

A SOCIO-ECONOMIC STUDY OF TILAPIA FARMING
IN THE PHILIPPINES

Aida R. Librero and Elizabeth S. Nicolas
Philippine Council for Agriculture and Resources Research

A SOCIO-ECONOMIC STUDY OF TILAPIA FARMING
IN THE PHILIPPINES

Aida R. Librero and Elizabeth S. Nicolas

1. Introduction

This study would attempt to assess present technology, productivity and profitability of tilapia fishponds in the country. The study covered 131 tilapia pond operators coming mostly (93%) from Luzon, specifically in Cagayan (29%) and Isabela (29%) in Northern Luzon, Central Luzon (21%), and Southern Luzon (16%). Data refer to 1974 operations.

More of the tilapia farms (59%) adopted polyculture systems particularly tilapia-carp combination (21%) and tilapia-bangos (11%). The rest were stocked with one or more of the following species: mudfish, carp, catfish, gourami, crab and shrimps. Fifty-four out of 131 operators monocultured tilapia in their ponds particularly in Cagayan Valley and in Southern Luzon.

2. The operator and his farm

The tilapia operator is a male about 49 years of age and had received formal education for more than 9 years. More than one-fourth reached or graduated from college while 29% and 45% had high school and elementary education, respectively.

The tilapia operator has had some 7 years experience in fish farming. Majority cited that the main reasons for engaging in tilapia farming were to supplement the food requirement of the household and to have an additional source of cash income.

Tilapia farming appeared to be a part-time job for the operators with only 1.5 months spent in the fishpond and most of their time spent in other occupations (9.3 months) mainly farming. Others were engaged in small business and employment. From these occupations, an operator derived an annual income averaging ₱5059.

The majority of farms (83%) were privately owned of which 63% were inherited (Table 1). Among leased fishponds, 6 out of 23 farms were leased from the government.

Most of the farms (66%) were operated commercially, that is, a major fraction of their output was sold. One-third of the farms were subsistence or backyard fishponds where production is wholly used for home consumption. Most of the commercial farms were found in Southern Luzon and Cagayan Valley while subsistence farms were found in Ilocos.

Table 1. Pond ownership and type of fishpond by region

Item	Ilocos	Cagayan Valley	Central Luzon	Southern Luzon	Other regions	Philis.
Number of farms	15	58	28	21	9	131
Pond ownership (number)						
Owned						
Purchased	6	20 ^{a/}	8	4 ^{b/}	2	40 ^{b/}
Inherited	8	37	15	9 ^{b/}	-	69 ^{b/}
Leased						
Private	1	1	5	6	4	17
Government	1	-	-	3	2	6
Type of fishpond (percent)						
Commerical fishpond	33	71	54	91	78	66
Home fishpond	67	29	46	9	22	34

^{a/} Two farms were part of the lots acquired by the operators as homestead.

^{b/} One was partly purchased and partly inherited.

Majority (64%) of the farms surveyed were started between 1971 and 1974. The earliest fishponds, however, were started before 1950.

Table 2. Distribution of tilapia fishponds by farm size and type of stock.

Farm size (sq m)	Tilapia	Tilapia-Carp	Tilapia-Bangos	Tilapia Others	All Farms
No. of reporting	54	27	36	14	131
500 or less	18	12	12	1	43
501-9,999	25	10	15	-	50
10,000 & above	11	5	9	13	38
Ave. area (sq.m)	4,715	3,620	6,405	30,193	7,677

Compared to milkfish ponds, tilapia fishponds could be described as small. Of the 131 farms studied 33% had areas of 500 sq m or even less (Table 2). Majority of the farms were more than 500 sq m in size but less than 1 hectare. While only 29% was more than 1 hectare in size the biggest was a 10-hectare farm in Bicol.

Of the 131 farms, only 22 maintained nursery ponds.

3. Cultural practices

General repair and cleaning of the pond preparatory to stocking were not regularly practiced in tilapia farms. Both were done only when the operator deemed it necessary. However, pond cleaning was done by about one-fourth of the respondents prior to every stocking.

Majority (63%) did pond levelling to make available the essential nutrients in the soil.

The most common pest/predators in the pond were mudfish, tenpounder, frog, goby, reptiles, birds, snails, flat worms and eels.

Table 3. Pest elimination practices

Item	All farms
Practiced pest elimination (%)	
No	24
Yes	76
Methods of eliminating pests (%)	
Catch and kill	92
Use of pesticides	4
Both	4
Pesticides used (number)	
Tobacco dusts	1
Endrin	5
Basudin	1
Aquatin	1
2, 4-D	1
Rate of pesticide application/half hectare	
Tobacco dust (kg)	33
Endrin (oz)	5
Basudin (kg)	400
Aquatin (oz)	8
2, 4-D (oz)	7

The majority of operators (76%) practiced pest elimination (Table 3). The "catch and kill" method was the most common way of eliminating pests. Only 8 percent used pesticides. Pesticides used were endrin, tobacco dust, basudin, aquatin and 2, 4-D.

Table 4. Pond fertilization

Item	Mono-culture	Poly-culture	All Farms
Number of respondents	54	77	131
Practiced pond fertilization (%)			
Yes	30	47	40
No	70	53	60
Frequency of application (1%)			
Prior to stocking	31	11	19
Only when needed	63	86	79
Once a month	6	3	2
Types of fertilizers applied (number) ^{a/}			
chicken manure	12	24	36
Carabao dung	3	5	8
Urea	1	5	6
Ammonium sulfate	-	4	4
14-14-14	-	1	1
16-20-0	1	-	1

^{a/} Some respondents applied more than one kind of fertilizer.

Fertilization is not a common practice in tilapia ponds (Table 4). Only 30% is monoculture and 47% in polyculture ponds practiced fertilization. Of these, the majority fertilized the pond only when needed, the rest did so prior to stocking or regularly once a month. Here, the usual practice is to apply chicken manure every 20-30 days.

Organic fertilizers were most commonly used like chicken manure (69%) and carabao dung (15%). A few applied inorganic fertilizers like urea, ammonium sulfate, 16-20-0, and 14-14-14.

Most tilapia operators gave supplementary feeds, usually of more than one type. Rice bran and white ants were most commonly given with the latter given only in Ilocos and Cagayan Valley (Table 5).

Dried shrimps, starter mash and bread crumbs were applied in a few farms. Others fed their stocks with chopped, succulent vegetables such as papaya leaves, camote and kangkong tops and even crushed coconut and kitchen left-overs.

Table 5. Supplementary feeding by type of stock

Item	Mono-culture	Poly-culture	All Farms
Number of farms	54	77	131
Gave supplementary feeds		<u>number</u>	
Yes	34	63	97
No	20	14	34
Types of feeds given ^{a/}			
Rice bran	31	48	79
White ants	6	17	23
Shrimps	1	4	5
Starter mash	3	1	4
Bread crumbs	1	3	4
Others	2	8	10

^{a/} Majority of operators gave more than one type.

^{b/} Chopped papaya leaves, camote and kangkong tops, crushed coconut and kitchen left-overs.

Supplementary feeds were given according to body weight or size of the stock. Feeding was usually done three times a day and adjusted as body weight increased. Hence, the actual rate of feeding during the rearing period could not be estimated.

4. Stocking and cropping practices

Stock of tilapia fry/fingerling were either gathered or purchased or freely entered the pond or given free by BFAR. More than one-half of the operators got their tilapia seeds from BFAR. Experienced farmers have learned to keep some tilapia breeders for their own supply.

Sixty two out of 131 farms were not stocked with tilapia seeds since the usual practice in these ponds was to harvest only the full grown fish, allowing the young ones to grow.

The size of stock determined the date of cropping. Others considered market demand, home consumption needs, weather conditions, and need for immediate cash.

Table 6. Factors determining the date of cropping and methods of cropping

Item	All Farms
Number of respondents	131
Factors determining date of cropping ^{a/}	number
Size of stock	86
Demand for species	47
For home consumption	45
Need for cash	10
Weather condition	18
Availability of feed	3
Method of cropping ^{b/}	
Gill netting	44
Pond draining	35
Cash netting	33
Seining	11
"Pasubang"	6
Use of scoop net	13
Others	12

^{a/} Respondents gave more than one factor.

^{b/} Respondents gave more than one method of harvesting.

Gill netting, pond draining and cast netting were commonly used in harvesting. The use of gill nets was popular in Southern Luzon and to some extent in Cagayan Valley where cast nets were more preferred.

An average monoculture farm produced 197 kilos of tilapia equivalent to 209 kilos per half-hectare. Monoculture farms in Central Luzon were the most productive yielding on average 465 kilos per half-hectare. Productivity of farms in Cagayan Valley and Southern Luzon was comparable, 181 kilos and 160 kilos per half-hectare, respectively.

An average tilapia-crop pond yielded about 388 kilos per half-hectare composed of 52 percent tilapia and 48% carp. Other polyculture farms had lower aggregate production. Tilapia-bangos farms had an aggregate yield of 212 kilos per half-hectare composed of 42% tilapia and 50% bangos while tilapia-others produced only 240 kilos per half-hectare, 47% tilapia and 53% other species.

Table 7. Annual fish production

Region	Monoculture farms	Polyculture Farms					
		Tilapia-Carp		Tilapia-Bangos		Tilapia-others	
<u>kilos per farm</u>							
Ilocos	80	21	57	11	27	324	60
Cagayan Valley	94	107	108	1200	675	110	134
Central Luzon	559	607	375	498	681	156	203
Southern Tagalog	292	304	253	45	149	53	38
Other regions	100	-	-	246	1325	122	230
Philippines	197	146	135	271	736	143	164
<u>kilos per half-hectare</u>							
Ilocos	86	240	652	5	13	604	112
Cagayan Valley	181	139	140	300	169	160	195
Central Luzon	465	379	234	50	68	121	158
Southern Tagalog	160	294	275	18	60	12	10
Other regions	100	-	-	30	161	47	88
Philippines	209	202	186	90	122	112	128

Table 8. Annual cropping rate by use of fertilizer

Item	Used fertilizer	Did not use fertilizer
	<u>kilos per half-hectare</u>	
Tilapia	677	167
Tilapia-carp		
Tilapia	299	110
Carp	300	79
Tilapia-bangos		
Tilapia	60	34
Bangos	191	66
Tilapia-others		
Tilapia	170	71
Others	188	103

Fertilizer-using farms appeared to have obtained relatively higher yield per half-hectare than non-users. With the use of fertilizer, tilapia yield in pure culture averaged 677 kilos per half-hectare or four times as much as that obtained by non-users while fish yield in tilapia-carp fishponds average 599 or three times as much.

Table 9. Annual cropping rate by use of supplementary feeds

Item	Used supplementary feeds	Did not use supplementary feeds
	<u>kilos per half-hectare</u>	
Tilapia	316	146
Tilapia-carp		
Tilapia	196	227
Carp	196	148
Tilapia-bangos		
Tilapia	63	26
Bangos	138	92
Tilapia-others		
Tilapia	120	98
Others	137	140

Application of supplementary feeds likewise increased fish yield. Monoculture farms using supplementary feeds yielded more than twice as much as the non-users. However, polyculture farms using supplementary feeds yielded only slight increases in fish production. For instance, tilapia-carp using supplementary feeds derived 392 kilos per half-hectare of fish compared to 375 kilos obtained by non-users. Other polyculture ponds showed a similar trend in yield.

Most of the output in both monoculture and polyculture farms are sold at market outlets as near as 2 kilometers to as far as 87 kilometers.

5. Cost and returns

Table 10. Costs and returns in tilapia farms

Type of farm	Gross Receipts	Total expenses	Net returns	Rate of return	
				Over expenses	Over fixed capital ^{a/}
	pesos per half-hectare			percent	
Pure tilapia	884	482	402	83	119
Tilapia-carp	1580	638	942	148	240
Tilapia-bangos	782	282	500	177	676
Tilapia-others	1028	493	535	109	270
All farms	930	403	527	131	262

^{a/} Value of fishpond land was excluded.

It appeared that tilapia farming becomes more profitable when done in polyculture with other fishes especially carp. Per half-hectare, tilapia-carp farms attained a gross receipts of ₱1580 compared to only ₱884 in monoculture farms. The average for all farms was ₱930 per half-hectare.

A tilapia farm used an annual operating capital of ₱403 per half-hectare a large proportion of which was used to pay for hired labor. Tilapia-carp farms incurred the biggest expense (₱638 per half-hectare) and tilapia-bangos farms the least (₱282).

Net profit in polyculture farms was higher than in monoculture farms. Tilapia-carp farms obtained a profit of ₱942 per half-hectare, thus, about ₱1.48 of net profit is returned to the operator for every peso spent in operating his farm or ₱240 return to his fixed capital excluding land. Of course, if the value of land is added, this rate will be considerably reduced. Monoculture farms obtained a net profit of ₱402 per half-hectare or a rate of return over expenses of 83%. For all farms, net return was ₱527 per half-hectare.

The use of fertilizers increased production and thus, income in tilapia farms. Users of fertilizers among monoculture farms attained a net return of ₱1465 per half-hectare, about 57% higher than that obtained by non-users. Likewise in polyculture farms, fertilizer users profited more (₱768 per half-hectare than the non-users (₱427).

Table 11. Costs and returns in tilapia farms

Item	Use of fertilizer		Use of Supplementary feeds	
	Did use	Did not use	Did use	Did not use
<u>pesos per farm</u>				
Monoculture farms				
Gross return	738	1693	1693	929
Total expenses	356	544	556	373
Net returns	382	1149	1137	556
Polyculture farms				
Gross returns	2275	1566	1996	1650
Total expenses	929	660	835	670
Net return	1346	906	11161	980
<u>pesos per half-hectare</u>				
Monoculture farms				
Gross returns	2827	1376	2939	593
Total expenses	1362	442	965	238
Net return	1465	934	1974	355
Polyculture farms				
Gross return	1298	737	1268	576
Total expenses	530	310	530	234
Net returns	768	427	738	342

Supplementing the natural food of tilapia in ponds brought more profit to the operator. Among monoculture farms, users of supplemental feeds netted about ₱1974 per half-hectare while non-users netted only ₱355 or 5.6 times lower. The same relationship of net returns was observed among polyculture farms.

6. Problems and other information

Lack of technical support was cited as a major problem by the operators especially in Cagayan Valley where almost 50% of the operators received no technical support. Improper construction of pond gates and dikes also beset many of them. Other problems cited include flood and water pollution, low supply of fingerlings, unavailability of credit, insufficiency of capital and high price of inputs.

Table 12. Problems in tilapia farming

Item	Ilocos	Cagayan Valley	Central Luzon	Southern Luzon	Other regions	Phils.
Number of respondents	15	58	28	21	9	131
				<u>number</u>		
Lack of technical support	2	24	4	8	1	39
Lack of proper infrastructure	7	4	10	2	2	25
Land grabber and poachers	2	17	10	2	1	22
Flood and water pollution	-	5	1	4	2	17
Low supply of fingerling	-	6	6	4	1	16
Unavailability of credit ^{a/}	-	11	3	-	2	16
Insufficient capital	3	5	-	3	2	13
High price of inputs	1	6	4	-	-	11

^{a/} Including red tape in the processing of loan application.

Majority cited credit assistance from the government as one of the ways that will help improve the tilapia industry. More than one-fifth suggested technical assistance from the government while another one-fifth suggested continuous supply of fingerling.

Improvement of the industry could also be made possible through cooperation among fishpond operators viewed as follows: first, it would provide informal sessions regarding proper fishpond management, second, there will be a continuous supply of fish seed if communal fishponds are set-up, third, source of "bayanihan" labor is possible and, lastly, financial assistance among them would be available.

Table 13. Extension Assistance

Item	Number of farms
Reached by extension worker	
Yes	63
No	68
Recommendations provided for	
Stocking techniques ^{a/}	22
Management practices during rearing ^{b/}	19
Cultural practices prior to stocking ^{c/}	
No recommendations given	10
Followed recommendations	
Yes	48
No	5

^{a/} Includes rate of stocking, polyculture of tilapia and sexing of tilapia fingerlings prior to stocking.

^{b/} Water level to be maintained in the pond at rearing stage and the practice of supplementary feeding.

^{c/} Pond lay-out, proper dike construction, fertilization, "lumut" and "lablab" growing and pest elimination.

About one-half of the operators had not been reached by government extension workers. Those reached by extension workers are provided information on proper stocking and management practices while a number of them were not given any information. Of those who received recommendations from extension workers, 91 percent followed them.

Appendix Table 1. Cash and non-cash receipts in tilapia farming

Item	Tilapia	Tilapia- Carp	Tilapia- others	Tilapia bangos	All Farms
Number of farms	54	27	36	14	131
	<u>pesos per farm</u>				
Cash farm receipts					
Fishes sold	517	625	991	4140	1057
Non-cash farm receipts					
Value of fishes used at home	161	423	258	370	264
Value of fishes given away	122	96	55	209	108
Change in inventory	33	-	13	-	-
Sub-total	316	519	326	579	372
Total Farm Receipts	833	1144	1317	4719	1429
	<u>pesos per half-hectare</u>				
Cash farm receipts	548	863	774	686	688
Non-cash farm receipts					
Value of fishes used at home	171	584	201	61	172
Value of fishes given away	129	133	43	35	70
Change in inventory	35	-	10	-	-
Sub-total	335	717	254	96	242
Total Farm Receipts	1580	1580	1028	782	930

Appendix Table 2. Cash and non-cash expenses per farm by type of stock

Item	Tilapia		Tilapia-carp		Tilapia-others		Tilapia-bangos	
	Amt.	%	Amt.	%	Amt.	%	Amt.	%
Cash expenses								
Fry/fingerlings bought	25	7	5	2	17	3	347	23
Chemicals bought	2	1	-	-	-	-	4	-
Fertilizers bought	7	2	6	2	3	1	104	7
Supplementary feeds	57	15	32	12	60	12	7	-
Hired labor	98	26	101	38	179	36	482	32
Value of commission	27	7	73	27	87	17	173	11
Food for laborers	32	8	8	3	2	-	11	1
Transportation	6	2	22	8	15	3	-	-
Equipment purchased	81	21	20	7	58	12	152	10
Lease	28	7	-	-	36	7	137	9
Interest borrowed capital	-	-	-	-	30	6	16	1
Miscellaneous	18	5	2	1	16	3	82	5
Sub-total	381	100	269	100	503	100	1518	100
Non-cash expenses								
Fry/fingerlings gathered/ given free	25	33	35	18	79	61	58	31
Unpaid family and exchange labor	39	53	25	13	33	26	47	25
Change in inventory	-	-	73	38	-	-	79	42
Other non-cash expenses	10	14	60	31	17	13	4	2
Sub-total	74	100	193	100	129	100	188	100
Total Expenses	1457	-	462	-	632	-	1706	-

Appendix Table 3. Costs and returns from tilapia farming, 1974

Item	Mono-culture	Polyculture			All Farms
		Tilapia-carp	Tilapia-others	Tilapia-bangos	
Number of farms	54	27	36	14	131
			<u>pesos per farm</u>		
Farm receipts					
Cash receipts	517	625	991	4140	1056
Non-cash receipts	316	519	326	579	389
Total	833	1144	1317	4719	1445
Farm expenses					
Cash expenses	381	269	503	1518	513
Non-cash expenses	74	193	129	188	126
Total	455	462	632	1706	639
Net cash farm income	136	356	488	2622	543
Non-cash farm earnings	242	326	197	391	263
Net farm earnings	378	682	685	3013	806
			<u>pesos per half-hectare</u>		
Farm receipts					
Cash receipts	549	863	774	686	688
Non-cash receipts	335	717	254	96	242
Total	884	1580	1028	782	930
Farm expenses					
Cash expenses	404	372	392	251	333
Non-cash expenses	78	266	101	31	70
Total	482	638	493	282	403
Net cash farm income	145	491	382	435	355
Non-cash farm earnings	257	451	153	65	172
Net farm earnings	402	942	535	500	527