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CRAB FARMING IN THE PHILIPPINES: A SOCIO-ECONOMIC STUDY

by

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CRAB FARMING IN THE PHILIPPINES: A SOCIO-ECONOMIC STUDY

Lustina P. Lopie & Aida R. Librero

1.0. Introduction

Alimango, Scylla serrata (Forskal) under family Portunidae which includes all swimming crabs having the last pair of legs developed into paddle-like structure for swimming, is the most important commercial crab in the Philippines. They are especially abundant in swampy places and rivers reached by tidal waters. They are caught in commercial quantities by traps (bintol), hooks (panukot), scissors net (sakag), and gill net (pante).

The alimango are scavengers and cannibals. In their natural habitats the larger crabs often attack the smaller and weaker ones by first pulling of the appendages and then breaking the carapace to reach the softer parts of the body. They also feed on fish and shrimps which they catch by the quick movement of the pincers as they lie camouflaged in the bottom of the pond or river. The crabs also feed on algae and decaying organic matter.[1]

An important by-product of bangos fishponds, many problems such as supply of fry and food, enemies, and water pollution, are often encountered in crab culture.

This research was conducted to study the economic aspects of crab culture as well as the social conditions of the crab farm operators. Specifically, the objectives are:

1.1.1. To study the characteristics and social conditions of the crab farm operators.

1.1.2. To assess the practices and technology followed in crab culture.

1.1.3. To determine the patterns of input use in crab culture

1.1.4. To analyze the costs and returns in crab production

1.1.5. To assess the problems and plans of the crab farm operators.

[1] Villaluz, D. K. Fish Farming in the Philippines, Manila: Bookman Inc., 1953, p. 149.

1.1. Scope of the study

This study is part of the research program entitled " A Socio-Economic Survey of the Aquaculture Industry in the Philippines" which includes the various aspects of aquaculture from fry gathering to marketing, nursery operations, rearing pond operations and the culture of bangos, tilapia, prawn, catfish, carp, siganid, seaweeds, and eels.

The study covers seven regions throughout the country namely: Ilocos, Cagayan Valley, Central Luzon, Southern Luzon, Bicol, Western Visayas, and Western Mindanao. A total of 61 crab farm owners/caretakers were personally interviewed. The most number of samples came from Bicol (30), followed by Western Visayas (12), Southern Luzon (10), Ilocos and Western Mindanao (3) each, Central Luzon, (2), and Cagayan Valley (1) (Appendix Table 1). Only four out of 61 samples cultured pure crab. Fifty seven farms stocked crab in combination with other species, e.g., bangos, prawn, tilapia, shrimps, spadefish, etc. Information gathered refer mainly to the year 1974, but some additional data for 1975 were obtained.

2.0. The Crab Farm

2.1. The farm area

Farm area was categorized into total farm and operational area. Operational area included the area utilized for all fishpond operations while total farm area included the operational plus other areas which may be used for constructing the farm house and storage for farm tools and other supplies. Operational area ranged from 0.50 hectare in Ilocos to 90.54 hectares in Southern Tagalog (Table 1). The average operational area was biggest in Luzon[1] (17.10 hectares) compared with 13.48 has. in Visayas/Mindanao and Bicol with 14.16 has.

Based on the operational area, the sample farms were divided into two farm size groups: small - 10 hectares and less, and large - more than 10 hectares (Table 2). Only one out of four monoculture farms belonged to the large size group. In contrast, the majority of polyculture farms belonged to this farm size group. A total of 30 sample farms had less than 10 hectares operational area while 31 samples had more than 10 hectares.

2.2. Year started operating

As shown in table 3 the most number of crab farms (15) started in the 1960's with a large proportion coming from Bicol (30%). The least

[1] For purposes of this study the region called Luzon comprises of the Ilocos, Cagayan Valley, Central Luzon, and Southern Tagalog regions. Bicol was separated due to its relatively larger sample size. Visayas/Mindanao is composed of Western Visayas and Western Mindanao.

Table 1. Farm and operational area in crab farms, by region.

Region	Number of sample farms	Total farm area	Operational	
			Area	Per cent
Luzon except Bicol[a/]	15	20.09	17.10	85
Bicol	30	18.72	14.16	76
Visayas/Mindanao	16	17.29	13.48	78
Philippines	61	18.68	14.70	79

[a/] Unless otherwise specified, this group of regions shall be referred to as Luzon which for purposes of this study comprises of Ilocos, Cagayan Valley, Central Luzon, and Southern Tagalog regions.

Table 2. Distribution of fishpond samples by farm size and by type of stock.

Farm Size	Pure Crab	Crab-Prawn	Crab-Milkfish	Crab-Milkfish-Prawn	Crab & others[a/]
10 hectares and less	3	3	5	12	7
Area/farm	4.23	4.08	5.08	5.06	3.49
More than 10 hectares	1	4	5	19	2
Area/farm	22.50	19.69	21.55	27.04	19.33
All sizes	4	7	10	31	9
Area/farm	8.80	13.00	13.32	18.53	7.01

[a/] Includes milkfish, prawn, tilapia, shrimps, spadefish, barracuda, mullet, whitings, and ten pounder.

(2) on the other hand, started in 1970. While 52% of the farms were already in operation before 1970, 45% just started more recently, that is after 1970. While most of the farms in Visayas/Mindanao existed in the 1950's, a big portion of farms in Luzon were developed just lately.

In terms of total fishpond area, almost 200 hectares or 24% of the total area were developed in the 1960's. In addition, more than one half of the total area of all sample fishponds was developed in Bicol. Of this area, 32% was developed in the said period. While 28% of the total farm area in Visayas/Mindanao was developed in the 1950's, 25% in Luzon was developed earlier, before 1950.

Table 3. Year crab farms was started by region (total area in has).

Year	Luzon			Bicol			Visayas/Mindanao			All regions		
	Number	Per-cent	Total area	Number	Per-cent	Total area	Number	Per-cent	Total area	Number	Per-cent	Total area	Per-cent
Before 1950	2	13	39.00	-	-	-	1	7	30.00	3	5	69.00	9
1950-1959	3	20	13.50	4	13	97.00	6	40	60.60	13	22	171.10	22
1960-1964	1	7	17.00	4	13	73.00	2	13	32.50	7	12	122.50	15
1965-1969	1	7	2.50	5	17	64.00	2	13	4.50	8	13	71.00	9
1970	1	7	4.00	1	3	25.00	-	-	-	2	3	29.00	4
1971	1	7	25.00	5	17	45.75	2	13	36.00	8	13	106.75	13
1972	4	26	25.50	2	7	50.00	1	7	48.00	7	12	124.50	16
1973	2	13	30.50	3	10	12.51	-	-	-	5	8	43.01	5
1974	-	-	-	6	20	55.00	1	7	2.00	7	12	57.00	7
All years	15	100	158.00	30	100	422.26	15	100	213.60	60	100	793.86	100

2.3. Species cultured

Only 20 out of 61 farm samples reported that the same species was cultured from the first year of operation to the present. Some deviated from one species to another for some reasons. Out of the 3 monoculture farms reported, two were formerly culturing bangos and one with crab-bangos-prawn. Unavailability of fry and food for bangos were the reasons given.

Majority of farmers in crab-bangos-prawn (7 out of 10) reported culturing bangos only in their first year of operation. Some said that addition of some species was just a trial. Few were either encouraged to culture different species or followed other fishpond operators.

Among the crab-prawn farmers, 3 out of 6 changed from bangos to crab-prawn because of loss in bangos culture, high price, unavailability of bangos fry in the area, relatively cheap price in the market, and unsuitability of bangos culture during bad weather.

2.4. Pond ownership

On the average, 37% of the sample farms was owned while a much higher percentage (61%) was leased. Only one farm in Southern Luzon was partly owned and partly leased. Among the leased farms, 84% was leased from the government and the remaining 16% from the private sector. On the other hand, most (65%) of the farms owned were purchased (Table 4). Among the three regions, Luzon had the highest proportion of ownership through inheritance. In addition, among the four monoculture crab farms, three were leased from the government and one was owned through inheritance.

2.5. Types of business organization

Crab farms can either be operated as a single proprietorship, a partnership or family business. Majority of them (82%) were operated as a single proprietorship. Only 8 and 10 per cent on the other hand, were operated as a partnership and family business in that order (Table 5). Except for Bicol, the other two regions reported that some of their farms were operated as a family business. Bicol had the highest percentage (97%) of farms operated as a single proprietorship.

.6. Types of ponds

In a fishfarm, the typical flow of fry started in the nursery pond, then to the transition pond and then to the rearing pond. In few cases, separate ponds for catching and feeding purposes were constructed. Fifty six of 61 farms had nursery pond. The most number of compartment averaging 2.60/farm was in Luzon while Bicol and Visayas/Mindanao had 1.93 and 1.92 compartments respectively. Only a small portion of the farms total

Table 4. Pond ownership in crab farms by region.

Item	REGION			
	Luzon	Bicol	Visayas/Mindanao	All regions
Number of farms	15	30	16	61
Owned				
Purchased				
Number	3	9	3	15
Per cent	20	30	19	24
Inherited				
Number	4	2	2	8
Per cent	26	7	12	13
Leased				
Government				
Number	6	15	10	31
Per cent	40	50	63	51
Private				
Number	1	4	1	6
Per cent	7	13	6	10
Owned/leased				
Number	1	-	-	1
Per cent	7	-	-	2

Table 5. Type of business organization in crab farms by region.

Region	Number of farms	Single proprietorship	Partnership	Family business
		Per cent		
Luzon	15	67	20	13
Bicol	30	97	3	-
Visayas/Mindanao	16	69	6	25
All regions	61	82	8	10

area was allotted to this type of pond. The average area per compartment ranged from 0.29 hectare in Visayas/Mindanao to 0.49 in Bicol (Table 6).

Most farms (75%) had transition ponds with 1.63 compartments per farm on the average. The average area per compartment ranged from 1.42 ha. in Visayas/Mindanao to 2.08 in Luzon. Only 7% reported to have feed ponds. The number of rearing compartments per farm ranged from 2.50 in Visayas/Mindanao to 2.60 in Bicol with the area per compartment largest in Bicol (6.71 ha.) and smallest in Visayas/Mindanao (4.76 ha.). The rearing area per farm was 15.15 hectares on the average. With less than one half of the farms having a catching pond, many of them harvested the crop directly from the rearing pond.

Table 6. Number and area by type of ponds in crab farms by region (area in hectares).

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	16	61
Types of ponds				
Nursery pond				
Number with nursery ponds	10	27	13	50
Number of compartments	26	52	25	103
Total area	11.79	25.43	7.35	44.57
Area per compartment	0.45	0.49	0.29	0.43
Transition pond				
Number with transition pond	8	29	9	46
Number of compartments	16	46	13	75
Total area	33.25	68.09	18.51	119.85
Area per compartment	2.08	1.48	1.42	1.60
Rearing pond				
Number with rearing pond	15	30	16	61
Number of compartments	38	78	40	156
Total area	210.73	523.05	190.24	924.02
Area per compartment	5.55	6.71	4.76	5.92
Catching pond				
Number with catching pond	4	20	5	29
Number of compartment	9	24	5	38
Total area	0.27	5.57	.78	6.62
Area per compartment	0.03	0.23	0.16	0.17
Feed pond				
Number with feed pond	2	2	-	4
Number of compartments	2	3	-	5
Total area	0.55	0.57	-	1.12
Area per compartment	0.27	0.19	-	0.22

3.0. The crab farm operator and his family

3.1. The farm operator

Majority of the crab farm respondents were male. Furthermore, all caretakers were male. An owner, 52 years of age had been managing the present pond for nine years but had been in the business for 13 years. Although the caretakers have had an experience of 14 years, they had been managing the present ponds for only 7 years (Table 7). Fifty two per cent of the respondents were in their present residence since birth. The remaining 48 per cent had migrated to their present residence due to the location of the fishpond, change of occupation, search for better opportunity, marriage and education of their children.

Table 7. Characteristics of crab farm operators by type of respondent.

Item	Owner	Caretaker	Total
Number of farms	51	10	61
Sex (per cent)			
Male	80	100	84
Female	20	-	16
Age (years)	52	41	50
Years of experience in the business	13	14	13
Years managing present pond	9	7	8
Years of residence in the community	35	25	33
Educational attainment (number)[1/]			
None	1	-	1
Primary	5	1	6
Intermediate	11	6	17
High school	12	3	15
College	20	-	20
Average year of schooling	10	7	9
Labor potential (months)			
Fishpond operation	6	10	6
Other occupation	5	1	5
Not gainfully employed	1	1	1

[1/] No answer from 2 respondents

Several reasons were given why the operators studied decided to enter the fishpond business. Some of these were its being the main source of livelihood in the area (30%), line of specialization (21%), and good/ additional source of income (15%).

Almost all (98%) of the operators had received formal education except for one owner operator in the Bicol region. More than one third of the owners reached college. Majority of the caretakers (60%) reached the intermediate level but none had reached college. On the average, owner operators had formal schooling of 10 years; caretakers had 7 years.

Owner-operators spent one half of the year in the farm and 5 months for other occupation. Majority (84%) had other occupation. Business appeared to be the best source of additional income averaging P10,983 per year (Table 8). This was followed by employment. While a caretaker's job seem to be a full time activity, one-third were able to engage in other occupations.

3.2. The operator's household

A crab farm household had 7 members with at least one economically active member helping the owner or caretaker augment the family income (Table 9). Most of the owner's household members (45%) had reached or finished college. They spent 9 months in other occupation and one month

for the farm. In contrast, most caretaker's household members, reached intermediate level only. None reportedly reached the college level. Four months of their labor potential were spent in the farm and 8 months in other occupation.

Table 8. Income and other occupation by type of respondent.

Item	Owner		Caretaker	
	Number[b/]	Annual income	Number	Annual income
Number reporting.	43		3	
Occupation				
Business	23	10,983	1	1,800
Employee	9	8,624	-	-
Farmer	9	4,707	1	7,000
Others[a/]	5	2,700	1	1,600
All types	*	8,979	*	3,467

[a/] Includes fisherman, laborer, and driver

[b/] Some respondents have more than one other occupation

Table 9. Characteristics and labor potential of crab farm household members by type of respondent

Item	Owner	Caretaker	Both
Number reporting	49	10	59
Size of household	7.27	6.20	7.08
Total number of economically active members	66	8	74
Age (years)	29	25	29
Educational attainment (number)			
None	1	-	1
Primary	6	1	7
Intermediate	6	6	12
High School	23	1	24
College	30	-	30
Average years of schooling	10	6	10
Labor potential (months)			
Fishpond operation	1	1	2
Other occupation	9	8	8
Not gainfully employed	2	a/	2

[a/] Less than one month.

Three fourths of the operator's household members was engaged in other occupations such as business, employment, and farming.

Fifty out of the 61 operator-respondents had children of school age. Ninety two per cent of these operators were able to send their children to school, while 8% were not because of their children's poor academic grades or being more needed in the business.

4.0. Cultural practices

4.1. Pond preparation

Prior to the arrival of fry/fingerlings, ponds must be clean, free from pests and predators and food available. Luzon farms took about 16 days to prepare the pond. A much longer time averaging 31 days was used for this activity in Visayas/Mindanao (Table 10).

As expected, a farm belonging to more than 10 hectare farm size group spent a longer time doing such preparation (25 days) than those belonging to smaller farm size group (20 days) (Appendix Table 2). However, on the per hectare basis, the former spent only one day while the latter spent a longer time of 4 days.

General pond repair includes repair of dikes, screens, and gates, or the pond as a whole. Majority (43%) of the farms were repaired only when needed, while more than one third did it more regularly or prior to every stocking. Three per cent of operators in Bicol did not repair their ponds.

Cleaning was practiced in majority (93%) of the ponds. Of these, 56% was done prior to every stocking while 26% did it only when needed. Pond levelling was done by 69% of the sample farms.

Pond drying may directly or indirectly eradicate predators that may be burrowing in the mud. Almost all of the farms practiced pond drying. The average length of drying ranged from 8 days in Luzon to 11 days in Bicol. Large farms spent longer time (11 days) than small ones (9 days).

Predators and pest eradication practices. Predators and competitors feed on the cultured species and on the natural food in the pond. These include crustaceans, reptiles, birds, frogs, polychaete worms and other fishes. Among the other fishes which were mostly competitors, ten pounder, tarpon, and tilapia were the most common (Table 11).

Table 10. Pond preparation in crab farms, by region

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	16	61
Pond preparation before arrival of fingerlings (days)	16	21	31	22
Frequency of general pond repair[a/]		per cent		
Only when needed	60	43	25	43
Prior to every stocking	27	40	31	34
Others	20	17	44	25
No repair	-	3	-	2
Frequency of cleaning				
Prior to every stocking	47	70	38	56
Only when needed	47	10	38	26
Others[b/]	6	17	6	11
Not cleaning	-	3	18	7
Practiced pond drying				
Yes	80	100	94	93
No	20	-	6	7
Length of drying (days)	8	11	9	10
Practiced pond levelling				
Yes	60	80	56	69
No	40	20	44	31

a/ Percentages total more than 100 since some respondents gave more than one answer.

b/ Includes after typhoon, yearly, monthly, everyday and continuous.

Table 11. Predators and practice of pest eradication in crab farms, by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	16	61
Practiced pest eradication			per cent	
Yes	93	93	94	93
No	7	7	6	7
Predators/competitors			number	
Other fishes				
Ten pounder	5	18	9	32
Tarpon	3	17	11	31
Tilapia	5	11	5	21
Eel	2	4	-	6
Others[a/]	14	20	6	40
Snakes	3	14	11	28
Crustacean	4	14	3	21
Frog	1	7	-	8
Lizard	-	5	3	8
Bird	-	2	2	4
Worm	1	2	-	3
Method of eradication[b/]			per cent	
Catch and kill	47	87	75	74
Chemicals	80	13	69	44
Pond drying	-	33	-	16
Pond draining	-	10	-	5
None	7	7	6	7

a/ Includes grouper, grunt, catfish, mudfish, herring, barracuda, spadefish, goby, mudskipper, talakitok, lawi-lawi, dasia, idlik, bursyan, mullet.

b/ Percentages total more than 100 since some respondents used more than one method of eradication.

Pest eradication as practiced in 93% of all farms was necessary to reduce mortality of stocked species. To eliminate predators and competitors, different methods were employed such as catch and kill, use of chemicals, pond drying and pond draining. As indicated earlier, most farms dried the ponds. Also popular was "catch and kill" method employed by 87% in Bicol and 75% in Visayas/Mindanao. Chemical application was employed more in Luzon (80%). Only 27 out of 61 farms applied chemicals (Appendix Table 3). Pesticides used were Aquatin, Endrin, Gusathion, Thiodan, Brestan, Sodium cyanide and Tubli. Among these pesticides, Endrin was the most widely used. This was followed by Aquatin and Brestan. Endrin was applied at the rate of 11 ounces per hectare. There was a variation in the rate of application of Aquatin ranging from 11 oz. in Visayas/Mindanao to 25 oz. in Luzon. Except for Brestan, chemicals were applied at a higher rate in large farms than in small farms (Table 12). Eighteen farms or 67% of chemical users applied only one type of pesticide, 30% applied two types and 4% applied three types of pesticides.

Fertilization increases productivity by enhancing the growth of natural food in the pond. Only 46% of the farms applied fertilizer either organic or inorganic (Table 13). Chicken manure was the most commonly used organic fertilizer applied at the rate of 38 sacks per hectare. Animal manure (cows/carabao) was used only in Visayas/Mindanao while guano or bat manure was used in Luzon only.

For inorganic fertilizer users, the most widely used was 16-20-0 followed by urea. Inorganic fertilizers are customarily expressed as percentage of available nitrogen (N), phosphoric acid (P_2O_5) and potash (K_2O). Urea was the only fertilizer belonging to the purely nitrogen type while 14-14-14 was the only complete type (NPK). Three types of fertilizer (16-20-0) (18-46-0) ((12-20-0) were of the nitrogen-phosphorus type.

The rate per hectare of urea on the average was 84.29 kg. while 14-14-14 was 70.97 kg. For the nitrogen-phosphorus type used in Luzon, the rate averaged 36.31 kilos.

Only 3 types of inorganic fertilizers were reportedly used in Bicol and Visayas/Mindanao namely urea, 14-14-14 and 16-20-0. In the former region, a greater rate per hectare of 14-14-14 (300 kgs.) was applied while in the latter the two other types of fertilizer were applied in greater quantity.

As expected, the rate per hectare of fertilizer used in the two farm size groups, increased with the increase in farm size (Table 14).

Table 12. Chemical application in crab farms by farm size, 27 farms.[b/]

Item	Less than 10 has.	More than 10 has.	All sizes
Number of farms	12	15	27
	rate per hectare		
Pesticide used			
Aquatin (oz.)	11	16	15
Endrin (oz.)	3	12	11
Gusathion (oz.)	7	15	15
Thiodan (oz.)	12	-	12
Brestan (kg.)	1	1	1
Sodium cyanide (kg.)	b/	-	b/
Tubli (bundle)	-	1	1
Average area applied (has.)	4.01	20.16	12.98
Frequency of application			
Prior to every stocking	66	93	82
Only when needed	17	-	7
Once a year	17	7	11

[a/] Thirty four farms did not apply chemicals.
[b/] Less than 0.5 per cent.

Table 13. Fertilizer application in crab farms by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	16	61
	per cent			
Applied fertilizer				
Yes	60	30	63	46
No	40	70	37	54
Area fertilized (has.)	10.72	16.56	14.14	13.82
	rate per hectare			
Types of fertilizer used				
Chicken manure (sacks)	6.94	99.37	100	38.47
Cow/carabao manure (sacks)	-	-	54.56	54.56
Guano (sacks)	1	-	-	1.00
Urea (kg.)	7.94	48.78	198.25	84.29
14-14-14 (kg.)	-	300.00	166.67	170.97
Nitrogen-phosphorous	36.31	62.57	171.74	93.06

Six farms or 28% of fertilizer users applied two types of fertilizers while only one farm in Western Visayas belonging to more than 10 hectare farm size group applied three types of fertilizer.

4.2. Stocking and care

4.2.1. Sources of stock

Crab. Forty nine out of 61 crab farmers purchased crab seed (Table 15). The remaining 12 farms had either free entrance or gathered stock. Crab seeds could be purchased within the barrio, within the town, within the province or outside the provincial location of the ponds. In most cases (46%) crab seeds were purchased from other towns but within the province where the pond is located. A relatively high proportion (36%) also of the crab farm operators did not have to go out of their towns to secure this stock materials. The smallest proportion (16%) of the farmers purchased their stock within the barrio.

Other species. Milkfish and prawn were the most common species cultured in the pond together with crab. In all regions, majority of the operators purchased these species mostly if not all in their fry stage. Milkfish fingerling as stock material was used only in four farms in Luzon and two in Bicol. Of the 9 farm operators polyculturing crab with tilapia, shrimp and spadefish, 5 did not purchase the said species and depended mostly on those that gained free entrance into the pond. In some cases, a crab polyculture operator purchased his stock materials from different sources.

4.2.2. Care practices

To lessen the incidence of mortality of stock materials, care practices must be observed from the time that these are transported up to the time that these are reared in the pond. It has been a practice that during the transport of crab seed from the source to the pond they usually have no pinchers for easy handling and to prevent their fighting and hurting one another.

Acclimatization. Prior to stocking the fry were conditioned to their new environment. The more popular method of acclimatization was the transfering of fry into a bigger container e.g. basin, and gradually changing the water with pond water. In case of bangos fry, acclimatization could be with the use of suspension net in the nursery pond. Another method is placing the fry in a banca with continuous supply of water. On the

Table 14. Fertilizer application in crab farms by farm size.

Item	Less than 10 has.	More than 10 has.	All sizes
Number of farms	30	31	61
	per cent		
Applied fertilizer			
Yes	33	58	45
No	67	42	54
Area fertilized (ha.)	3.78	19.33	13.82
	rate per hectare		
Types of fertilizer used			
Chicken manure (sacks)	0.75	39.51	38.47
Cow/carabao manure (sacks)	-	54.56	54.56
Guano (sacks)	-	1.00	1.00
Urea (kg.)	50.05	89.21	84.29
14-14-14 (kg.)	-	170.97	170.97
Nitrogen-phosphorous	53.15	97.09	93.06

Table 15. Sources of stock in crab farms by region.

Region	Number of farms	Gathered own fry	Free entrance	Purchased Fry	Purchased Fingerling
		number			
Luzon					
Crab	15	1	2	12	-
Bangos	10	-	1	5	4
Prawn	11	1	1	9	-
Tilapia	1	1	-	-	-
Bicol					
Crab	30	3	-	27	-
Bangos	26	3	-	21	2
Prawn	20	3	-	16	1
Tilapia	1	-	-	-	1
Spadefish	1	-	-	1	-
Visayas/Mindanao					
Crab	16	1	5	10	-
Bangos	12	-	4	8	-
Prawn	10	1	2	7	-
Tilapia	1	-	1	-	-
Shrimp	4	-	2	2	-
Others[a/]	1	-	1	-	-

average, 48% of the operators acclimatized their stock for 9.5 hours. Seventy per cent of operators in Bicol practiced acclimatization while only 6% in Visayas/Mindanao practiced this activity (Appendix Table).

Time of stocking. Stocking of fry or fingerlings is usually done in the colder parts of the day since an abrupt change in temperature results in a higher mortality. Almost a similar proportion of crab farm operators did stock their ponds in the early morning (57%) and late afternoon (52%). It would be noted that fry/fingerlings in Bicol were either stocked in the early morning or late afternoon. Majority (54%) of crab farm operators in Luzon stocked anytime of the day (Table 16).

Table 16. Time of stocking in crab farms by region, 54 farms[a/]

Region	Number of farms	Early morning	Late afternoon	Anytime
		per cent[b/]		
Luzon	13	23	31	54
Bicol	29	72	79	-
Visayas/Mindanao	12	58	9	33
All regions	54	57	52	20

[a/] Seven farms did not stock.
[b/] Percentages total more than 100 since some gave more than one time of stocking.

Supplementary feeding. Supplementary feeds enhances the growth of cultured species in the pond by making available to them more supply of food. Only 19 out of 61 crab farm operators supplemented the natural food in the pond (Table 17). The practice was more predominant in Luzon (47%). It would be noted that none among the 4 monoculture crab farm operators practiced supplementary feeding. Of the supplementary feeds given, rice bran was the most widely used (18). Two operators in Luzon and one in Bicol gave bread crumbs. It was only in Luzon where gulaman and alamang were given. Moreover, bread crumbs, gulaman and alamang were mixed with rice bran before giving them.

Water level maintained. Alimango prefers brackish water ponds which contain no less than one meter of water in depth, a condition which discouraged them from burrowing in the mud or through the walls of dikes. From the survey, the water level maintained during rearing averaged 94 cms. A much lower water level (84 cms.) was observed in the monoculture crab farms.

Table 17. Supplementary feeding practice in crab farm by region.

Region	Number of farms	Used supplementary feeds		Type of supplementary feeds given			
		Yes	No	Rice bran	Bread crumbs	Gula-man	Ala-mang
		per cent		number			
Luzon	15	47	53	6	2	1	1
Bicol	30	30	70	9	1	-	-
Visayas/Mindanao	16	19	81	3	-	-	-
All regions	61	31	69	18	3	1	1

4.2.3. Mortality

From Table 18 a comparison was made on the mortality rate from stocking to harvesting in pure and combination crab farms. It was observed that average mortality rate was high in combination farms e.g., crab-bangos-prawn (30%) and lower in pure crab farms (18%). Combination of crab and prawn in fishponds was not advisable since they both molt. During the molting stages crab was stronger than prawn, thus, there was a tendency for crab to eat the weaker prawn. Higher mortality rate in bangos-prawn-crab could partly be accounted to this. However, from the survey, the reported causes of mortality were sudden change of weather, typhoon, predators, and lack of food.

Table 18. Mortality rates from stocking to harvesting in crab farms.

Item	Pure Crab	Crab-milkfish prawn	Crab and others	All farms
Number reporting	2	29	20	51
Mortality rate			per cent	
Average	18	30	19	25
Maximum	45	45	42	44
Minimum	5	20	14	17
Causes of mortality			number	
Sudden change of weather	1	17	14	32
Typhoon	1	12	12	25
Predators	-	17	8	25
Lack of food	-	8	6	14
Others[a/]	1	8	3	12

[a/] Includes water condition, overstocking, weak fry and stress.

4.3. Cropping practices

Crabs are harvested on or before the aligui[1] begins to form. At this stage, they are fat and command a good price in the market. Female crabs with triangular-shaped abdomen and male crabs below 84 by 22 mm. should not be caught for the market. They should be returned to the river or pond to allow them to grow into full maturity.

In determining the date of cropping, several factors were considered. The more dominant factor was the size of stock (82%). Other factors also considered were the availability of natural feed, 37%; demand for stock, 34%; and weather condition and home consumption, 11%.

Crabs reach marketable size in about six to eight months[2]. However, in Luzon, crabs were harvested after 4.80 months only of rearing.(Table 19). Farms in Bicol and Visayas/Mindanao reared their crabs for 6.15 and 6.22 months respectively. Duration and number of rearings averaged 5.85 and 1.17 times. It would be interesting to note that crabs in monoculture farm were reared for a longer time averaging 6.50 months as compared to 5.79 months in polyculture farms. This difference in the duration could be partly attributed to the fact that in combination farms, the size of other species cultured was also considered.

Majority (74%) of the crab farms harvested their crop totally (Table 20). Few others harvested theirs on selective basis. Several methods of harvesting were employed. The more popular methods were gill netting, pond draining and pasubang. For these farms employing other methods, crab traps locally termed as "bintol" was particularly used for catching the crab.

5.0. Stocking and cropping patterns

5.1. Stocking pattern

Alimango spawns throughout the year, but the height of spawning occurs from the last week of May to the third week of September, a period of about four months. As shown in

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1/ Aligui is the growing or maturing group of eggs, orange-red in color.

2/ Villaluz, D. K. op. cit. p. 150.

Table 19. Duration and number of rearings of crab by region.

Region	Number reporting	Duration of rearing (nos.)	Number of rearings
Luzon	11	4.8	1.27
Bicol	27	6.15	1.07
Visayas/Mindanao	9	6.22	1.33
All regions	47	5.85	1.17

Table 20. Cropping practices in crab farms by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	16	61
Factor that determine date of cropping[a]		per cent		
Demand for stock	20	47	25	34
Size of stock	73	93	75	82
Availability of natural feed	13	57	31	39
Others[b]	20	10	-	11
Method of harvesting				
Selective	27	17	19	20
Total	60	80	75	74
Both	13	3	6	6
Harvesting method used[a]				
Gill netting	27	93	6	54
Seining	20	7	19	13
Pasubang	13	33	63	36
Pond draining	47	30	56	41
Others[c]	27	3	50	21

a/ Percentages total more than 100 since respondents gave more than one factor or method.

b/ Includes weather condition and home consumption.

c/ Includes fish and crab traps, cast net, scoop net fish corral, banata, bintol fish net.

Appendix Table 5 crab seeds seemed to be available throughout the year. Most farms stocked crab in May. The largest volume of fry was stocked in August averaging 12.18 thousand pieces. The least number of farms (1) and volume of fry ((0.30 thousand) was stocked in March.

On the average, price of crab seed was ₱149 per thousand. A relatively low price per thousand of ₱82 was received by crab seed purchased in October. This is mainly due to a crab farmer in Altavas Aklan who purchased crab seeds in Hantic Antique at a price of ₱80 per thousand prices.

5.2. Cropping pattern

More farms reported to have cropped in December. The least (4) number harvested crabs in May. Quantity cropped ranged from 167 kilos in February to 1,442 kilos in July (Appendix Table 6). Although the least volume was cropped in February, it received the highest price of ₱11.36 per kilo. The price was lowest (₱6.24) in August. Considering the price and volume harvested those cropped in September earned the highest value for crab produced averaging ₱12,778. The lowest value was received in February, ₱1,897 primarily due to the very small quantity of crab harvested in this month

5.3. Productivity of crab farms

A monoculture crab farm produced a total of 2,801 or 339 kilos per hectare (Table 21). As expected, productivity in combination farms was higher averaging 8,498 or 698 kilos. A crab-bangos-prawn combination farm produced a bigger volume averaging 782 kilos per hectare than a crab others combination farm (544 kilos). Others include bangos,prawn, tilapia, shrimps, spadefish, etc.

In addition to the cultured species, some tilapia, shrimp, mullet, prawn and bangos that had gained free entrance into the ponds contributed 38 kilos to the total production per farm.

Productivity in crab farms can be assessed in terms of productivity in other species cultured like bangos which is the dominant species cultured in the fishpond. Based on a study on bangos production, a monoculture bangos farm produced an average of 580 kilos annually.[1] This is higher as compared to 339 kilos in monoculture crab farm. However,

[1] A. R. Librero, et. al. "Milkfish farming in the Philippines: A Socio-Economic Study. SEAFDEC-PCARR Research Program, Research Paper Series No. 8, August 1977, p. 100.

Table 21. Annual cropping per farm and per hectare by type of species cultured, 1974-1975 (quantity in kilos, value in pesos), 59 farms.

Item	Number of farms	Average rearing area (has.)	Per Farm		Per hectare	
			Quantity	Value	Quantity	Value
Pure crab	4	8.27	2801	19270	339	2329
Crab-milkfish Prawn	29	14.98	11712	81086	782	5412
Crab & others	26	9.03	4913	33260	544	3685
All farms						
Pure crab	4	8.27	2801	19270	339	2329
Crab-Polyculture	55	12.17	8498	58478	698	4805

it must be noted that productivity in pure crab farm was based only on 4 samples as against 1,175 samples of bangos. In contrast, productivity in crab-polyculture farm was higher than bangos by 118 kilos.

Productivity of crab farms in the three regions - Luzon Bicol, and Visayas/Mindanao is presented in Table 22. On per hectare basis, productivity of pure crab farm was highest in Bicol (476 kilos) and lowest in Luzon (90 kilos). With regards to the crab polyculture farms, productivity was lowest in Visayas/Mindanao averaging 382 kilos. The highest on the other hand, was in Luzon which was more than twice that of the former (1,182 kilos).

Table 22. Annual cropping per farm and per hectare by region, 1974.

Region	Number of farms	Average rearing area(has.)	Per farm		Per hectare	
			Quantity	Value	Quantity	Value
Luzon						
Pure crab	1	6.00	538	2688	90	448
Crab polyculture	14	15.48	18301	128984	1182	8332
Bicol						
Pure crab	1	21.00	10000	70000	476	3333
Crab polyculture	29	10.41	5300	36580	509	3515
Visayas/Mindanao						
Pure crab	2	3.05	333	2196	109	721
Crab polyculture	12	12.55	4792	29140	382	2321
All regions						
Pure crab	4	8.27	2801	19270	339	2329
Crab polyculture	55	12.17	8498	58478	698	4805

As expected, large farms had a higher productivity than the small farms. In crab monoculture farms alone, total produced averaged 10,000 kilos for the former and 401 kilos for the latter (Table). However, it must be noted that only one monoculture farm belongs to the bigger farm size group. In polyculture crab farms, production in the bigger farms having an average rearing area of 20.57 hectares was 14668 kilos which was relatively high than that in a smaller farm (2,100 kilos).

Table 23 indicates that a higher yield per farm and per hectare was obtained by large farm operators than the small farmers. A monoculture crab farms in the smaller farm size group obtained a total yield of 586 kilos per hectarewhich was almost one fifth only of the yield obtained in the large size monoculture crab farm. Although a big edge on production yield enjoyed by the larger crab polyculture farms over the smaller polyculture farms can be observed on the per farm basis, the difference is not very significant when the per hectare annual yield is considered. Thus the big difference lies on the yield obtained in monoculture crab farms.

Table 23. Annual cropping per farm and per hectare by farm size 1974-75 (quantity in kilos, value in pesos), 59 farms.

Farm Size	Number of farms	Average rearing area(has.)	Per farm Quantity	Per farm Value	Per hectare Quantity	Per hectare Value
10 and less						
Pure crab	3	4.03	401	2360	99	586
Crab polyculture	27	3.46	2181	14486	608	4192
More than 10						
Pure crab	1	21.00	10000	70000	476	3333
Crab polyculture	28	20.57	14668	100898	713	4906
All sizes						
Pure crab	4	8.27	2801	19270	339	2329
Crab polyculture	55	12.17	8498	58478	698	4805

7.0. Disposal and marketing

Almost all of the produced in crab farms were sold. A small portion was eaten, given or paid to caretakers and harvesters (Table 24).

More than one half of the crab farm operators sorted their crop either according to size, or species or both before marketing.

Table 24. Disposal of fish produced per farm and per hectare by type of species cultured.

Item	Pure Crab	Crab-milkfish-Prawn	Crab and Others	Pure crab	Crab-polyculture
Number of farms	4	29	26	4	55
Average rearing area (has.)	8.27	14.98	9.03	8.27	12.17
Total production per farm	2801	11712	4913	2801	8498
Disposal per farm					
Sold	2751	11586	4855	2751	8404
Eaten	25	48	21	25	36
Given	25	73	23	25	49
Others[a]	-	5	14	--	9
Total production/hectare	339	782	544	339	698
Disposal per hectare					
Sold	333	773	537	333	690
Eaten	3	3	2	3	3
Given	3	5	3	3	4
Others[a]	-	1	2	-	1

[a] Caretaker's and harvester's share.

Majority sold their crop on wholesale basis at an average price of ₱7.63 per kilo (Table 25). Only two farm operators in Western Visayas sold their crop on contractual arrangement which received the highest price of ₱10.50 per kilo.

Table 25. Selling arrangement and price received for crab and average distance of outlet, 60 farms.

Item	Number reporting[b]	Price per kilo (₱)	Average distance (km)
Wholesale	39	7.63	131
Retail	15	6.82	17
Consignment	6	6.57	82
Contract	2	10.50	182

[a] One farm did not sell its produce.

[b] Two farms practiced more than one type of selling arrangement.

Table 28. Annual costs and returns from crab farms per hectare by type of species cultured.

Item	Species cultured: Pure crab	Crab-milkfish-prawn	Crab & others	All farms
Average area (has.)	8.80	18.68	11.05	14.65
	pesos per hectare			
Cash farm receipts				
Stocked fish sold				
Crab	2155	659	1001	860
Others 1/	337	3622	1000	2898
Other crops	-	56	26	57
Non-cash farm receipts				
Value of fish used at home	26	28	17	24
Value of fish given away	23	33	19	28
Change in inventory(increase)	-26	14	1	8
Other non-cash farm income	-	1	19	7
Total farm receipts	2503	4413	3051	3882
Cash farm expenses				
Stock of fry/fingerlings bought	97	435	265	365
Supplementary feeds	-	6	2	4
Hired labor cost	274	418	285	368
Value of commission	17	318	351	316
Fertilizer bought	8	177	24	119
Chemical bought	7	28	2	19
Food for laborers	42	78	12	55
Ice	-	8	14	10
Equipment purchased/rented	4	51	35	44
Lease	145	26	27	31
Permit	24	10	8	10
Interest on borrowed capital	-	23	9	17
Miscellaneous	2	25	39	29
Non-cash farm expenses				
Fry gathered/given free	-	1	5	2
Unpaid family labor	-	1	4	2
Other non-cash farm income	-	1	19	7
Total farm expenses	620	1606	1101	1398
Net cash farm income	1865	2734	1922	2428
Net non-cash farm income	23	73	20	56
Net farm earnings	1888	2807	1950	2484
Earnings on capital	1861	1143	2068	1540
Per cent earned on capital	71	24	88	42
Interest on average inventory	157	281	145	221
Operator's farm labor earnings	1732	2047	1942	1988
Family farm labor earnings	1732	2049	1946	1991
Total other income	897	1324	2039	1882
Family income from all sources	2785	3652	4925	4093
Expenses per kilo	1.31	2.45	2.45	2.41
Rate of return				
as per cent of operating capital	304	175	177	178
as per cent of capital investment	72	80	84	81

1/ Includes bangos, prawn, tilapia, shrimp, ten pounder, spadefish, mullet, barracuda and whiting.

Non-farm income was highest in crab and others farm (₱30,505) and lowest in monoculture farm 9(₱7,890). Family income from all sources which included both net farm earnings and non-farm income, highest in crab-bangos-prawn (₱56,855) and lowest in the latter (₱24,509) was However, on the per hectare basis, this was highest in crab and others and again lowest in monoculture farm.

Rate of return as per cent of operating capital ranged from 175% in crab-bangos-prawn farm to 304% in monoculture farm. Rate of return as per cent of capital investment in contrast was highest in crab and others farm (84%) and lowest in monoculture farm (72%).

8.3. Costs and returns by region

A wide variability in the total farm receipts was observed among the three regions. Per farm, this varied from ₱26,887 in Visayas/Mindanao to ₱122,866 in Luzon (Table 29). On the per hectare basis, farm receipts ranged from ₱2038 in the former to ₱7135 in the latter region.

The per hectare farm expenditure incurred did not vary much among the regions ranging from ₱1,057 in Visayas/Mindanao to ₱1,862 in Luzon (Table 30). Thus although crab farmers in Luzon incurred the highest expenditure, expenses per kilo was still the lowest (₱1.77) among the three regions. Crab farm operators in Bicol spent almost twice (₱3.24) of that in Luzon for every kilogram of produce.

Apparently, a crab farm in Luzon realized the highest per hectare net cash income and net farm earnings amounting to ₱5,206 and ₱5,273 respectively. In the said measures, Visayas/Mindanao realized the lowest averaging ₱923 and ₱981.

Earnings on capital was likewise highest in Luzon averaging ₱26,852 or ₱2,812 per hectare and lowest in Visayas/Mindanao, ₱9,464 or ₱796 per hectare. With a lower capital invested in Luzon as compared to that in Bicol it was not surprising that the per cent earned on capital would be highest in this region (70%). Bicol and Visayas/Mindanao farms earned only 36 and 37% in capital invested.

Family income from sources averaged ₱52,358. This was highest in Luzon (₱87555) and lowest in Visayas/Mindanao (₱22,578).

Rate of return as per cent of operating capital ranged from 93% in Visayas/Mindanao to 283% in Luzon. Likewise, rate of return as per cent of capital investment was highest in Luzon (227%). On the other hand, this was lowest in Bicol (36%).

Table 29. Annual costs and returns per farm by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	14	59
		pesos per farm		
Cash farm receipts				
Stocked fish sold				
Crab	18796	13680	3647	12600
Others[a/]	100614	23560	20315	42451
Other fishes	1450	457	987	835
Non-cash farm receipts				
Value of fish used at home	703	172	393	359
Value of fish given away	530	431	239	410
Change in inventory (increase)	-27	121	261	117
Other non-cash farm income	-	-	445	106
Cash farm expenses				
Stock of fry/fingerling bought	8447	4320	4210	5343
Hired labor cost	6059	6703	1861	5390
Value of commission	5264	3942	1158	4635
Food for laborers	2476	331	9	800
Fertilizer	2147	637	3700	1748
Chemicals	200	50	821	271
Supplementary foods	161	42	8	64
Ice	78	240	6	143
Equipment purchased/rented	1366	327	562	647
Lease	531	592	64	451
Permit	86	191	99	142
Interest on borrowed capital	520	141	214	255
Miscellaneous	476	366	500	426
Non-cash farm expenses				
Fry gathered/given free	13	8	113	34
Unpaid family labor	38	28	18	28
Other non-cash farm expenses	-	-	445	106
Net cash farm income	89049	19815	12037	35571
Net non-cash farm income	1155	688	762	824
Net farm earnings	90204	20503	12799	36395
Earnings on capital	26852	21683	9464	19705
Per cent earned on capital	70	36	37	42
Interest on average inventory	2318	3639	1525	2835
Operators farm labor earnings	68003	18215	5623	25439
Family farm labor earnings	68059	18247	5644	25475
Total other income	17334	30674	15431	24084
Family income from all sources	87655	52527	22578	52358
Expenses/kilo	1.77	3.24	2.96	2.41
Rate of return				
as per cent of operating cost	283	114	93	17
as per cent of capital investment	227	36	49	81

a/ Includes bangos, prawn, tilapia, shrimp, ten pounder, spadefish, mullet, barracuda and whitings.

Table 30. Annual costs and returns per hectare by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Average area (hes.)	17.11	14.16	13.04	14.65
		pesos per hectare		
Cash farm receipts				
Stocked fish sold				
Crab	1099	966	280	860
Others[a/]	5882	1663	1580	2898
Other fishes	84	32	76	57
Non-cash farm receipts				
Value of fish used at home	41	12	30	24
Value of fish given away	31	30	18	28
Change in inventory (increase)	- 2	9	20	8
Other non-cash farm income	-	-	34	7
Cash farm expenses				
Stock of fry/fingerling bought	494	305	323	365
Hired labor cost	354	473	143	368
Value of commission	542	278	89	316
Food for laborers	145	23	1	55
Fertilizer bought	125	45	283	119
Chemicals bought	12	4	63	19
Supplementary foods bought	9	3	1	4
Ice	4	17	-	10
Equipment purchased/rented	80	23	43	44
Lease	31	42	5	31
Permit	5	13	8	10
Interest on borrowed capital	30	10	16	17
Miscellaneous	28	26	38	29
Non-cash farm expenses				
Fry gathered/given free	1	1	9	2
Unpaid family labor	2	2	1	2
Other non-cash farm expenses	-	-	34	7
Net cash farm income	5206	1399	923	2428
Net non-cash farm income	67	48	58	56
Net farm earnings	5273	1447	981	2484
Earnings on capital	2812	1499	796	1540
Per cent earned on capital	70	36	37	42
Interest on average inventory	243	252	128	221
Operators farm labor earnings	7121	1260	473	1988
Family farm labor earnings	7127	1262	475	1991
Total other income	1815	2121	1299	1882
Family income from all sources	9179	3632	1900	4093
Expenses/kilo	1.77	3.24	2.96	2.41
Rate of return				
as per cent of operating cost	283	114	93	178
as per cent of capital investment	227	36	49	81

a/ Includes, bangos, prawn, tilapia, shrimp, tenpounder, spadefish, mullet, barracuda and whitings.

8.4. Costs and returns by farm size.

The annual gross income was higher in large farms (₱101,127) than in small farms (₱14,104). Likewise, the former received a higher gross income per hectare than the latter averaging ₱4,025 and ₱3,122 respectively (Table 31).

Farm expenditure including both cash and non-cash was likewise higher in large farms than in small farms averaging ₱34,537 and ₱6,897, respectively (Table 32). However, on the per hectare basis, expenses were slightly lower in the former (₱1,375) than in the latter (₱1,526). Because of a lower gross receipts and higher expenses per hectare in small farms, expenses per kilo of fish produced was higher ₱3,17) in those farms than in large farms (₱2.30).

Realizing a net farm income of ₱6,889 and non-cash income of ₱318, net farm earnings amounted to ₱7,207 or ₱1,596 per hectare in small farms. On the other hand, large farms realized a much bhigher net farm earnings amounting to ₱66,590 or ₱2,650.

Earnings on capital amounted to ₱6,744 in small farms and ₱37,851 in large farms. Similarly, per cent earned in capital was higher in large farms (45%) than in small farms (32%).

Not surprisingly, bigger farms had a higher family income from all sources averaging ₱95,234 than in smaller farms (₱21,733). However, on the per hectare basis, this was higher in the latter (₱4,207) than in the former (₱2,882).

Table 31. Annual costs and returns per farm by farm size.

Item	10 hectare and less	More than 10 hectares	All sizes
Number of farms	30	29	59
		pesos per farm	
Cash farm receipts			
Stocked fish sold			
Crab	3422	22094	12600
Others a/	9569	76467	42451
Other fishes	682	994	835
Non-cash farm receipts			
Value of fish used at home	239	484	359
Value of fish given away	185	643	410
Change in inventory (increase)	-8	246	117
Other non-cash farm income	15	199	106
Cash farm expenses			
Stock of fry/fingerling bought	1541	9276	5343
Hired labor cost	1975	8923	5390
Value of commission	1748	7621	4635
Food for laborers	145	1477	800
Fertilizer bought	147	3404	1748
Chemicals bought	20	531	271
Supplementary feeds bought	24	106	64
Ice	55	234	143
Equipment purchase/rented	441	860	647
Lease	162	750	451
Permit	57	231	142
Interest on borrowed capital	111	403	255
Miscellaneous	358	496	426
Non-cash farm expenses			
Fry gathered/given free	42	26	34
Unpaid family labor	56	b/	28
Other non-cash farm expenses	15	199	106
Net cash farm income	6889	65243	35571
Net non-cash farm income	318	1347	824
Net farm earnings	7207	66590	36395
Earnings on capital	6744	37851	19705
Per cent earned on capital	32	45	42
Interest on average inventory	1247	5058	2825
Operators farm labor earnings	5723	53042	25439
Family farm labor earnings	5782	53042	25474
Total other income	14763	37133	24084
Family income from all sources	21733	95234	52358
Expenses/kilo	3.17	2.30	2.41
Rate of return			
as per cent of operating cost	104	193	178
as per cent of capital investment	34	95	81

a/ Includes, bangos, prawn, tilapia, shrimp, ten pounder, spadefish, mullet, barracuda, and whitings.

b/ Less than one peso.

Table 32. Annual costs and returns per hectare by farm size.

Item	10 hectares and less	More than 10 hectares	All sizes
Average area (has.)	4.52	[illegible]	14.65
		pesos per hectare	
Cash farm receipts			
Stocked fish sold			
Crab	758	879	860
Others[a]	2118	5042	2898
Other fishes	151	40	57
Non-cash farm receipts			
Value of fish used at home	53	19	24
Value of fish given away	41	26	28
Change in inventory (increase)	- 2	10	8
Other non-cash farm income	3	8	7
Cash farm expenses			
Stock of fry/fingerling bought	341	570	365
Hired labor cost	437	555	368
Value of commission	387	504	319
Food for laborers	32	69	55
Fertilizer bought	33	136	119
Chemicals bought	4	21	19
Supplementary foods bought	5	4	4
Ice	12	9	10
Equipment purchase/rented	98	34	44
Lease	36	30	31
[illegible]	13	9	10
Interest on borrowed capital	2c	15	37
[illegible]	79	20	29
Non-cash farm expenses			
Fry gathered/given free	9	1	2
Unpaid family labor	12	b/	2
Other non-cash farm expenses	3	8	7
Net cash farm income	1525	2595	2428
Net non-cash farm income	71	54	56
Net farm earnings	1596	2650	2484
Earnings on capital	1529	1543	1540
Per cent earned on capital	32	45	42
Interest on average inventory	283	206	221
Operators farm labor earnings	1297	2162	1988
Family farm labor earnings	1311	2162	1991
Total other income	3347	1514	1882
Family income from all sources	4927	3082	4093
Expenses/kilo	3.17	2.30	2.41
Rate of return			
as per cent of operating cost	104	193	178
as per cent of capital investment	34	95	81

a/ Includes bangos, prawn, tilapia, shrimp, tennpounder, spadefish, mullet, barracuda, and whitings.

b/ Less than one peso.

9.0. Labor Utilization

9.1. Labor requirement

Table 33 shows that repair of dikes, screens, and gates was the most laborious operation consuming 21.3 man-days per hectare. Weeding, the second labor-consuming operation utilizing 3.2 man-days was highest in Bicol and lowest in Visayas/Mindanao. Labor utilized for pond preparation and water management were highest in Luzon utilizing 6.2 and 4.3 man-days per hectare respectively. Thelowest on the other hand, were in Visayas/Mindanao utilizing 0.8 man-day for the former and in Bicol (0.3) for the latter operation. Harvesting was not as labor consuming as the four operations mentioned above. It consumed 1.2 man-days in Luzon and 0.6 in Visayas/Mindanao.

Labor consumed for all operations was highest in Bicol and lowest in Visayas/Mindanao. Similarly, Bicol had the most number of man-days utilized per farm for all operations totalling 651 (Table 34). The lowest was also utilized in Visayas/Mindanao. This big difference could not be attributed solely [illegible] to farm size since a farm in Bicol averaging 14.22 hectares was only a little bigger than that in Visayas/Mindanao averaging 12.76 hectares.

Table 33. Labor requirement in crab farms by operation per rearing per hectare by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Total area (has.)	199.01	426.56	204.10	829.69
		man-days		
Repair of dikes, screens, gates	9.0	35.4	4.1	21.3
Pond preparation	6.2	2.2	0.8	2.8
Pest control	0.3	0.2	a/	0.2
Fertilization	0.4	0.4	0.1	0.3
Water management	4.3	0.3	0.4	1.3
Stocking	1.4	0.2	0.1	0.5
Feeding	0.8	0.7	a/	0.5
Weeding	3.3	4.7	0.1	3.2
Harvesting	1.2	1.1	0.6	1.0
Sorting, counting, packing	0.4	0.6	0.5	0.6
Repair of equipment	0.2	-	0.1	0.1
Total	27.5	45.8	6.9	31.8

a/ Less than 0.05 man-day.

Except for minor operations such as pest control, fertilization, stocking, and repair of equipment, all the remaining operations utilized greater man-days in the smaller farms (Appendix Table 9). Furthermore,

Table 34. Labor requirement in crab farms by operation, per rearing per farm by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	16	61
		man-days		
Repair of dikes, screens, gates	119.6	502.6	52.7	290.4
Pond preparation	82.2	31.1	9.9	38.1
Pest control	3.5	2.4	.5	2.1
Fertilization	5.5	5.9	1.7	4.7
Water management	57.2	4.5	5.1	17.6
Stocking	19.0	3.5	.9	6.6
Feeding	10.0	9.4	.4	7.2
Weeding	43.3	67.3	1.2	44.1
Harvesting	16.4	15.1	7.0	13.3
Sorting, counting, packing	4.9	9.1	7.0	7.5
Repair of equipment	3.4	-	1.7	1.3
Total	365.0	650.9	88.1	432.9

the smaller farms consumed 52.9 man-days per hectare in doing all operations which was almost twice that utilized in bigger farms (27.7 man-days).

A direct relationship existed between the number of man-days utilized per operation and the size of farm. Thus, a small farm utilized only 240.1 man-days compared to 619.5 man-days in a large farm (Appendix Table 10).

9.2. Farm personnel

9.2.1. Caretakers

It was a general practice (72%) to hired caretakers in the fishpond and this was true in four fifths of farms in Bicol (Table 35). Obviously, a higher percentage (94%) in large farms hired caretakers compared to smaller farms (50%).

A total of 66 caretakers were hired by 44 farms in all regions averaging 1.5 per farm. Fifteen small farms hired one caretaker each while in large farms, the number of caretakers hired ranged from one to eight. Only one farm in Southern Luzon having an operational area of 90.54 hectares hired 8 caretakers.

Caretakers were compensated in different ways. Compensation could be salary only, commission only or a combination of the two. Among these three the first one was the mostpopularly practiced (41%).

Table 35. Hiring of caretakers and mode of compensation in crab farms by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	16	61
Presence of caretaker				
With				
Number	11	25	8	44
Per cent	73	83	50	72
Without				
Number	4	5	8	17
Per cent	27	17	50	28
Total number of caretakers	21	32	13	66
Number of caretakers/farm	1.9	1.3	1.6	1.5
Compensation				
Monthly salary				
Number	5	19	3	27
Per cent	24	59	24	41
Salary/month (pesos)	184	181	200	183
Commission[a/]				
Number	5	3	5	13
Per cent	24	10	38	20
Commission/year (pesos)	14,179	322	2,921	7,802
Salary plus commission				
Number	11	10	5	26
Per cent	52	31	38	39
Salary/month (pesos)	236	176	160	198
Commission/year (pesos)	13,704	5,479	1,227	8,141

[a/] Two caretakers were without commission due to loss.

On the average a caretakers received a fixed salary amounting to P183 per month or P2196 annually. Caretakers in large farms received a much higher monthly salary of P189 compared to P160 in small farms.

The commission could be a percentage of gross produce, gross sale or net profit. A caretaker in Bicol received commission equivalent to P322/year very much lower compared to that in Luzon's P14,179. Caretakers in large farms received a commission (P10,693) almost twice of that received by those in the smaller farms (P5,394).

For the third type of compensation, a caretaker received a monthly salary of P198 or P2,376 per year plus commission amounting to P8,141 on the average, a total income of P10,517 was earned by each caretaker from the farm.

9.2.2. Laborers/helpers

Laborers and helpers were hired to do the different operations in the pond. Almost all (97%) farms hired laborers averaging 11.5 laborers

per farm (Table 36). More than four fifths of these laborers were paid a daily wage. A small fraction was paid on contractual basis, by fixed salary, cash, kind, or both cash and kind.

Table 36. Hiring of laborers/helpers and mode of compensation in crab farms by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regionss
Number of farms	15	30	16	61
Hiring of laborers/helpers				
Number	13	30	16	59
Per cent	87	100	100	97
Total number of laborers	155	370	153	678
Number/farm	11.9	12.3	9.6	11.5
Compensation				
Monthly salary				
Number	4	2	-	6
Per cent	3	1	-	1
Salary/month (pesos)	165	95	-	142
Daily wage				
Number	123	368	72	563
Per cent	79	99	47	83
Wage rate	12	8	8	9
Contractual basis				
Number	28	-	56	84
Per cent	18	-	37	12
Amount received/year (pesos)	567	-	206	327
Others[a/]				
Number	-	-	25	25
Per cent	-	-	16	4

a/ Others includes payment in cash or kind or both.

Wage rate ranged from P8 in Bicol and Visayas/Mindanao to P12 in Luzon. Laborers in large farms were paid a daily rate of P10 while those in smaller farms were given P8.00.

Laborers were contracted in most cases to do the repair of dikes, screens, and gates. Different measurements were used in determining the volume of their work and the amount to be paid to them. These laborers may be paid per hole, per meter, per fathom or per meter square. The annual income received by these laborers from the farm averaged P327.

Seldom practiced was payment of laborers by fixed salary. A laborer received a monthly income of P142 or P1704 annually.

Overseer/administrator. Only one farm in Ilocos region belonging to more than 10 hectare farm size group hired an overseer or administrator receiving a monthly salary of P300 plus P32,420 as commission.

10.0. Financing

Majority (86%) of the crab farm owners utilized their own savings as operating capital. Only 14% borrowed 25-100% of their operating capital from relatives private individuals, or from banks. Operating capital borrowed were used for the purchase of inputs like fry and for development.

11.0. Some social considerations, problems and plans

11.1. Caretaker-owner relationship

Four out of the 10 caretaker respondents reported that the owner visited their farm weekly, 2 visited their farms yearly and one each for everyday, twice a week, 6 times/year and twice a year. With regards to decision making, 3 reported that the owner solely made the decisions while 3 said that both the owner and caretaker participated in decision making. Only one caretaker solely made the decisions.

Majority (80%) of caretakers received some amenities from the owners. Amenities given may either be in the form of cash or kind. When asked about their present relationship with the owner, 70% answered "fairly satisfied" and 30% were "very satisfied".

11.2. Level of living indicators

Majority of owners in Bicol rated their income as "moderate" (81%) while 31% said "very adequate". In Visayas/Mindanao on the other hand, income was rated as "just enough" (42%), "very adequate" (29%) and "moderate" (29%). Among the caretaker respondents, majority (70%) rated their income as "just enough". Only 10% reported that their income was "not adequate". To overcome this inadequacy, some of them resorted to borrowing.

Ownership of some important properties and various items could indicate the level of living of the farm respondents. Majority of the operators owned their residential house and lot (Table 37). Few were rented or borrowed. With regards to caretaker respondents, residential house and lot were either owned or part of the fishpond area.

All owner respondents in Bicol and Visayas/Mindanao owned their residential house while their lot were mostly owned. Seventy five per cent of 3 caretakers in Bicol owned their residential house while only one was provided by the owner. Residential lot was either owned or part of the fishpond area.

Table 37. Level of living indicators by type of respondent and by region.

Item	Luzon		Bicol		Visayas/ Mindanao		All regions	
	Owner	Care-taker	Owner	Care-taker	Owner	Care-taker	Owner	Care-taker
Number reporting	10	4	26	4	14	2	50	10
				number				
Radio	10	3	17	4	14	2	41	9
Portable record player	3	-	12	1	6	-	21	1
LPG stove	3	-	13	1	9	-	25	1
Kerosene stove	2	1	2	2	2	-	6	3
Kerosene lighting	3	1	8	3	9	1	20	5
Electric lighting	3	-	13	-	3	1	19	1
Dining tables and chair	6	2	20	3	12	2	38	7
Sala set	5	-	25	3	14	2	44	5
Bed	4	2	25	3	14	2	43	7
Others	1	1	25	1	5	-	31	2
Residential house								
Owned	9	1	25	3	14	1	48	5
Rented	1	-	-	-	-	-	1	-
Others a/	1	2	-	1	-	1	1	4
Residential lot								
Owned	8	-	21	2	13	-	42	2
Rented	1	-	2	-	1	-	4	-
Others a/	-	2	-	2	-	2	-	6

a/ Include part of the fishpond area and borrowed.

In terms of household items, more owners in Bicol and Visayas/Mindanao have various items such as radio, portable record player, LPG stove, kerosene lighting, electric lighting, dining tables and chair, sala set, bed and others. Others consisted of TV, refrigerator, telephone, piano and stereo. More caretakers in Bicol owned most of the items mentioned above as compared to the other regions. It was noted that only one caretaker in Visayas/Mindanao reported to have electric lighting.

11.3. Attitudes towards the crab farm business

Majority (81%) of respondents thought that their children would like to enter the fishpond business. More than four-fifths would really encourage their children to enter the business mainly because of its being a good source of income or profitable business (59%). Other minor reasons given were its being a family business, source of livelihood in the area, to help in improving the techniques of the industry and in the campaign for food production, and to have a continuous supply of fish (Table 38). Those who did not want their children in the business cited that it was a costly and laborious business and they wanted their children to be professionals.

Table 38. Reason for advising children to enter the fishpond business by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number reporting	14	28	14	56
		per cent		
Encourage children to enter the business				
Yes	93	79	86	84
No	7	21	14	16
Reasons				
Good source/profitable	46	68	58	59
Family business	15	5	25	13
Others a/	39	27	17	28

a/ Includes main source of livelihood in the area, help in improving the techniques of the industry, to have a continuous supply of fish, and help in the campaign for increased food production.

11.4. Membership in fishery organization, problems and plans

Only 8 owner respondents were members of a fishery association. Six out of [illegible] were in Bicol. As members, some of the benefits they obtained were price control of inputs and product, continuous supply of enough fry/fingerling and technical information. One operator from Bicol received no benefit from such association.

Several problems were encountered in the fishpond industry as cited by crab farm operators. Unavailability of supply of inputs was the major problem, followed by peace and order situation, unfavorable price structure, insufficiency of operating capital, lack of proper infrastructure, unpredictability of weather, unavailability of technical support (Table 39). Minor problems cited were unavailability of credit, predators, loose soil, great mortality, slow growth of produce, and delayed release of lease agreement. Only one farm operator in Luzon reported no problem.

Although unavailability of technical support was not a major problem in the fishpond industry, majority of owners/caretaker in Luzon and Visayas/Mindanao were hardly reached by extension workers (Table 40). All of the respondents in Bicol on the other hand, had been reached by extension workers. Information given were mostly technical in nature, like proper fishpond operation, use of fertilizer and chemicals, growth of lab-lab, depth of water to be maintained, proper care of fish, construction and planning of fishpond layout, and leases legal technicalities. Only one in Luzon reported that no information was extended to him.

As presented in Table 41 all the respondents strongly believed that the government could contribute a lot in improving the fishpond industry.

Table 39. Problems encountered in the industry by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number reporting	12	30	15	57
Problems[a/]		per cent		
Unavailability of supply of inputs	17	33	33	30
Peace and order	17	30	7	21
Unfavorable price structure	8	20	27	19
Insufficiency of operating capital	17	7	40	18
Lack of proper infrastructure	8	30	-	18
Unpredictability of weather	33	17	-	16
Unavailability of technical support	-	13	27	14
None	8	-	-	2
Others[b/]	25	40	13	30

[a/] Percentages total more than 100 since some respondents gave more than one problem.

[b/] Others includes unavailability of credit, predators, loose soil, great mortality, slow growth of produce and delayed release of lease agreement.

Table 40. Extension assistance received by owners/caretakers of crab farms by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number reporting	14	30	16	60
		per cent		
Reached by extension workers				
No	64	-	81	37
Yes	36	100	19	63
		number		
Information given				
Technical information[a/]	3	27	2	32
None	1	-	-	1
Others[b/]	-	5	1	6

[a/] Include proper fishpond operation, use of fertilizer and chemicals, growth of lablab, depth of water to be maintained, proper care of fish, construction and planning of fishpond lay out and lease's legal technicalities.

[b/] Includes sources of fry and fingerlings and where fertilizer could be obtained.

The government assistance could be in the form of credit extension, technical assistance and subsidy on price inputs. Few others consisted of supply of inputs, peace and order maintenance, regulation of fry transport, and moral support.

Table 41. Government assistance and cooperation to improve the industry.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	16	61
Suggested government assistance (number)		number		
Credit assistance	7	13	8	28
Technical assistance	-	4	5	9
Subsidy on price of inputs	4	2	2	8
Others[a/]	4	14	1	19
Cooperation among fishpond operators/ caretakers		per cent		
Yes	87	100	87	93
No	13	-	13	7
		number		
Sharing of technical know how	3	23	1	27
Credit assistance	3	-	3	6
Others[b/]	11	3	6	20

[a/] Includes supply of inputs, peace and order maintenance, regulation of fry transport, and moral support.

[b/] Includes organization of security groups, elimination of middleman, minimizing transportation cost, stabilization of price structure, continuous supply of inputs, and unite in asking for government help.

Aside from government assistance, cooperation among fishpond owners/ caretakers could also help improve the fishpond industry as reported by 93% of the respondents. Sharing of technical know-how and credit assistance were some of the ways in which cooperation could help.

Following better methods of other fishpond owners/caretakers to improve production was done by majority of owners/caretakers in Bicol and Visayas/Mindanao with 97 and 86% respectively. In contrast, only 27% of owner/caretakers in Luzon reported to have followed the recommendations. Cultural methods followed consisted of the growing of natural food e.g. lumot and lab-lab, use of fertilizer and chemicals, supplementary feeding, proper stocking rate, length of culturing fish, and levelling of ponds. In addition, all the respondents who reported, attempted to improve their cultural practices.

Majority (63%) of the respondents had plans of expanding the business. However, most were faced with problems such as unavailability of capital, unavailability of land, lack of technical services, unavailability of fry, and unavailability of manpower (Table 42).

Table 42. Plans of expanding the business by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number reporting	15	29	16	60
			per cent a/	
Plans of expanding				
Yes	67	69	50	63
No	33	31	50	37
Problems of expanding				
Unavailability of capital	60	75	62	68
Unavailability of land	10	10	25	13
None	20	-	-	5
Others b/	10	25	13	21

a/ Percentages total more than 100 since some respondents gave more than one problem.

b/ Others includes lack of technical services, unavailability of fry, and unavailability of manpower.

12.6. Summary

A total of 61 sample crab farms were studied covering seven regions throughout the country namely: Ilocos, Cagayan Valley, Central Luzon, Southern Luzon, Bicol, Western Visayas and Western Mindanao. Of the 61 farms only four cultured pure crab. Fifty seven farms stocked crab in combination with other species e.g. milkfish, prawn, tilapia, shrimps, spadefish, etc.

The most number of crab farms (15) started in the 1960's with a large proportion coming from Bicol (30%). Likewise, almost 200 hectares or 24% of the total area were developed in the 1960's.

On the average, 37% of the sample farms was owned while a much higher percentage (61%) was leased. Majority (82%) of crab farms were operated as a single proprietorship.

More than four fifths of the crab farm respondents were male. Almost all (98%) of the operators had received formal education, except for one owner operator in the Bicol region. While 52% of the respondents were in their present residence since birth, 48% had migrated to their present residence due to the location of the fishpond, change of occupation, search for better opportunity, marriage and education of their children.

Some of the reasons given by the operators for venturing into the fishpond business included its being the main source of livelihood in the area, line of specialization and good/additional source of income.

Duration of pond preparation in crab farms ranged from 16 days in Luzon to 31 days in Visayas/Mindanao. In general farms were repaired only when needed. Pond cleaning and levelling were done in majority of the farms. Likewise, almost all of the farms practiced pond drying with the length of drying ranging from 8 days in Luzon to 11 days in Bicol. Large farms spent longer time (11 days) drying their ponds than small ones (9 days).

Predators and competitors in the farms included crustaceans, reptiles, birds, frogs, polychaete worms and other fishes. Nine, three per cent of all farms eradicated them through catch and kill, use of chemicals, pond drying and draining. Only 27 out of 61 farms applied chemicals such as Aquatin, Endrin, Gusathion, Thiodan, Brestan, Sodium dyanide and Bubli. Endrin was the most widely used pesticide applied at the rate of 11 ounces per hectare. Except for Brestan, chemicals were applied at a higher rate in large farms than in small farms.

Only 46% of the farms applied fertilizer either organic or inorganic. Chicken manure was the most commonly used organic fertilizer applied at the rate of 38 sacks per hectare. Of the inorganic fertilizers used, urea was applied at the rate of 84 kg. per hectare while the complete type 14-14-14 was 171 kg. For the nitrogen-phosphorus type, rate per hectare was 93 kg.

Forty nine out of the 61 crab farms purchased crab seeds, in most cases (46%) from other towns but within the provincial location of the pond. On the average, 46% of the operators acclimatized their stock for 9.5 hours. Seventy per cent of operators in Bicol practiced acclimatization while only 6% in Visayas/Mindanao did this. Almost a similar proportion of crab farm operators did stock their ponds in the early morning (57%) and late afternoon (52%). In Luzon, however, time of [illegible] not considered in stocking ponds.

Most farms stocked crab in May. The largest volume of fry was stocked in August averaging 12.18 thousand pieces. On the average, price of crab seed was ₱149 per thousand. Average mortality rate from stocking to harvesting was higher in combination farms e.g., crab-milkfish-prawn (30%) and lower in pure crab farms (18%). Causes of mortality were sudden change of weather, typhoon, predators, and lack of food.

Only 19 out of 61 crab farm operators supplemented the natural food in the pond with the practice being more predominant in Luzon. Rice bran was the most widely used supplementary feeds.

The more dominant factor considered in determining date of cropping was the size of stock. Duration and number of rearings of crab averaged 5.85 months and 1.17 times. Crab in monoculture farms were reared for a longer time averaging 6.50 months as compared to 5.79 months in polyculture farms. Majority (74%) of the farms harvested their crop totally.

A monoculture crab farm produced a total of ,280l or 339 kilos per hectare. Productivity in combination farms was higher averaging 6498 or 698 kilos. Productivity per hectare of pure crab farm was highest in Bicol (476 kilos) and lowest in Luzon (90 kilos). In the crab polyculture farms on the other hand, productivity was lowest in Visayas/Mindanao (382 kilos) and highest in Luzon (1182 kilos). A higher yield per farm and per hectare was obtained by large farm operators than the small farmers.

More farms reported to have cropped in December. Quantity cropped ranged from 167 kilos in February to 1442 kilos in July. Crabs harvested in February received the highest price, ₱11.36 per kilo while the price was lowest, ₱6.24 in August. Almost all of the produce in crab farms were sold on wholesale basis at an average price of ₱7.63 per kilo.

As expected, the big portion of the capital investment (94%) averaging ₱42,377 or ₱2893 per hectare went to land. Other than land, capital investment in crab farms constituted mainly of farm buildings and transportation.

On the average, a crab farm received a total income of ₱56,878 of which 98% was cash and 2% non-cash. Gross receipts realized per farm and per hectare was bigger in crab polyculture farms particularly in the crab-milkfish-prawn (₱82,447 or ₱4413) than in crab monoculture farms (₱22,079 or ₱1508).

Almost all (99%) of the expenditures incurred were in cash. A one hectare monoculture farm spent only ₱620 per year as compared to ₱1,606 incurred in crab-milkfish-prawn polyculture farm. Net cash farm income earned was ₱35,571 or ₱2128 per hectare while non-cash farm earnings was quite small amounting only to ₱824 or ₱56. Net farm earnings averaged ₱36,395 or ₱2,484 per hectare. The per hectare farm receipts ranged from ₱2038 in Visayas/Mindanao to ₱7135 in Luzon. Farm expenditure incurred was lowest in Visayas/Mindanao (₱1057) and highest in Luzon (₱1862). Apparently, a crab farm in Luzon realized the highest net cash income and net farm earnings amounting to ₱5205 and ₱5273 per hectare.

The annual gross income per hectare was higher in large farms (₱4025) than in small farms (₱3122). Although expenditure incurred per farm was higher in large farms than in small farms, the expenses were slightly lower in the former (₱1375) than in the latter (₱1526) on the per hectare basis. Realizing a net income of ₱6889 and non-cash income of ₱318, net farm earnings amounted to ₱7207 or ₱1596 per hectare in small farms. On the other hand, large farms realized a much higher net farm earnings amounting to ₱66,590 or ₱2650.

Labor consumed per farm and per hectare for all operators was highest in Bicol and lowest in Visayas/Mindanao. A direct relationship existed between the number of man-days utilized per operation and the size of farm. Thus, small farm utilized only 240.1 man-days as compared to ₱619.5 man-days in large farm.

In general caretakers were hired in the fishpond and this was true in four fifths of farms in Bicol. A total of 166 caretakers were hired by 44 farms in all regions averaging 1.5 per farm. Caretakers were paid mostly (41%) by monthly salaries averaging ₱183 or ₱2196 annually. Caretakers in large farms received a much higher monthly salary of ₱189 compared to ₱160 in small farms.

Almost all (97%) farms hired laborers averaging 11.5 laborers per farm. More than four fifths of these laborers were paid a daily wage with the rate ranging from ₱8 in Bicol and Visayas/Mindanao to ₱12 in Luzon. Only one farm in Ilocos region belonging to more than 10 hectare farm size group hired an overseer or administrator.

Only 14% of the crab farm owners borrowed 25-100% of their operating capital from relatives, private invidiuals, or from banks.

Majority of operators owned their residential house and lot. With regards to caretaker respondents, residential house and lot were either owned or part of the fishpond area. In terms of household items, more owners in Bicol and Visayas/Mindanao have various items such as radio, portable record player, LPG stove, kerosene lighting, electric lighting and others. More caretakers in Bicol owned most of the items mentioned earlier as compared to the other two regions.

Major problems encountered in the fishpond industry as cited by crab stock operators include unavailability of supply of inputs, peace and order situation, unfavorable price structure, insufficiency of operating capital, lack of proper infrastructure, unpredictability of weather and unavailability of technical support.

Appendix Table 1. Regional distribution of fishpond samples by type of stock.

Region	Pure Crab	Crab-Prawn	Crab-Milkfish	Crab-Milkfish-Prawn	Crab and others 1/
Ilocos	-	-	-	2	1
Cagayan Valley	-	-	-	1	-
Central Luzon	-	-	2	-	-
Southern Luzon	1	3	-	5	1
Bicol	1	3	8	16	2
Western Visayas	2	1	-	6	3
Western Mindanao	-	-	-	1	2
Philippines	4	7	10	31	9

1/ Others include bangos, prawn, tilapia, shrimp, spadefish, barracuda, mullet, whitings and ten-pounder.

Appendix Table 2. Pond preparation and repair in crab farms by farm size.

Item	Less than 10 has.	More than 10 has.	All Sizes
Number of farms	30	31	61
Pond preparation before arrival of fingerlings (days)	20	25	22
		per cent	
Frequency of general pond repair[a]			
Only when needed	33	52	43
Prior to every stocking	47	23	34
Others[b]	17	32	25
No repair	3	-	2
Frequency of cleaning			
Prior to every stocking	63	69	56
Only when needed	20	32	26
Others[b]	7	16	11
Not cleaning	10	3	7
Practiced pond drying			
Yes	93	94	93
No	7	6	7
Length of drying (days)	9	11	10
Practiced pond levelling			
Yes	63	74	69
No	37	26	31

[a] Percentages total more than 100 since some respondents gave more than one answer.

[b] Includes after typhoon, yearly, monthly [illegible]tinuous.

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Appendix Table 3. Chemical application in crab farms 27 farms.[a]

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	12	4	11	27
			rate per hectare	
Pesticide used				
Aquatin (oz.)	25	-	11	15
Endrin (oz.)	12	14	6	11
Gusathion (oz.)	7	-	15	15
Thiodan (oz.)	12	-	-	12
Brestan (kg.)	1	1	1	1
Sodium cyanide (kg.)	b/	-	-	b/
Tubli (bundle)	1	19	-	1
Average area applied (ha.)	9.15	21.15	14	12.98
			per cent	
Frequency of application				
Prior to every stocking	92	100	64	82
Only when needed	8	-	9	7
Once a year	-	-	27	11

[a] Thirty four farms did not apply chemicals.

[b] Less than 0.5.

Appendix Table 4. Acclimatization and water level maintained during rearing period in crab farms by region.

Item	Luzon	Bicol	Visayas/ Mindanao	Philippines
Number of farms	15	30	16	61
			per cent	
Practiced acclimatization				
Yes	47	70	6	48
No	53	30	94	52
Number of hours	7.5	10.2	8.0	9.5
Water level maintained during rearing period (cm.)	89	95	94	94

Appendix Table 5. Quantity, value and price of crab seed, stocked per farm by month, 1974-75

Month	Number reporting	Quantity per farm	Value per farm	Price per thousand pieces	Per cent of total
1974					
April	5	8.20	1,264	154	16
May	11	3.50	479	137	15
June	7	3.33	448	135	9
July	8	4.62	530	115	14
August	4	12.18	2,438	200	19
September	4	3.11	460	148	5
October	2	2.60	214	82	2
November	3	10.17	1,375	135	12
December	4	3.58	559	156	6
1975					
January	-	-	-	-	-
February	2	2.60	387	149	2
March	1	.30	36	120	a/
Monthly average	-	5.03	748	149	-

a/ Less than 1 per cent.

Appendix Table 6. Monthly quantity, value and price of crab cropped per farm, 1974-75.

Month	Number reporting	Quantity per farm	Per cent of total	Value per farm	Price per kg.
1974-1975		kilos		pesos	pesos
April	5	313	2	2445	7.00
May	4	424	2	3405	7.84
June	6	897	6	6227	6.94
July	9	1442	13	10368	7.19
August	8	744	6	4337	6.24
September	10	1405	14	12778	9.09
October	12	256	3	2107	8.28
November	14	724	10	5834	8.06
December	20	832	17	7235	8.70
January	12	1294	16	8560	6.61
February	7	167	1	1897	11.36
March	11	882	10	6226	7.06
Monthly average	-	831	-	6420	7.73

Appendix Table 7. Average capital investment per farm and per hectare in crab farms by region.

Item	Luzon	Bicol	Visayas/ Mindanao	All regions
Number of farms	15	30	14	59
Average area (ha.)	17.11	14.16	13.04	14.65
		pesos per farm		
Land	34,356	54,707	24,552	42,377
Farm buildings	2,430	831	780	1,225
Transportation	1,403	854	186	835
Nets	798	350	74	398
Containers	65	42	11	41
Other Tools	657	125	194	277
Total	39,709	56,909	25,797	45,153
		pesos per hectare		
Land	2,008	3,862	1,882	2,893
Farm buildings	142	58	60	84
Transportation	82	60	14	57
Nets	47	25	6	27
Containers	4	3	1	3
Other tools	38	9	15	19
Total	2,321	4,017	1,978	3,083

Appendix Table 8. Average capital investment per farm and per hectare by farm size, 59 farms.

Item	10 hectares and less	More than 10 hectares	All sizes
Number of farms	30	29	59
Average area (ha.)	4.52	25.13	14.65
		pesos per farm	
Land	19,681	65,857	42,377
Farm buildings	492	1,984	1,225
Transportation	455	1,228	835
Nets	174	631	398
Containers	27	54	41
Other tools	170	387	277
Total	20,999	70,141	45,153
		pesos per hectare	
Land	4,357	2,621	2,893
Farm buildings	109	79	84
Transportation	101	49	57
Nets	38	25	27
Containers	6	2	3
Other tools	38	16	19
Total	4,649	2,792	3,083

Appendix Table 9. Labor requirement in crab farms by operation per rearing per hectare by farm size.

Item	10 hectares and less	More than 10 hectares	All sizes
Total area (has.)	135.98	693.71	829.69
Repair of dikes, screens and gates	35.4	18.6	21.3
Pond preparation	3.0	2.7	2.8
Pest control	0.1	0.2	0.2
Fertilization	0.1	0.4	0.3
Water management	1.4	1.3	1.3
Stocking	0.4	0.5	0.5
Feeding	0.8	0.5	0.5
Weeding	9.0	2.1	3.2
Harvesting	1.5	0.9	1.0
Sorting, counting, packing	1.1	0.4	0.6
Repair of equipment	0.1	0.1	0.1
Total	52.9	27.7	31.8

Appendix Table 10. Labor requirement in crab farms by operation per rearing per farm by farm size.

Item	10 hectares and less	More than 10 hectares	All sizes
Number of farms	30	31	61
		man-days	
Repair of dikes, screens and gates	160.6	416.1	290.4
Pond preparation	13.7	61.7	38.1
Pest control	0.5	3.7	2.1
Fertilization	0.5	8.7	4.7
Water management	6.4	28.5	17.6
Stocking	1.7	11.4	6.6
Feeding	3.8	10.5	7.2
Weeding	40.8	47.2	44.1
Harvesting	6.9	19.4	13.3
Sorting, counting, packing	4.9	10.1	7.5
Repair of equipment	0.3	2.2	1.3
Total	240.1	619.5	432.9