paddy Rice (P)	Dried Grain For Sale		Estimated Income from Selling Dried Rice Grain (P)
		Farm	Fish Refuge	before	after	%	Kg		%	kg	
Urdaneta City											
Nagcamaliran East	3.3	2.97	0.33	14,850	16,500	25	4,125	115,500	50	5,568.75	194,906
Sta Lucia	2.0	1.8	0.2	9,000	10,000	10	1,000	28,000	30	2,699.73	94,490.55
Tupa, Agno	3.0	2.7	0.3	13,500	15,000	20	3,000	84,000	50	5,400	189,000

Table 5 shows rice farming estimated net income per cropping. The Nagcamaliran East farm gained more income because of bigger portion of yield and farm area.

Table 5. Rice Farming Estimated Net Income/cropping

Rice-Fish farm Site	Farm Size (ha)	Area (ha)		Estimated Total Gross Income from Paddy Rice and Dried Rice Grain (P)	Estimated Total Net Income from Paddy Rice and Dried Rice Grain (P)
		Farm	Fish Refuge		
Urdaneta City					
Nagcamaliran East	3.3	2.97	0.33	310,406	217,284.20
Sta Lucia	2.0	1.8	0.2	122,490.55	85,743.55
Tupa, Agno	3.0	2.7	0.3	273,000	191,100

Table 6 presents the fish farm and yield. Rice-fish farmers usually bought tilapia in certified hatcheries. It takes 120 – 135 days before harvesting the tilapia. According to the farmers, fifteen percent of the harvest is being kept for themselves and the rest are sold in the nearby market.

Lansing and Kremer (2011) claimed that the presence of fishes in the farm are beneficial. Paddies with fish require 68% less pesticide and 24% less fertilizer than rice monoculture. This is due to the interaction of rice and fish. Insects attracted to rice plants become a food source for the fish, and the leaves of the plants provide shade that lowers water temperature during hot days. Rice also moderates the aquatic environment. It acts as a nitrogen sink and helps reduce the concentration of ammonia in the water and total N in the soil.

It could be interpreted that aside of the feeds fed on the fish, other nutrients are being derived naturally from the rice ecosystem. This would hasten the productivity of the fish as well as the rice.

Table 6. Fish Farm and Yield Profile

Rice-Fish Farm Site	Farm Size (ha)	Area (ha)		Fry Raised		Fry Size (cm)	Fry Buying Price (P)	No. of Days to Produce Harvestable Fish	Ave. Length of Harvest-able Fish (cm)	Ave. Wt. of Harvest-able Fish (kg)	No. of Times to Harvest Fish in a Year
		Farm	Fish Refuge	Kind	manner						
Urdaneta City											
Nagcamaliran East	3.3	2.97	0.33	tilapia	bought	24	35	135	150	0.04	2x
Sta Lucia	2.0	1.8	0.2	tilapia	bought	24	35	135	150	0.04	2x
Tupa, Agno	3.0	2.7	0.3	tilapia	bought	17	40	120	145	0.04	2x

The estimate of fish farming net income is presented in Table 7. Only 30% is realized as net income for fish farming, the rest are expenditures.

Table 7. Fish Farm Income in one cropping

Rice-Fish farm Site	Farm Size (ha)	Area (ha)		Quantity of Fry Purchased (#)	Fish For Sale			Income From Selling Fish (P)	Estimated Net income (P)
		Farm	Fish Refuge		%	#	kg		
Urdaneta City									
Nagcamaliran East	3.3	2.97	0.33	10,000	85	8,500	1,200	72,000	22,000
Sta Lucia	2.0	1.8	0.2	10,000	85	8,500	1,200	72,000	22,000
Tupa, Agno	3.0	2.7	0.3	10,000	90	9,000	1,300	78,000	28,000

Summary

The elderly yet schooled rice-fish farmers owned their farmlands and were members of farmers organization.

Their farmlands with varying farm type, physical, and chemical soil characteristics showed desirable change specifically in soil chemical characteristics.

Fully and supplementarily irrigated farms were applied with home made fertilizer and carbonized rice hull during paddy preparation

Ten percent of the rice farm area was alloted for fish refuge. Despite rice area reduction, rice yield as well as income increased by 10%.

The fry Tilapia (O. nilotica) of 17-24 cm in length could be raised in 120-135 days with average weight of 0.04 kg and 145 cm in length.

Increased net income from rice and fish yield ranged from 20-40%. Aside, symbiosis exist between and among the fish and rice plants which it is ecologically sound.

CONCLUSION AND RECOMMENDATION

Elderly but schooled farmers adopt rice-fish farm for improving soil characteristics and productivity, increased income, health and environment reasons.

Though rice is regarded carbon neutral, there is a need to conduct further study on methane emission by this type of land use.

Soil sampling must be done before, during and after harvest.

Farmers need to be trained on how to raise fingerlings for rice-fish farming.

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