AFSSRNews Section ***AFSSRNews*** is the Newsletter of the Asian Fisheries Social Science Research Network

Editorial

Asian Fisheries Social Science Research Network: Completing the Transformation

The AFSSRN is undergoing a transformation as reported in the January-March 1997 issue of *Naga*. The Network is to become a section of the Asian Fisheries Society. The transformation process will be formalized and completed during the meeting of the founding members of the Network in Phuket, Thailand on 23 October 1997. The founding member countries that will be represented at the meeting are Malaysia, Indonesia, Philippines, Thailand and Vietnam. The cost of organizing the meeting will be borne by ICLARM. The new constitution of the Network is expected to be confirmed at the meeting. The Chairman and other office bearers for the Network will be elected and the program of activity for the year 1998 will be worked out. The Vice Chairman of the Network will be appointed by ICLARM as provided for in the new constitution. ICLARM will continue to support the Network to arrange annual meetings or workshops. It will also continue to be part of *Naga* for reports about news and activities of the AFSSRN. After the meeting in Phuket, we will get in touch with all those who have shown interest in joining the Network from countries outside Southeast Asia as we start the process of accepting members into the new AFSSRN. Ideas and suggestions for future Network activities are welcome. Please get in touch with us: Dr. K.Kuperan Viswanathan, Associate Professor, Department of Natural Resource Economics, Faculty of Economics and Management, Universiti Pertanian Malaysia, 43400 Serdang, Selangor, Malaysia. E-mail: KUPERAN@ECON.UPM.EDU.MY: Dr. Robert S. Pomeroy, Senior Scientist, ICLARM, MCPO Box 2631, 0718 Makati City, Philippines. E-mail: R.POMEROY@CGNET.COM.

Rice-Fish Farming Systems Research in the Vietnamese Mekong Delta: Identification of Constraints

Dang Kieu Nhan, Le Than Duong and Arjo Rothuis

Background

The Mekong Delta

The Mekong Delta is a region of considerable importance for Vietnam with an area of 3.9 million ha, approximately 12% of the total area of Vietnam, and a population of 16 million. It contributes significantly to national exports, particularly rice and processed fisheries products, and produces 27% of the Gross Domestic Product (NEDECO 1993).

The two main physical factors influencing land use in the Delta are hydrology and soil type. Hydrology is determined by rainfall, upstream discharge and tidal fluctuations. Rainfall is concentrated between May and November. Combined with upstream discharge, large parts of the Delta become flooded from August to October.

The dominant cropping systems in the Mekong Delta are double and single rice cropping, occupying 71% of the total agricultural area. Fish is a major source of animal protein in the diet of the Delta's inhabitants, estimated to contribute 60% of their total animal protein intake.

Rice-fish Culture in the Mekong Delta

As in other Asian countries, the collection of indigenous fish from rice fields is an ancient practice. During the annual flooding period fish intrude into the paddy fields and live there until the water recedes. However, the heavy application of toxic agro-chemicals and other factors related to agricultural intensification have made the environment less suitable for fish, with a consequent decline of indigenous fish production (Interim Committee Lower Mekong Basin 1992; Duong 1994; Thuoc 1995). As a result, farmers have shifted towards stocking the rice fields with fingerlings produced in hatcheries. At present, only 35 000 ha of the 400 000 ha of rice land suitable for rice-fish culture is actually being used for this (Tuan and Phuong 1994).

Rice-fish systems with irrigated rice are mostly concentrated in the semi-deep water area in the central part of the Mekong Delta. The yield of introduced fish varies from

99 to 730 kg/ha. In most cases, fish yields are below 300 kg/ha, for a rearing period of 6-9 months (Nhan and Duong 1992; Tuan and Phuong 1994). Typical fish species in this system are silver barb (*Puntius gonionotus*), common carp (*Cyprinus carpio*) and tilapia (*Oreochromis niloticus*).

The Rice-Fish Project

The need for an increased fish production from rice fields prompted the Can Tho University (Vietnam) and the University of Leuven (Belgium) to initiate a collaborative research project named "Impact Analysis and Improvement of Rice-fish Farming Systems in Semi-deep Freshwater Area of the Mekong Delta, Vietnam." The overall objectives of the project are to: (1) understand the interactions of fish production and rice field ecology; (2) identify economically and ecologically appropriate technologies of integrated rice-fish culture for extension to farmers; and (3) monitor and evaluate the impact of proposed rice-fish farming systems on the socioeconomic situation of rice farmers.

Technical and Economic Benchmarks Analysis

Methodology and Results

In 1995, a survey was carried out in the Co Do area (Fig. 1), agroecologically representative of the semi-deep freshwater area of the Mekong Delta. The objective was to analyze the present rice-fish and rice monoculture farming systems, and to identify problems and constraints of integrated rice-fish culture for on-station and on-farm study design.

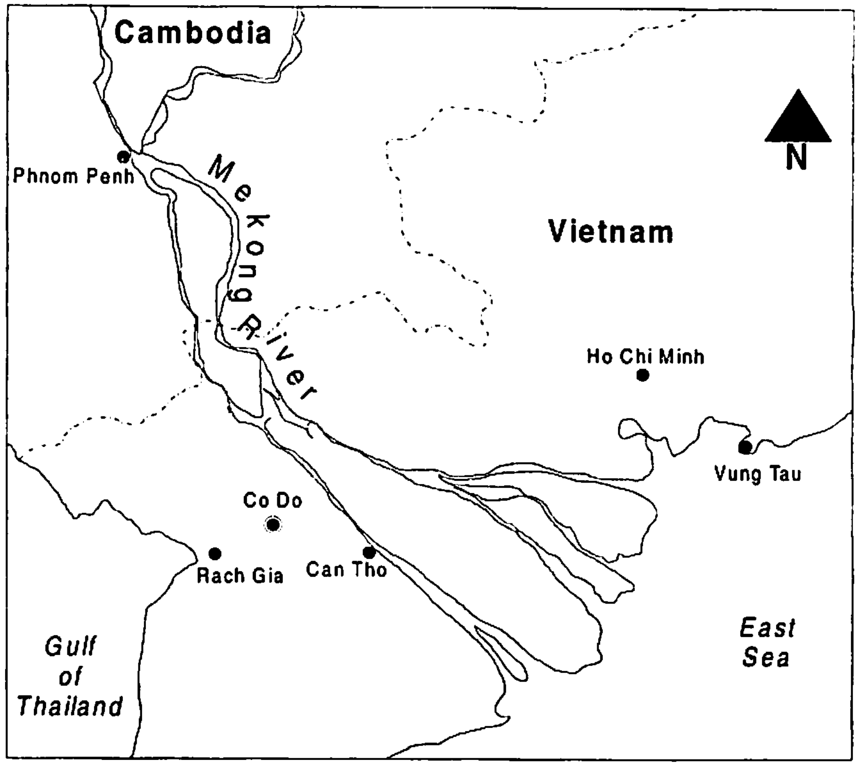
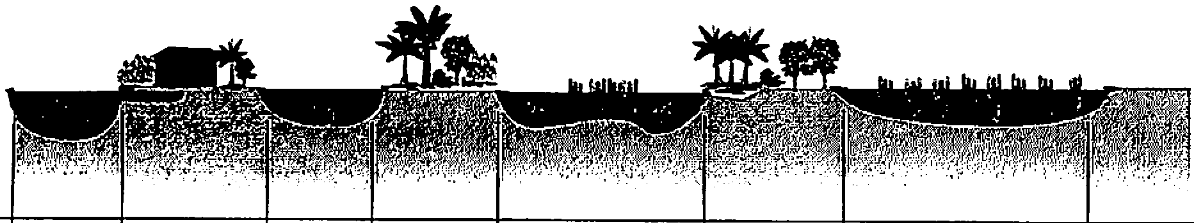


Fig. 1. Map of the south of Vietnam showing Co Do area.

Based on soil types of the area, a total of 96 households were interviewed using a combination of a structured questionnaire and a pictorial modeling method. Three farming systems could be differentiated: (a) double rice with introduced fish (48 interviews); (b) double rice with indigenous fish (11); and (c) double rice without fish (37).

Integrated rice-fish culture has been practised in the study area since 1992. At a typical rice-fish farm, five resource systems could be identified: the irrigation canal, homestead, fish pond, rice field and the dike (Fig. 2). The rice-fish system with introduced fingerlings was practised on significantly ($p<0.05$) bigger farms compared to rice monoculture. At the larger farms, a part of the holding would be allocated to rice-fish culture and another part to rice monoculture (risk avoidance). Introduced fish were reared mostly in polyculture with the major species being silver barb, common carp, Nile tilapia and silver carp (*Hypophthalmichthys molitrix*). Fish were usually stocked during the establishment of the wet season rice crop and harvested about nine months later. The results showed that rice yields were not significantly ($p<0.05$) different among the three farming systems, both for the wet (WS) and dry season (DS) crops. Pesticide application in the DS crop did not differ among the systems, but significantly ($p<0.05$) fewer pesticide sprays were used in the rice-introduced fish system during the WS crop (Table 1). The farmers were obviously aware of the risks of fish mortality after pesticide application. This finding confirms the compatibility of rice-fish culture with the adoption of Integrated Pest Management (IPM). The averages of total fish produc-



Resource system	Canal	Homestead	Fish pond	Dike	Rice- fish field	Dike	Rice-monoculture field	Small dike
Soil types	Silt	Loam	Silt	Loam	Clay loam	Loam	Clay loam	Loam
Water source	River	Canal and rainfall	Canal	Canal and rainfall	Canal and rainfall	Canal and rainfall	Canal and rainfall	Canal and rainfall
Crops and vegetables		Beans Cucumber Bitter gourd Pumpkin Cabbage Mushroom	Water spinach	Cucumber Beans Cassava Bitter gourd Mushroom	Rice Water spinach (in the trench)	Cucumber Beans Cassava Bitter gourd	Rice	
Trees		Banana Custard apple Papaya Guava Eucalyptus		Banana Custard apple Guava Eucalyptus		Banana Custard apple Guava Eucalyptus		
Animals	Indigenous fish Small shrimp Clam	Chicken Pig Duck	Introduced fish Indigenous fish		Introduced fish Indigenous fish Duck		Indigenous fish	

Fig. 2. Resource systems transect of the rice-fish system in the Co Do area.

Table 1. Rice production and pesticide use in the different farming systems (mean; standard deviation in parenthesis).

	Rice-introduced fish	Rice-indigenous fish	Rice-monoculture
Rice yield (tons/ha)			
DS crop	5.6 (0.9)	5.5 (0.9)	5.9 (0.7)
WS crop	3.7 (0.9)	3.8 (0.7)	4.0 (0.6)
Pesticide input in DS crop (number of sprays/farmer)			
Insecticides	1.4 (1.2)	0.8 (1.3)	1.7 (1.5)
Fungicides	1.2 (0.9)	1.4 (0.9)	1.1 (1.0)
Herbicides	1.5 (0.8)	1.7 (0.6)	1.4 (0.8)
Total	4.0 (1.9)	3.9 (1.8)	4.2 (1.8)
Pesticide input in WS crop (number of sprays/farmer)			
Insecticides	1.5 (1.3)	1.5 (1.2)	2.2 (1.4)
Fungicides	1.0 (0.8)	1.6 (1.0)	1.2 (1.0)
Herbicides	1.6 (0.9)	2.2 (0.8)	1.8 (0.8)
Total	4.1 (2.0)[a]	5.4 (1.4)[b]	5.3 (1.4)[b]

Source: Rothuis et al. (in press a, b)
[a,b] Indices with the same superscript are not significantly different at 0.05 level among farming systems.

tion were 155, 73 and 11 kg/ha for rice-introduced fish, rice-indigenous fish and rice monoculture, respectively. The yield of introduced fish was found to be negatively affected by flooding, rice field area and rice seeding rate, while feed input and duration of the fish rearing period had a positive effect on the fish yield. The effect of most of these variables could be traced to events associated with fish recovery rate.

Cost-benefit analysis of the three farming systems, based on a one hectare integrated farm, are presented in Table 2. Although not significantly different, the total farm return above variable costs (RAVC) and total farm net return (NR) of the rice-introduced fish and the rice-indigenous fish systems were lower than those of the rice monoculture system. This resulted basically from a lower gross rice return in rice-fish farms due to the conversion of rice land into fish refuge trenches and high dikes. Moreover, the total fixed costs of rice-fish farms were significantly ($p<0.05$) higher than those of rice monoculture farms. On the other hand, the RAVC from the homestead in rice-introduced fish systems were significantly ($p<0.05$) higher than those of the rice monoculture system. This finding concurs with the results of a similar rice-fish survey carried out in Cai Be district of Tien Giang province (Nhan and Can 1992; Nhan et al. 1995).

Constraint Identification

In general, fish yields from rice-fish farming systems in the study

Table 2. Costs and benefit of rice-fish culture and rice monoculture (means; standard deviation in parenthesis) (VND 1 000/one ha farm).*

	Rice-introduced fish		Rice-indigenous fish		Rice-monoculture	
Gross return						
Rice-from r-f field	7 535	(3 459)	7 323	(3 699)	0	
Rice-from r-m field	2 238	(3 542)[a]	2 250	(3 095)[a]	11 662	(2 024)[b]
Total gross rice return	9 773	(2 045)[a]	9 574	(1 576)[a]	11 662	(2 024)[b]
Fish from r-f field	750	(600)[a]	402	(307)[b]	0	
Fish pond	229	(482)	312	(461)	71	(152)
Homestead	1 642	(1 637)[a]	1,060	(1 674)[a]	1 287	(3 489)
Dike	284	(440)	278	(479)[ab]	26	(59)[b]
Total farm	12 678	(2 730)	11 626	(2 914)	13 046	(3 946)
Variable costs						
Rice-from r-f field	4 670	(1 924)	4 209	(1 904)	0	
Rice-from r-m field	1 312	(2 098)[a]	1 623	(2 197)[a]	6 598	(796)[b]
Total rice variable costs	5 989	(822)[a]	5 831	(709)[a]	6 598	(796)[b]
Fish from r-f field	631	(310)[a]	92	(96)[b]	0	
Fish pond	96	(214)	93	(132)	31	(86)
Homestead	956	(1 245)[a]	675	(1 559)[b]	989	(3 353)[b]
Dike	123	(256)[a]	107	(151)[a]	9	(28)[b]
Total farm	7 793	(1 828)	6 800	(1 406)	7 628	(3 595)
Fixed costs						
Rice-from r-f field	1 452	(580)	1 274	(580)	0	
Rice-from r-m field	333	(526)[a]	399	(537)[a]	1 722	(234)[b]
Total rice fixed costs	1 785	(176)	1 673	(83)	1 722	(234)
Depreciation of r-f field	156	(74)[a]	94	(46)[a]	0	
Total farm	1 940	(195)[a]	1 767	(114)[b]	1 722	(234)[c]
Return above variable costs (RAVC)						
Rice-from r-f field	2 858	(2 173)	3 115	(2 178)	0	
Rice-from r-m field	926	(1 490)[a]	627	(1 385)[a]	5 063	(2 156)[b]
Total rice variable costs	3 785	(1 938)[a]	3 743	(2 174)[ab]	5 063	(2 156)[b]
Fish from r-f field	119	(530)[a]	309	(244)[b]	0	
Fish pond	134	(308)	218	(338)	40	(103)
Homestead	686	(619)[a]	385	(226)[ab]	298	(506)[b]
Dike	161	(375)	171	(337)	16	(54)[b]
Total farm	4 884	(2 300)	4 826	(2 296)	5 418	(2 246)
Total farm cash return	3 243	(2 042)	3 180	(1 823)	3 914	(2 830)
Total farm net return	2 944	(2 281)	3 059	(2 291)	3 696	(2 122)
Profit cost ratio	0.32	(0.25)	0.36	(0.26)	0.43	(0.25)

Source: Rothuis et al. (in press a, b)

* Based on a double rice crop, one fish crop, and one year cultivation at the homestead and dike.

[a,b] Indices with the same superscript are not significantly different at 0.05 level among farming systems.

**1 US$1 = VND 11 000

area were low and their contribution to the total farm profit was rather insignificant. However, the integration of rice and fish appears to present an attractive alternative to rice monoculture from an environmental and ecological point of view.

Reasons for the low farm profit from fish include a combination of technological and socioeconomic factors and natural hazards that result in low fish production. The fish profitability was also affected by low market prices and high production costs. The total rice-fish farm profitability was also low because of an inefficient use of the dike resource system. Furthermore, since rice-fish farmers have a smaller area available for rice production (on a per ha farm basis) the system is sensitive to fluctuations in rice market prices.

The above approach has facilitated the design of on-station and on-farm experiments. At the project's research station in Co Do, past and current experiments have focused on the effect of fingerlings size and stocking density, rice seeding rate and fish species on the rice and fish periods, so as to avoid the risks of fish loss through floods. Seasonal fluctuations in market prices for fish are also taken into consideration.

The present study has indicated the usefulness of a whole farm approach. Rice-fish culture is often only one component of an integrated farming system. It is the opinion of the authors that rice-fish extension programs should not focus on aquaculture technologies alone, but preferably on all the farm resource systems.

Acknowledgments

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Dan Kieu Nhan *and* **Le Thanh Duong** *are from the Mekong Delta Farming Systems Research and Development Institute of the Can Tho University, Can Tho, Vietnam.* **Arjo Rothuis** *is from the Laboratory of Ecology and Aquaculture of the Leuven University, Naamsestraat 59, 3000 Leuven, Belgium.*