Assessaeat and **Evaluation of Aquaculture** Practices in llocos Sur

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Abstract

This study aimed to conduct an impact assessment and ewalutior *af aguaeudra* practicas *S llocas Sr, {t triad to determine the socio-demographic and economic characteristics of the raspadgmis, tha* agaeltoa *status, ayd* the *larwel af assessment and to idntfy the problems in aquaculture. One hundred-eightfish famars saywd as respondents, Sir wen* takew fnoms ewer coastal - *ICpd* ...

On the socio-demographic characteristics of the respondents, mjorly oftkafishfarmers ware male (9,7434), mast wane withia *the age bracket of35-44 (2$%), and 81.48% were married, 49.07% kad* 3 o 4 *ckilden and tkrea tofour dependents(47.22%), Os the eductiona! attainment of the respondents, most of then were high school gradates (29,63%).*

O the socio-economic characteristics, majority of the fish farmers {55.3,$36) had a monthly ineons below P,3,002,00 frow *fishing. Aside from fishing, farming was considered as another sore of liwelilsod, Mass of* tha respondents *had prmanes bungalow type houses anddeclared the income derivedfrom fishing as sufficient to spport their faunilias, Mass of the fisk farmers* owed radio, *elcctr... and ekrvisions,*

On the status of aquaculture methods, most of the fish farmers utilized fishponds for aquaculture, did not use pesticides to eradicate pests and predators, and applied fertilizer by means of the broadcast method. Most of the fish species were stocked at 20 pieces/m². Feeding the fishes with commercial feeds attained the highest percentage at 83.33%. Majority of the respondents adopted 5% of the total body weight given as food to the culture organisms.

Freshening of water in the pond was done depending upon th condition of the waler, As ko the mthod af karwesting the stock, majority used the partial harvest method by means of the gill net. On the exilewt of' distribution of tle product, majorty said 4lair harvest through retail. Ou the equipment for aquaculture farming, majority seed and owned o generalor.

Tapia was the dominant species being cultured (87.04%), followed by milkfisk {$1.83%6), and sigarids {(37.96%6).

Ponds were seldom prepared by majprity of he fish farmers; fisk acclimatization before skooking as occasionally done (r-s3,26), stockig in the early morning was preferred by more respondents {r=3..$6) sics tke emperatrs is more forwarabla for tlafishes, and stocking in the late aferoon was less preferred by the fiskpond ow9rs; nurageant *of lke pond was seldom peaeticad;* karvastiwg *of fish was done in due time; and fish sortig, handling and wasketig were seldom pratticad,*

High price of feeds, lock of extension services, laxity in the enforcement Of fishery lows; lack of aid from govern*mamt agencies; and unfavorable environment were considered by fish farmers as wery pressing prohlens.*

More financial assistance should he giwen by concerned government agencies ad nos-gowernnao agencies to agent! iprove the fish farmers' livelihood. Fishery laws should be strictly implemented by tke gowarmmweni. Further study an the economic impact of the aquaculture practices of fish farmers in the Ilocos Ragiow skold ha candweted,

Introduction

ıAnotıe ta

World fisheries production has stopped increasing, many inshore fisheries stocks are overexploited and there are few new stocks to exploit. In Asia and the Pacific, severe over-fishing is compounded by the use of destructive technologies like explosives and poisons that damage the fisheries habitat (Newkirk, 1990).

It is blieved tat the only means to significantly raise fish productioa levels is through aquaculture ans improved practices ud managemeot ols for local fishers.

Two main reasons for lack of development in small scale aquaculture are: lack of research otecl al problems ad relevt techwaokgy ad leek af cnhrl of extemal impacts.

Mest of the basic productioa methodologies used for freshwater fishponds have bees devekped by farmers with little, if aay, "scientific" input, Freshwater fish armers have had sn incentive to conduct experiments by tleelves mnd invest is «iterative technokgy because they have corlled access to the required esoces and expect returs freffrts ms@de,

'The province of locosur has a vst area of wtr resources feashle for fish ciltivatin. These 4tr ts&mis include pats, rivers, streems, estuaries, lagoons, ponds, inrigated and swamp areas,

To date, locos Sur inlsnd water resources have not bee thoroughly inventoried and classifed i terms of their productivity and fisheries potential, The lack of aquate and reliable data on the status of fishery resources of the provines hinters acer estimate of its potentials, Recondd catches are often underestimated and these are not adequate for purposes of assessment ad policy formlat i ow its devekpmen, conservatim and management.

Results of' his study will serve as benchmark iafraation in determining the cret trerd of aquaculture ad the siatns of fish farmers ithe utilization of aquatic resources. Furthermore, the data gathered will help BFAR agencies in tle formulation of plas and plicies in the conservation and management of thes resources.

Objectives

This study evaluated the aquaculture practices of fish farmers in 1locos Sur.

Specifically, it sought to

1. dtermine the profile of the respondeats in terms of
   a. socio-«demographic and
   - economic chsrcteristics;
2. identify the status of qqoositure in terms of methodologies, and agencies that help i the improvement of fish eulore practices;

3. identify tho species of fish cultivated;
4. delen ine the level of aquaculture practices of the fish faners; ad
5. determine the aquaculture-related problems encountered by the respondents,

Definition o& Terrs

Rgaectfuiss, This term refers to the different fish culture activities like pond pepart'ion, stocking, management, harvesting, 4ad fish handling and marketing,

{no@dead. fhla is s method of swing feds ly scattering or thowirg in any direction.

Fr.sheig. ks refers to the regular changing of pond water.

Nturg! Feeds, This term refers to the planktons which gow after the ap2ty fQ r fer{lb Her fl nd pM#66»

Prial Harvest, Only a portion of the stocked animals are removed from a full pod or cage using a seine net fr **ponds and** bucket fr cases; edditional juveniles are often stocked into the pond after **a** partial harvest, and the production cycke cn#es

Total Harvest The pond is drained and all animals are removed from the pod.

Revier of Relasted Litersture

Aquaculture is fring of squtic organisms in fresh, brackish or salt wier, A wide variety *of* squatic organisms are produced through aquaculture, including fishes, crustaceans, mo!tusks, algae, and aquatic plants. Ulike capure fisheries, aquaculture requires deli}rate human interveniu *in the organisms'* productivity ad results in yields tht exceed hose from the netural environment *lone.* Stocking water with *seed* (juvenile organisms}, fertilizing the water, eeding the organisms, and maintaining water quality are common examples of such intervertiOs.

Most aquaculture crops re destined for human consumption. However, aquaculture als pokes hait fishes, or#mental or qarim fishes, aquatic animals used to augment natural populations for capture end sport fisheries, algae used fr chemical extraction, and pear oysters and mussels, asnnag others,

Aquaculture is considered sn agricultural activity, despite the many differences between quaciture an terrestrial agriculture, Aquacukure mainly produces protein crops, while starchy staple crops are the primary products of terrestrial «grkulnae, { sdltin, terrestrial animal waste can be disposed of6ff-site, whereas in aquaculture such waste accumulates in the culture environment. Conquenly, aquaculirists must carefully manage their production units *to*

ensure that water quality does not deteriorate and become stressful to the culture organism.

Aquaculture was developed more than 2000 years ago in countries such as China, Rome, Egypt, Norway, after, «quaculture practises in fwrope, China, and Japan commonly involved stocking wild-caught seed example, carp fierlings (jwvenikc fish) captured from rivers ponds or other bodies of water for further growth.

Mollusk culture was sdvaced in the 1200s by the discovery in France that mussel spac {newly settled juveniles) would settle upright posts in the iutertidal zone, and in the 1600s by the discovery in Japan that oyster spat would etle o upright bamboo stakes driven iato the es flr, T'le coaept of pond fertilization was developed in Europe abut 1500. In this process, manure is odde to the water to encourage te growth of small ogauss such as Aquatic invertebrates 4nd plankton, wlich *in* ty ore csten by the fish.

Most fish sand crustacean aquaculture is undertaken in earthen ponds, These ponds are usually equipped with water inlets ad outlets that penit independent control of water addition and discharge. Ponds are stocked with a segifg quantity of juvenile aquatic animals, Msagerrentpscties renege from pod fertilization, which increases the mumber of natural fod organisms, to provision of a complete, formulated fed that supplies all nutrients nee-scary fr growth. Animals that have reached market size are harvested from the ponds. In a complete harvest, the pod is drained and all simals are removed from the pond for processing, In a partial harvest, only a portioa of the animals are removed frm a full pond using s seine et, Addtioal juveniles are fen stocked into the pond after a partial harvest, and the production cycle is continued, Channel catfish grown ...the United States, end marine shinp grow in China, Central America, and South America, are often cultured in earthen ponds of'sbut $ to 1Q hectares(abut {2 to 2$ seres).

Fish can also be raised in cages and raceways sg, narrow earthen or cowerete ponds tlat receive as comtinus flow of water trom s arty srtesin well, spring, or stream. Often, several racewaysare built in series dow the slope of' s hill, Cages are usd to raise fish in lakes, bays, or the opn oegn ad are constuuted of flexible netting suspended from s superstructure floating on the water's surface, May uore fingerlingg can be stocked into ncewsys sd cages than into earthen ponds, but nutritionally completes forau.lated feed must be provided to fish grow in tbesec systems, Raibw trout are grows in mceways in many places, including Chile, Europe, and the United States. Salmon are grown in cages, and Norwy leads the world in the prductin of fared salmon.

Mollusk aquaculture is carried out in coastal waters either as botton culture r off-botton culture, l bottom culture, juvenile organisms re spread over pnepared ares of the ace flr in ether the intertida zer shlkw

coastal waters, In off-bottom culture, juveniles attached to a substrate, such as oyster spat attached to oyster shell, are bound to **rps qnd** suspend} fins mfts or floats. Advantges of off-bottom mollusk culture include protection from predators an the ability to use more vertical spee, Franee has as koag listry of mussel culture, snd the bouchet culture technique, in which rope containing newly sel muse!s is wrpped in s spiral us oak pokes set in intertidal res, las changed little in lmndreds of years of use. **Seaweed** is also grown using off-bo/top cu!ture techiques, most notably in Aia,

Aquaculture is practiced in many regions of the United States. Chanel catfish are grown primarily in the sutler ad souhester United States, with greatest pro»fuction in Mississippi, Arkansas, Alabama, and Louisiana. More than 7$ peeemt of the trust produced domestical}. for human conswnptin are gown in Idaho. Japanse littleneck clams and Pacific oysters are grown along tle Pacifig Coat, and lard class and American bluepoint oysters are grow along the Atlantic Coust. Most U.S. fish farms that produce ornamental fishes wre kocaied in floridg. The largest baffish aquaculture industry is located in Arkansas.

The globe] squacultural yield in 1992 was 19.3 million metric tons (42.5 Hillian pounds), worth spproximately $32,5 billion, This yield, which represented nearly Z0 percent of world fishery production, was composed of 48.8 percent fishes, $,1 percem crustaceans, 1#,1 pere mollusks, 27,9 percent algae and qatic plant and 0.1 percent other organisms. **Aquacultural** production has grow stedily fomn an estimated 1 million mnetrie tans {2,3 billion pounds) ,-. 1966 to the curat vale. World aquacultural production is expected to grow *S percent* mually through the year {2, {(Rarholomew W, Green, 1992 6$; Microsoft Corporation)

Methodology

This sudy evabusted and assessed the aquaculture practices of fish farer; in lko;s Sur fray 3uuawry to September 2%03.

The study was conducted in 18 coastal municipalities of 1locos Sur namely, Tagudin, $a, Cnz, Sta, tscia, Cando, Santiago, San fstel, Sta, ksria, Narvacs, Santa for the first district; and Vigan, Coayan, Sta. Catalina, $an Vicente, So. Deaninga, Mags:gal, R$sn *Juau*, *Casbugaso* srkd $inait tor the second district, A total of 108 fish farmers were taken as respondents, six of hwe;w taken tom every caws#al municipalty,

A questionnaire supplemented by personal interview with the respondents was utilized in gdbering data fr this study.

The following norms for interpretation were used in the study:

A. Aquaculture Practices

Numerical Value	4nterpnettio
4.21- 5.00	**Always**
3.41- 4.20	Often
2.61- 3.40	Occasional
3.41- 2.60	Seldom
1.00- 1.80	Never

B. Problems Erccmterd

Numerical Value	interpretation
4.21 =$.00	Most Serious
3.41- 4.20	Very Serious
2.61- 3. 40	Serious
1.81- 2.60	Lest Serious
i.00- 1.89	Not a Problem

The following statistical tools were used to answer the problems of the study:

Frequencies and percentages were used to describe the socio-demographic, socio-economic characteristics and aquaculture status of the respondents.

The mean was utilized to determine the level of assessment of the respondents" aquaculture reties nd problens encountered in aquaculture farming.

Resnkis ed Bisesssions

A. Socio- Demographic Characteristics of the Respondents

Table I displays the frequency distribution of the respondents from the 3$ coastal mwuieipalties *in {logos Sus* in #ems *of* the socdemographic characteristics. Tere were 108 respondents and six **were taken equally** from the different cogs#al harangays fle coaclgl ouuicipalilies,

ex. As to sex, majority of the respondents were male (98 or 90.74%) and only 1 {9.26%) were f ■ le, Hlis idicstes that oles sre still the key players in the fek4 *of* squeulur,

Age. The ages of the respondents rngcd from 15 to 75 years old. Twenty-eve or 2$% be ly to the age bracket of'344, rd the lsst belong to

the age bracket of 15-24 (7.41%). The result showed that they ae capable of preparing their work which is a requisite fr the work nedd in the feld of qucuture.

Chi! **Status.** The respondents were mostly married (81.48%), 18 were single and only on in cch grop was separated and widow/er respectivel,

Tahk , Dhtrlbtion of nspodnts **la tens of tklr el-demograpie** chsrscteristis.

Socio-Dmogrpkaie Charcterstis»	F'gvaency	Perce
er		
Male	98	**90.74**
Ferale	10	9.26
Age		
65-74	11	10.19
55-64	24	22.22
45-54	23	21.29
35-44	27	**25.00**
25-34	15	13.89
15-24	8	7.41
Civil Status		
Married	88	**81.48**
Separated	1	0.93
Widow/er	1	0.93
Single	18	16.66
Education±al **Attainment**		
College Graduate	20	18.52
Did no finish college	*26*	24.07
High school graduate	32	29.63
Did not finish high school	4	3.70
Elementary graduate	16	14.81
Did no finish elem.	10	9.26
Naber of **Ckikdrea**		
9-10	·2	1.85
7-8	*5*	4.63
5-.6	32	29.63
3-4	53	49.07
1-2	16	14.81
Napsber **of Depeneu t**		
7-8	*3*	2.78
5-6	24	22.22
3-4	51	47.22
1-2	30	27.78

Ed@eotion! Attnireant. Most of the **respondents were** high school graduates (29.63%); 26 or 24.07% dd not finish college **and four** (4) or 3.70% did not finish high school.

Nuber of children. As to the number of children, majority of the respondents, S3 **or** 49,37% had 3-4 children, **'he least were thoc within** the brecket 9-10 (2 or 1.85%). This **indicates thut the respondents** still **can support** the reeds of their families despite **the fact that majority** of **them sre** only high school graduates.

Naber of Depedets. Majority of the respondents (S1 or 47.22%) had 3-4 dependents which was just commensurate to the income derived from fishing which **.. below P3,000.00.**

, Ssci- Enok: Characteristics of the Respondents

The profile of tho respondents is presented in Table *2* which indicates their monthly income, other sounces of income. kind of huse, sufficiency of invome and apkianes owed.

Monthly Incmae. The fish farmers derived modest income from fish production. Majority of them 60 ($5.$5%) eamned **a** monthly income below P3,000. Only two fish farmers each eared P9,000-P10,999 and P13,000-14,999 respectively (0,93%). This result shows thast majority of the fish farmers cared a very minimal income from aquculture, and very **few ear quit a good** income. This is due to the fct that majority of tbe fish feners re only cnggd in small-scale aquaculture due to the high cost of managing **a** pond/cage plus the high cost of feeds. Only thsc who hve the financial means can **manage a** pond/cage in a larger scale.

Other Sources of 1cone. Fish frers had other sources of income oside fom fish famming. Most of them were enggel in farming (41 or 37.9$%). Only **a** few were engaged in teaching, as private employee and dressmaking/ tailoring (2 or 1.85%).

Kid of House. Majority of the fish farmers (58 o 53.70%) live in permanent horses, bungalow type. Only one (0.93%) lives in a 3-storey house. This result shows that fish farmers can construct their ow permanent houses (bungalow type) with their minimal emings, as augmented by other sources of income aside from fish farming.

Sufficiency of Ieome. Majority of the fish farmers (59 or 54.63%) dkeclard having an income sufficient to met their *needs* while the rest {49 *or* 4$.37%) claimedthat they did not have sufficient income. Th *fish* frmrs who

claimed sufficiency of income from fishing lived simple lives and spent only for their needs. They also derived additional money from other sources of income. Insufficiency of income for some fish farmers was due to the absence of other sources of income and/or inadequacy of earnings from other sources of income.

Table 2-a. Socio- economic characteristics of the respondents.

Scio-Econoiie Chancterisics	Frequency	Percentage
Monthly Income		
15,000 and above	4	3.70
13,000-14,999	1	0.93
11,000- 12,999	2	1.85
9,000- 10,999	1	0.93
7,000- 8,999	7	6.48
5,000- 6,999	13	12.04
3,000- 4,999	20	18.52
below 3,000	60	55.55
Other Sources of Income		
Farming	**41**	**37.96**
Sari-sari store owner	4	3.70
Teaching	2	1.85
Private Employee	2	1.85
Government Employee	6	5.56
Tricycle/jeepney/bus driving	4	3.70
Carpentry	6	5.56
Dressmaking/tailoring	2	1.85
Piggery	9	8.33
Poultry	10	9.26
None	22	20.37
Kind of House		
Bungalow		
permanent	58	53.70
semi permanent	15	13.89
temporary	3	2.78
2-storey		
permanent	16	14.81
semi permanent	13	12.04
temporary	2	1.85
3-storey t ent)	1	0.93
Sufficincy of Icomae		
Sufficient	**59**	54.63
Not sufficient	49	45.37

Table 2-b. Appliance/s owned.

Appliances Owned	Frequency	Percentage
Television	57	52.78
Washing Machine	23	2.13
Cellphone	35	32.41
VCD/Player	27	25.00
Component	33	30.56
Electric far	64	59.26
Air-conditioning unit	2	1.86
Gas Stove	42	**38.89**
Gas Range	8	7.41
Refrigerator	44	40.74
Electric Stove	16	14.81
Radio	**66**	**61.11**
Flat Iron	26	24.07
Rice cooker	11	10.18
Blender	3	2.78

All of the fish farmers owned more than one appliance. Majority of them owned a radio (66 or 61.11%), electric fan (64 or 59.26), and television ($7 or 52.78%). Only two (2) or 1.86% had air-con units. This indicates that radios are importaat for the respondents to be updated with uews and information as well s entertainment. Since it is handy, they can just bring to places where they work.

Table 3-A presents the status of aquaculture methodologies/practices of fish farmers in 1locos Sur. Most respondents used fishponds (61 *or* $6.48%), followed by fish cage (38 or 35.18%), agri-aquaculture (8 or 7.41%) and the lowest in rank were those who utilized fishpens (1 or 0,93%). This indicates that most respondents owned/managed fishponds and still considered fishponds as the prime source of fish products in the market.

As to pesticides used to eradicate pests and predators, most of the fish farmers (40 or 37.04%) declared not using any of the organic **or** inorganic pesticides. This signifies that fish farmers knew the effect of using organic and inorganic pesticides. Moreover, the price of these comunodities is high.

Likewise, in the method of fertilizer application, 45 or 41.67% did not use either the broadcast or the box/sac method. Thirty-eight or 3$.19% utilized the broadcast method, and twenty-five or 23.15% used the box/sac method. This implies that fertilizer application is not a must for the fish farmers due to its high price.

The stocking density used by most farmers was 20 fish/m' and above (41or 37.96%), while the lowest utilized 6-10 fishes/". The stocking of fishes beyond the allowed number was caused by the use of commercial feeds. Furthermore, fish fanmrs wanted to maximize the use of their ponds or cages since there was oversupply of fingerlings in many areas which had hatcheries. The cages had to be overstocked since there were no more buyers.

Table 3-A. **Status of aquaculture methodologies iu fish farming.**

Methodologies	Frequency	Percentage
Culture Medium Utilized		
Fishpond	**61**	**56.48**
Fishpen	1	0.93
Fish Cage	38	35.18
Integrated Agri-Aqua	8	7,41
Pesticides Used to eradicate pest and predators		
Organic/natural	21	19.44
Inorganic	**28**	*25.93*
None	**59**	**54.63**
Type of Fertilizers Used		
Organic	*35*	32.41
Inorganic	33	30.55
None	40	**37.0¢**
Method of Fertilizer Application		
Broadcast	**38**	35.18
Box/sac	*25*	23.15
None	**45**	**41.67**
Stocking Density Used		
1-5/m	20	**18.52**
6.10/?	18	16.67
16-20/m'	29	26.85
20 m and above	**41**	37.96
Type of Feeds Used		
Commercial	**90**	83.33
Natural	10	9.26
Formulated	0	0
Combination (C. & N)	7	6.48
None	I	0.93
Percent of TBW GNven au Feeds		
10%	14	12.96
7%	21	19.44
5%	**62**	57.41
3%	2	*1.85*
None	9	8.33

Table **3-a continued.**

Methodologies	**Frequency**	**Percentage**
Frequency of **Water Freshening (Pond)**		
Once a month	2	1.85
Twice a month	1	0.93
Once a week	3	2.78
Depends upon the condition	**66**	**61.11**
Tidal occurrence	36	33.33
MMethod **of Harvesting**		
Total	19	17.59
Partial	89	**82.41**
Type of Harvesting Device Used		
Gill Net	56	**51.85**
Cast Net	26	24.07
Screen	23	21.80
Draining	3	2.78
Extent of Distribution of Products		
Wholesale	16	14.81
Retail	92	**85.19**
Agency/ies Extending Help		
DA/BFAR	44	40.74
LGU's	0	0
SUC's	0	0
Private	37	34.26
None	27	25.0

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The types of feeds were categorized into commercial, natural, formulated and a combination of commercial and natural feeds. Commercial feeds attained the highest percentage (90 or 83.33%) and no one declared using the formulated feeds.

Feeding the fishes was based on the total percentage of body weight. Majority of the respondents (62 or 57.41%) adopted 5% of total body weight which is accepted, while two or 1.85% adopted 3% of the total body weight. Three percent of the total body weight to be given as feed for the fishes is not advisable because the culture species would not be able to attain optimum growth in due time.

Majority of the respondents signified that water freshening depended upon the condition of the fann or water (66 or 61.11%), while only one or 0.93% declared water freshening twice a month. This implies that most of the fish farmers are not aware of the importance of water freshening.

As to the method of harvesting the stock, partial harvest was utilized by 89 respondents (82.41%) and only 19 or 17.59% of the fish fanners used the total harvesting method. This indicates that partial harvest is better so that they can select bigger sizes which command higher price in the market.

Majority of the respondents (56 or 51.85%) preferred using the gill net in harvesting the stock, while only 3 or 2.78% drained the ponds.

On the mode of distribution of products, majority of them (92 or 85.19%) sold their products through retail while only (16 or 14.81%) sold their stock through wholesale method.

Lastly, technical and financial assistance came mostly from the DA/BFAR (44 or 40.74%). No assistance was extended by both LGU's and SUC's.

Table 3-B. Equipments **used in aquaculture farming.**

Equipment/Materials	Frequency	Percentage
Electric **Pump**		
Owned	11	10.18
Borrowed	10 = 23	9.26 – 21.29
Rented	2	1.85
Generator		
Owned	28	25.92
Borrowed	18 = 47	16.66 =43.51
Rented	1	0.93
Aerator (borrowed)		0.93
Refractometer (borrowed)	1	0.93
Paddle Whecl (owned)	1	0.93
No equipment used	I	32.41
	35	

The table shows the equipment used by the fish farmers. This shows that majority of them utilized and owned generator (47 or 43.51%) and electric pumps (10.18%) for their farms. One owned a paddle wheel, one also rented a generator, one borrowed an aerator, and one borrowed a refractometer.

Table 3-C. Frequency of respondents **engaged** in the culture of **different** species.

Species Cultured	Frequency of Fish Farmers	Percentage
1. Tilapia	94	87.04
2. Milkfish	*56*	*SI.85*
3. Catfish	2	1.85
4. Carp	3	2.78
$. Siganids	41	3.70
6. Mudcrab	2	11.11
7. Prawn/Shrimp	25	23.15
8. Sea Urchin	2	1.85

The table presents the species of fish cultured by the fish farmers. This indicates that tilapia is the species being cultured by most farmers (94 or 87.04%); fifty-six (51.85%) farmers raised milkfish. These two species constitute most of the fish demands of households.

Table 4. Level of the aquaculture practices of the respondents.

Aquaculture Practices	Mean	Description
A Pond Preparation		
1. Pond draining & drying	2.07	Seldom
2. Pond and dike cleaning	2.83	Occasional
3. Pond and dike repair	2.42	Seldom
4. Pond tilling	2.32	Seldom
S. Pesticides application	1.56	Never
6. Pond washing	2.0S	Seldom
7. Lime application	1.74	Never
8. Fertilizer application	1.70	Never
Total	**2.09**	**Seldom**
B. Stocking		
I. Fish are acclimatized before stocking	3.26	Occasional
2. Fish are stocked early morning	3.56	Often
3. Fish are stocked late afternoon	1.96	Seldom
Total	**2.93**	Occasional
C. **Management**		
1. Fish are fed based on total body weight	3.41	Occasional
2. Checking of water parameters (temp. salinity, D.O. and pH.)	1.75	Never
3. Regular freshening of pond water	2.22	Seldom
4. Monthly sampling of the stock	2.84	Occasional
Total	**2.56**	**Seldom**
D. Harvesting		
1. Fish are harvested in due time	4.56	Always
E. Fish sorting, handling and marketing		
I. Fish are sorted according to sizes	3.23	Occasional
2. Fish are packed and stored in baieras/ Styrofoam boxes with cracked ice ready for marketing	1.90	Seldom
Total	**2.57**	**Seldom**

Table 4 presents the detailed information of the aquaculture practices of the respondents in Ilocos Sur.

It can be viewed from the table that the different aquaculture practices were grouped into five. These are pond preparation, stocking, management, harvesting and marketing.

A. Pond Preparation

The overall result showed that the respondents seldom practiced the activities which are essential in pond preparation (x=2.09). Pond and dike cleaning were occasionally practiced while pesticides application; lime application and fertilizer application were never practiced.

This result indicates that pond preparation is not really a necessity since mosi of the fish farmers used commercial feds.

B. Stocking

Fish acclimatization before stocking was occasionally done ($=3.26). More respondents preferred to stock in the early morning (x=3.56) since the temperature is more favorable for the fishes. Stocking in the late afternoon was less preferred by the fish farmers.

C. Management

Fishes are fed based on the total body weight with a mcan rating of 3.25 (occasional). The checking of water parameters like temperature, salinity, dissolved oxygen and pH was seldom practiced.

Proper checking of water parameters should be taken into consideration, because it may affect the growth of the culture organisms.

D. Harvesting

Fishes were harvested in due time with a mean of 4.56. This indicates that fish farmers always harvested their stocks when ready for marketing.

E. Marketing

Fishes were occasionally sorted according to sizes (=3.23). Sorting the fishes according to sizes would give the fish farmers a higher gain. Packing and storing the harvest in *baieras/styrofoam* boxes with cracked ice ready for marketing was seldom practiced (X= 1.90) because sale of the products was mostly done in retail.

It can be gleaned on Table *S* that high price of feeds was considered a "very serious" problem by the fish farmers with a mean rating of 3.89. This was followed by the lack of extension services, laxity in the enforcement of fishery laws, lack of aid from government agencies and unfavorable environment, which were "serious" problems for the respondents.

Faulty stocking and unwise selection of culture site were not considered as a problem to the fish fanners/owners.

Table 5. Extent of the problems encountered by the fish farmers.

Problems Encountered	Mean	Description
1. No fry source in the nearby locality	2.08	Least Serious
2. Unwise selection of culture site	1.84	Not a Problem
3. Careless handling of fry and fingerlings during transporting	1.95	Least Serious
4. High price of feeds	**3.89**	Very Serious
5. Faulty stocking	1.81	Not a Problem
6. Inadequacy of farm personnel	1.99	Least Serious
7. Extreme change of water condition	2.47	Least Serious
8. Overstocking	2.14	Least Serious
9. **Lack** of fish food	2.19	Least Serious
10. Lack of aid from government agencies	3.16	Serious
11. Inadequacy of technically trained men	**2.18**	Least Serious
12. Laxity in the enforcement of fishery laws	3.19	Serious
13. Lack of extension services	3.44	Serious
14. Ufavorale environment	2.76	Serious

This implies that when putting up a project, one should consider the price of commodity/ feeds because the biggest portion of the production cost goes to feeds. However, if natural or a combination of commercial and natural feeds was utilized, it would lessen the cost of capital. The fish farmers must also find Nays and means to find linkages especially with government agencies and univrsities that could offer technical as well as financial means to sustain their projcts.

Conclusions

Based on the findings of the study, the following conclusions were drav:

1. On Socio-Demographic Profile of the Fish farmers

Most of the fish farmers were males, with ages falling within the bracket of 35-44 years. Most of them were married, high school graduates, had 3 to 4 chldren and had three to four dependents.

2. Most of the fish farmers bad a monthly income of below P3,000. Aide from fishing, fa r-ing was considered *as* another source of income. Most o! the respondents owned a permanent bungalow type house and declared the ircome they earned as sufficient to support their families.

3. Majority of the fish farmers owned a radio.

4. Most of the fish farmers utilized fishpond for aquaculture. No pesticides were used to eradicate pest and predators and no fertilizer was utilized.' The stocking density used was 20 fishes and above/m, commercial feed was purely given to the culture species; 5% of the total bodyweight was given to the culture organisms; freshening of water in the pond was done depending upon the condition of the pond; total harvest was practiced; the mode of distribution of the product was retail, and the Bureau of Fisheries and Aquatic Resources under the Dept. of Agriculture extend technical and financial support to the fish fanners.

5. Ponds were seldom prepared by the fish farmers; stocking techniques were occasionally practiced; management activities were seldom practiced; harvesting of fishes was done in due time and fish stocking and sorting, handling and marketing were seldom practiced.

6. High price of feeds, lack of extension service, laxity in the enforcement of fishery laws, lack of aid from govemment agencies, and unfavorable environment were considered very pressing problems to fish farmers.

Recommendations

Based on the conclusions, the following recommendations are hereby presented:

1. Technical assistance on aquaculture practices should be given by government agencies; specifically on pond preparation, stocking, management, harvesting, and fish sorting, handling and marketing. The fish farmers should be updated with the existing technology in aquaculture.

2. Financial support should be given by government agencies to augment/improve the fish farmers' livelihood.

3. Fishery laws should be well implemented by the government

4. Further study on the economic impact of fish culture practices in the Ilocos Region should be conducted.

References

BARDACH, J.E., 1986. *Constraints to Polyculture.*

BARDACH, I. E., 1990. *Aquaculture and Food Opportunities and Constraints.* Trans. Royal Soc. Canada Series I, Vol. 1

BECKER, FIKRET and ALLAN H. SMITH. 1993. *Coastal Marine Property Rights: The Second Transformation.*

CHUA, T.E., J.N. PAW, and E. TECH, 1989. *Coastal Aquaculture Development in ASEAN: The Need for Planning and Environmental Management.*

NEWKIRK, G. 1995. *Philippine Coastal Resources Under Stress.* Coastal Resources Research Network, Dalhousie University, Halifx, Nova Scotia, Canada.

POMEROY, R.S. 1992. *Aquaculture Development: An Alternative for Small-Scale Fisherfolk in Developing Countries.* International Center for Marine Resources Development, Kingston, R.I.

SANTIAGO, F. L et al, 1996. *Environmental Science: A Shared Responsibility Towards the Earth.*

VELASQUEZ, C. C. et al, 1990. *Philippine Science Encyclopedia for Biological Sciences.*