STUDY OF THE BANGUS FISHING INDUSTRY: PROSPECTS AND PROBLEMS, BENEFIT-COST ANALYSIS APPROACH*

By

SERAPIO A. BRAVO

National Economic and Development Authority

ABSTRACT

This study is an economic appraisal of the prospects and problems of the bangus fishing industry. The prospects had been appraised in the light of the cost-benefit flows or streams using the standard investment criteria of NPV and IRR.

Results showed that the project is economically feasible. Benefits start accumulating during the second year from the social viewpoint. The liquidity and stability of the project lend assurance to the loan-paying capacities and generation of working capital. The assumptions are valid and realistic to the project. The prospects of the bangus industry are bright. The problems are mostly on technology of raising, fry shortage and fund sources.

INTRODUCTION

As a fish-eating people with an expanding population, the Filipinos' demand for fish is increasing every year. The problem is that fish production growth rate is only 4.5% compared to the effective fish demand growth of 5%. Therefore, almost every year the insufficiency of supply is remedied by the Government through the importation of canned fish. This is a logical approach under the situation.

Fish, as hardly realized by the majority of Filipinos, is an important national product which provides about one-half of the animal protein being consumed. It is for this reason that the Government,

---

*This paper is based on the Thesis submitted by the author to the U.P. Program in Development Economics, School of Economics, University of the Philippines, 11th Session, 1975-1976.

through the Bureau of Fisheries and Aquatic Resources, launched the Expanded Four-Year Fish Production Program, designed to accelerate the fishing industry's growth rate from 4.6% to 6.6% per year. The main objectives of the Program are to attain self-sufficiency in fish and to totally do away with importations.[1]

The production of and demand for fish in the Philippines, as noted,[2] have increased by about 130% in the last decade. The demand is assumed to continue and accelerate in the coming decades due to the expected increase in population as well as to income expansion.

There are still about 400,000 hectares of mangrove-covered swamplands in the Philippines, available for the development of bangus or milkfish culture.[3] The available areas plus favorable climatic conditions, improved management tools and techniques, and the increase in technological material inputs provide great potentials for the development of bangus fish culture in this country.

Local Demand and Supply of Fish.

Philippine fish production comes from three sources, namely:

a. Production from commercial fishing fleets
b. Production of municipal and sustenance fisheries, and
c. Production of fishponds.

The total Philippine local demand and supply of fish for the last decade is shown in Table 1. As earlier noted, the total demand is increasing and the local produce is deficient and cannot satisfy the local demand so that importation of the vital commodity is the only remedial measure for the problem; thus the net import in 1974 is 33,584 mt. This figure is already minus the fish exports of 22,877 mt.

Table 2 shows the projection of the demand for fish up to 1980 including a very optimistic production projection based on past trends of production.

The Milkfish (Bangus) Industry:

Bangus or milkfish (*Chanos chanos* Forsskal) production comes mainly from brackishwater fishponds, lately an increasing percentage

[1] The Expanded Fish Production Program. FY 1975-1978.
[2] Smallholder Fishpond Study Project, Sinotech Engineering Consultants. Inc., Taipei, Taiwan, January 1975.
[3] Fishery Statistics of the Philippines, Bureau of Fisheries and Aquatic Resources, 1973.

TABLE 1

PHILIPPINE LOCAL DEMAND AND SUPPLY OF FISH
1964-1974 '000 Tons

Year	Produce	Import	Total Demand	Per Capita	Net Import
1964	603,506	49,439	651,981	21.2	48.475
1965	667,202	51,731	717,828	22.7	50,626
1966	705,278	50,120	752,825	23.1	47,547
1967	746,063	67,689	810,224	24.1	64,161
1968	937,684	88,291	1,023,995	29.5	86,311
1969	940,792	71,034	1,008,985	28.2	68,193
1970	988,884	62,746	1,048,223	28.4	59,339
1971	1,023,095	68,883	1,084,678	28.6	61,583
1972	1,122,410	64,202	1,175,864	29.6	53,455
1973	1,204,837	41,204	1,227,968	30.1	23,151
1974	1,268,368	56,461	1,301,962	31.4	33,584

Source: Fisheries Statistics of the Philippines, BFAR, 1974

TABLE 2
PROJECTION OF FUTURE FISH DEMAND, PHILIPPINES
1976-1980

Year	Population '000	Demand Total	Demand Per Capita	Production M.T.	National Income Price (5.4% Growth Rate) Total (M. Peso)	National Income Price (5.4% Growth Rate) Per Capita
1976	43,739	1,553,609	35.5	1,571,043	31,572	722
1977	44,964	1,659,621	36.9	1,706,823	33,277	740
1978	46,201	1,771,346	38.3	1,858,687	35,074	759
1979	47,448	1,888,905	39.8	2,021,694	36,968	779
1980	48,705	2,012,004	41.3	2,198,996	38,964	800

from freshwater fishpens* mostly concentrated in Laguna Lake and from natural waters like dams, reservoirs and other impoundments.

Approximately 90 percent of 176,000 hectares of operational fishponds in the Philippines are devoted to bangus culture. Lately, an additional 6,000 hectares of fishpens raise bangus, too. Thus, the local aquaculture industry is predominantly bangus fish culture. This emphasizes the importance of this fish. From production and consumption viewpoints, bangus is not only an income source and employment-generating commodity, but is also a major food and protein source for the expanding Filipino population.

The milkfish industry is now a multi-million peso industry. It currently employs some 170,000 to 180,000 Filipinos, with an approximate invested capital of ₱459.7 million.[4] The total bangus production in 1974 is reported to be 113.1 thousand mt as compared to only 99.6 thousand mt in 1973.[5]

A summary of milkfish production and consumption from 1969-1974 is shown in Table 3. This table includes the summary for the total fish produced and consumed for comparison.

A projected production of milkfish for the Philippines is summarized in Table 4. It is expected that future bangus production will not only come from fishponds but also from natural waters, fishpens, and fish estates.

The fish estate concept has been lately given consideration by the Government. The Philippines has declared a policy[6] to designate publicly-owned swamplands for subdivision to family-size fishponds to be leased to landless people. A study[7] has been already undertaken by a foreign consultancy group on this fish estate project.

Additional Relevant Information

Milkfish is the most popular table fish in the country. It has potential as an export commodity too. As a "first class" table fish

* Fishpens are fish enclosures made from local materials, like *banatan* and/or locally manufactured nylon nets, bamboos, etc., where bangus fingerlings are raised to marketable sizes (3 pcs. to a kilo).

[4] National Bangus Symposium, Philippine Village Hotel, July, 1975.

[5] Fisheries Statistics of the Philippines, Bureau of Fisheries and Aquatic Resources. 1974.

[6] P.D. 43, Fishery Industry Development Decree of 1972. Secs. 13 and 14.

[7] Smallholder Fishpond Study Project, Sinotech Engineering Consultants, Inc., Taipei, Taiwan, March, 1975.

TABLE 3

SUMMARY OF MILKFISH PRODUCTION AND CONSUMPTION
PHILIPPINES, 1969-1974

Year	MILKFISH Pro-duction	MILKFISH Con-sump-tion	MILKFISH % of (1) over (2)	MILKFISH Per Capita Intake	TOTAL FISH Production	TOTAL FISH Con-sump-tion	TOTAL FISH % of (2) over (4)	TOTAL FISH Per Capita Intake	Philippine 3/ total Population
	(1)	(2)	(3)		(3)	(4)			
1969	94.6	93.1	10.3	2.6	940.8	997.9	9.3	27.3	35.8
1970	96.6	95.9	9.8	2.6	988.9	1,040.0	9.2	28.4	36.9
1971	97.9	94.8	9.6	2.6	1,023.1	1,076.7	8.8	28.4	37.9
1972	98.9	97.8	8.8	2.5	1,122.4	1,166.1	8.4	29.6	39.1
1973	99.6	96.5	8.3	2.4	1,204.8	1,230.2	7.8	30.1	40.2
1974	113.1	-			1,268.3	1,300.1			41.3

Sources: 1/ Fisheries Statistics of the Philippines, BFAR, Manila, 1974
2/ Dosayla, et al. Summary of Four Economic Surveys of Food Consumption, NFAC, 1973. This figure is assumed as the total amount demanded.
3/ Monthly Bulletin of Statistics, UN, Vol. XXVIII, May 1974

TABLE 4

PROJECTED MILKFISH PRODUCTION IN THE PHILIPPINES

Year	FROM FISHPONDS Area/ ha.	Output/ ha.	Production	FISHPOND ESTATES Area/ ha.	Output/ ha.	Pro duc-tion M.T.	Natu-ral Produc-tions	Fish pens	Total
1976	185.6	855	159.5	0.5	1,000	1.0	18.2	8.0	185.9
1977	188.8	985	186.0	1.0	1,000	1.0	18.2	8.0	213.0
1978	192.1	1,140	219.9	1.0	1,500	1.5	18.2	8.0	246.7
1979	195.4	1,295	253.0	1.5	2,000	2.0	18.2	8.0	282.3
1980	198.9	1,325	263.8	1.5	2,000	2.5	18.2	8.0	293.0

Notes:

[1] In 1969-1973, the rate of increased of 1.7% per year was estimated from total area farmed and used as a basis for increase up to 1980.

[2] Estimates were based from the figures of output from the BFAR and the UP College of Fisheries, hence an average of the two figures.

[3] Source: C.V. Guerero, Bangus A Look Ahead, NFAC, QC, 1974

[4] Data for Natural Production of lakes, dams, reserviour etc. and fishpens furnished by the BFAR. The fishpen production is based on 2,000 has. of fishpens with an average field of 4,000 kgms. per hectare

The area, yield and production of fishponds (actual) from 1965 to 1971 are summarized as follows:

Year	Area	Yield	Production '000 tons
1965	137.2	460	63.0
1970	168.1	574	96.5
1971	171.4	575	97.9

it is consumed by people from all income levels, accounting for a great percentage of fish sold as fresh fish in Metropolitan Manila public markets and private supermarkets.

It is one of the most important pond-raised fish in the Philippines. It is easily cultured and can be raised in brackishwater impoundments as well as in freshwater units.

With vigorous government support to the intensification of fish production by converting virgin swamplands to fishponds through the fish estate concept and the application of improved techniques like the seeding of milkfish fry and/or fingerlings in fishpens in freshwater bodies, proper pond management, pond enrichment through deliberate fertilization, the application of pesticides and other chemicals to do away with deleterious algal growth, and the proper manipulation of stocking rates in pondfish culture, it appears that the potentials for increased milkfish harvest has been fully harmonized and amplified.

There are three (3) levels of fishpond productivity in the Philippines (Table 5). As the available swamplands that could be harnessed as potential bangus ponds (Table 6) have been identified and pin-pointed, it is assured that with proper harmonization of technology, economics of fishing and management tools, the bangus aquaculture industry could be a major factor in national fisheries development efforts.

A study of the potentials for the export of Philippine milkfish had been carried out and is being considered by the government.[9]

The Four-Year Development Plan* also mentions and provides for a concentrated development of inland fisheries, to wit:

> "Development efforts will be concentrated on inland fisheries. The target for all brackishwater production areas is set at a growth rate of 18 percent per year for the next four years."

On inland fisheries, which is mainly concerned with pond-raised fish or bangus fish culture, the plan seeks to emphasize specific objectives in attaining its goals, such as extension and training, research, stocking, and the development of fish estates**.Special attention

[9] Philippine Fish Marketing and Distribution Study. Department of Natural Resources. Draft Reports, Manila. September 1974, Volume 7, Potential for the Export of Philippine milkfish.

* *Four-Year Development Plan*, FY 1974-77 Republic of the Philippines, Manila, 1973.

** *Op. Cit.*, Report on the Smallholder Fishpond Study and PD 704.

TABLE 5

OPERATIONAL PRODUCTIVE FISHPONDS IN THE PHILIPPINES

	Area (has.)	%	Total Produce	%
1. High level productive ponds	64,218	37	53,733,760	55
2. Medium level productive ponds	61,082	36	31,818,400	32
3. Low level productive ponds	45,084	26	11,803,270	12

TABLE 6

SWAMPLANDS AVAILABLE FOR DEVELOPMENT FOR BANGOS CULTURE *

Fishery Region	Freshwater	Mangroves for Bangos	Total
I	1,790	6,035	7,825
II	2,922	13,430	16,352
III	4,095	50,374	54,469
IV	-	38,177	38,177
V	-	33,344	33,344
VI	9,741	141,096	150,837
VII	1,007	43,662	44,669
VIII	39,635	20,153	59,788
IX	46,948	13,803	60,751
X	20,110	7,304	27,414
TOTAL	126,248	367,378	493,626

*Source: Bureau of Fisheries and Aquatic Resources Statistics

should be given to stocking activities. To support this massive fish dispersal program in fishponds and other inland bodies of water, the production of bangus, carp and hito fingerlings will be concentrated and intensified.

Specifically, on the development of fish estates, the plan provides for the construction and development of family-size fishponds to be leased on a long term basis to qualified landless participants in land reform areas. The project is a scheme to develop modern fishpond villages in the Philippines with adequate facilities for flood control, transportation, electricity, and housing for beneficiaries. These estates will be run along the lines of a cooperative-type management organization with appropriate government supervision and financial assistance.

The above-mentioned policies are positive efforts to boost the development of the bangus industry.

The Problem

The preceding discussions have shown that the bangus fishing industry has expanded through the years. The main problem is that, its expansion was made through a seemingly "trial and error" method, e.g., investors just "invested" or ventured to "get engaged" in the industry, or decision made without formal economic feasibility studies, simply because "it is profitable" for anyone with liquid capital. This method of making a decision to invest in the industry seemed all right at the time since the industry was not yet crowded. But nowadays the industry is becoming crowded *per se* and with factors such as capital scarcity, risks involved, like natural calamity and the limited entry of entrepreneural talents to the industry, a more rational method of decision-making should be adopted. Feasibility studies therefore, are a necessary tool and a requirement before decisions to engage in the bangus industry are made.

In the future, the expansion should be characterized by deliberate directions by means of identifying the problems, prospects etc., through economic feasibility studies and not on a "trial and error" system, as in the past.

Objectives of the Study

The general objective of this paper is to seek and add new dimensions in defining and/or appraising the profitability and prospects of the bangus raising industry.

The second objective is to clearly delineate between the investors' interest in bangus culture and the benefits to the national economy.

Methods and Procedures

Source of data used

The data used came from the Bureau of Fisheries and Aquatic Resources and from private individuals through interviews.

Description of the Project

The project which is the basis for economic assessment, is a hypothetical 50-hectare bangus pond system in Mindoro Province. The operating data and other information are detailed in Appendix I.

The size of the pond is ideal and accessible; the market for the produce shall be Metro Manila. Almost 97% of the produce are bangus and the remaining 3% are miscellaneous products such as shrimps, crabs, tilapia, etc. Fish seeds for stocking will come from Dampalit, Malabon, Rizal.

Other assumptions regarding the Project

All the technical feasibilities had been established including equipment, facilities, and others.

The management aspects, as well as the organizational operations, are suitable.

The investors have limited capital. Therefore, it is assumed that the project will avail of DBP Inland Fisheries Project Loan fund.[10] The DBP fund will be used for:

(1) Clearing of project area;
(2) Construction of main, secondary and tertiary gates;
(3) Construction of nursery, transition, rearing and catching ponds;
(4) Purchase of bangus fry;
(5) Procurement of fertilizers and other productive inputs, and
(6) Procurement of equipment and paraphernalia required for fishpond operations.

The amount of loan shall be based on actual needs of the project with equity contribution of 15% for a 50-hectare pond. The repayment term excluding grace period of 3-4 years is 10-12 years, with a rate of interest of 12% per annum.

[10] Development Bank of the Philippines. *Guidelines for Fisheries Industry Loan Programs*. Section on Inland Fisheries Projects.

The project's economic life span is 20 years.

There will be no foreign exchange involved since all the materials are locally available.

Calculations and Investments Criteria

The calculations made to interpret the economic and financial evaluation will be based on the accepted indicators as: (1) NPV (net present value) and (2) IRR (Internal rate of return).

The formulas are indicated as follows:[11]

(a) Present value of net benefits (PV)

$$PV = -K_0 + \frac{b_1 - c_1}{(1 + i)} + \frac{b_2 - c_2}{(1 + i)^2} + \ldots \frac{b_n - c_n}{(1 + i)^n}$$

(b) Internal Rate of Return (IRR)

Let IRR = r such that or IRR = r when

$$-K_0 + \frac{b_1 - c_1}{(1 + r)} + \frac{b_2 - c_2}{(1 + r)^2} + \ldots \frac{b_n - c_n}{(1 + r)^n} = 0$$

Where:

$b_1\ b_2 \ldots b_n$ = expected benefits in years 1, 2, . . . n; b_n includes scrap value at end of year.

c = costs

K_0 = investment (pre-operational), capital expenditures made after the first year are discounted to present values.

i = annual discount rate (= to social preference rate from the national viewpoint and to time preference rate from the private investor's viewpoint).

r = internal rate of return

[11] Mears, L.A., *Economic Project Evaluation with Philippine Cases*. UP School of Economcs, U.P. Press, Diliman, Q.C. Vols. I and II, 1969.

$$PV^1 = PV + K_0$$

Or in formal mathematical statement the two investment tools are as follows:

$$NPV = \sum_{t=1}^{n} \frac{Bt - Ct}{(1 + i)^t}$$

IRR is that discount rate i such that

$$\sum_{t=1}^{n} \frac{Bt - Ct}{(1 + i)^t} = 0$$

Where:

Bt = benefits in each year
Ct = costs in each year
n = number of years
i = interest (discount) rate

The decision rules or the decision making tools for the above-enumerated criteria are summarized as follows:

	Criteria	*Decision Rule*
1)	NPV	Selection of projects where NPV> 0
2)	IRR	Selection of projects where IRR exceeds a chosen discount rate.

These two criteria, also-known as "go-no-go" decision criteria[12] are sufficient indicators of the economic feasibility of projects, viewed from two angles, from the private investors viewpoint and society's advantage or the social or national viewpoint. The consideration of the time flows or paths of benefits and costs is an outstanding and very distinct feature or characteristic of these criteria used by investors in project selection and evaluation. However, these criteria of investments do not consider the streams of costs and benefits which other investment criteria considers such as the following:

(1) proceeds per unit of outlay or total proceeds divided by total amount of investments;

[12] Tryon, J.L. and E.E. Cookson. *A Critical Survey of Project Planning;* Center for Development Planning, National Planning Association. Washington D.C., USA.

(2) average income on book value of investment or average income after subtracting depreciation divided by average book value say the ratio of annual benefits to the book value of the assets; and

(3) payback or recoupment period or the length of time from the beginning of the project before the net benefits return the costs of the capital investments.

In the "go-no-go" decision criteria, the decision rule is to select a project to be implemented as a "go" project when the NPV > 0 (greater than zero) and the IRR exceeds the chosen discount rate. When the opposite is true, that is, if the NPV < 0 (less than zero) and the IRR does not exceed the chosen discount rate, then it is a "no-go" project. This means that the project is uneconomic or not feasible so that implementation is not suitable. However, no ranking of acceptable alternative project is possible with the NPV criteria alone. This is supposed to be the only drawback to its use. NPV simply is the present net value of the cash flow stream.

In the IRR criteria, the project is "go" or suitable for investment and implementation if the internal rate of return exceeds the chosen discount rate and "no-go" project if the value of the discourant rate is below the chosen discount rate.

DISCUSSION OF RESULTS

The discussion of results for this project after subjecting it to economic analysis using the previously mentioned criteria of net present value (NPV) and the internal rate of return (IRR) of the benefit and cost flow stream are as follows:

Economic Project Evaluation

The economic appraisals done were on the private investors' and the social or national viewpoints as shown in the cash flow sheet in Appendix III. It is assumed that the investors are incorporated. Profit and loss statements were also done as shown in Appendix II.

[13] Gittinger, J. Price. *Economic Analysis of Agricultural Projects.* Economic Development Institute. IBRD. John Hopskin University Press. Baltimore, pp. 47-52.

Private Profitability

As shown in Appendix II net profits from the investors' viewpoint start accumulating from the second year of the project, with a net profit of ₱6,667. Profits increase every year up to the 20th year. Starting from the 16th year after the last payment of interests, a total aggregate profit of ₱309,267 is constantly being realized up to the 20th year which is the end of the economic life of the project. This means that the project is highly desirable in terms of profits, and that the project will remain highly profitable even with change in price, e.g., from ₱6.00[14] to any upward trend in bangus price.

Assuming, as earlier stated, that the demand for bangus is increasing every year as seen in previous trends,[15] the project's profitability is assured.

Liquidity and Stability of the Project

While the income statement gives a favorable picture on accounting profits, the cash flow statement gives an idea of the economic feasibility and liquidity of the project from the investor's viewpoint. Liquidity of the project is a very important component characteristic of projects of this nature. Appendix III or the cash flow shows this characteristic. It shows the ability of the project to pay back amortizations and interests including taxes. It also provides assurance that the project could maintain liquidity throughout the 20-year economic life. However, as can be seen in the cash flow with an initial investment of ₱572,818 composing a DBP loan of ₱466,000[16] and an equity fund of ₱106,818, it appears that the project can generate a working capital starting from the second year when only ten (10) hectares are developed, only if the owners put in more equity. On the fourth year, a working capital of ₱99,498 is required by the project and at this time amortization payments begin. As indicated, the project cannot generate sufficient funds for operational purposes for the second and third years of the project.

The economic feasibility of the project can be seen from the NPV and IRR calculations. With NPV at the chosen discount rates, loan

[14] ₱6.00 is the price basis for calculations of benefits in this project.

[15] *Loc. cit.*, Fisheries Statistics of the Philippines, Bureau of Fisheries & Aquatic Resources.

[16] The loan will have a grace period of three (3) years, with an interest rate of 12 percent per annum, payable in twelve (12) years.

repayment capacity appears assured, if the investors cover the deficiency in the first two (2) years of operation.

Table 7 and Figure 1 give the net present values of the project at different discount rates, from the private and social viewpoints. As shown by both viewpoints, the earning power of the money invested in the project is relatively high and bright, an indication shown by the IRR's (47.11% and 40.20%, respectively).

Linkages of the Milkfish Industry

Aside from the direct benefits aforementioned, the *Chanos-chanos* industry in the Philippines has relevant externalities or indirect benefits such as its linkages with the fertilizer and chemical industries, the transport system, the refrigeration and ice or cold storage industries and most probably in the near future, the fish meal industry, feeds industry, and fish canning and processing industries.

The direct employment benefits are not only internal in nature but some employment linkages with other industries can be mentioned. The use of locally available materials is also one externality worth-taking into account.

Other Information on the Prospects of the Industry

It is worth mentioning here that the development of the industry has lately been given a "shot in the arm" when the International Development Research Center (IDRC), based in Canada, approved a research grant of Cdn $757,000, to be implemented by the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC) in Tigbauan, Iloilo.[17] The SEAFDEC is a regional organization where the Philippines is a member. Its research facilities can likely contribute some breakthroughs in bangus technology, hence to the development of the aquaculture industry in the Philippines. The shortage of bangus seeds[18] (fingerlings and fry) is one of the major problems of the industry aside from funding sources and other still unsolved technical problems of bangus-raising.

[17] An Integrated Research and Development Project on Milkfish Seed Production & Cultivation, Aquaculture Department, SEAFDEC, Tigbauan, Iloilo, Philippines, January 27, 1975.

[18] Personal interview of a Malabon fishpond owner. Also from Bureau of Fisheries and Aquatic Resources Annual Reports.

TABLE 7
IRR AND NPV AT DIFFERENT DISCOUNT RATES

Viewpoints / Rates	15%	30%	40%	45%	IRR
Private	924,297	28[5] 980	129,189	38,385	47.11
Social (National)	1,542,779	318,062	5,509	(94,509)	40.28

CONCLUSIONS AND RECOMMENDATIONS

The local demand for milkfish has been increasing, as shown by trends, e.g., during the last two to three decades. These trends are due to the increasing consumption because of expanding Philippine population and the seeming expansion of the income of the people. Growth of the industry is expected to continue and such is motivated by good price, increased demand and the expected expansion of consumers and the foreign market.

It appears that at present, the supply of bangus is still inadequate. Hence expansion of the industry is vitally needed. As there are still relatively large tracts of available swamplands for development into bangus ponds, the prospects of the bangus-raising industry appears bright. As shown by the profitability of this bangus project, it can serve as a model for investors so that they can be motivated to engage in the industry. Hence, the still available swamplands can be put into productive purposes.

The heavy or relatively large capital investments needed to start a bangus project serves as a deterrent or a constraint to investors to engage in bangus-raising. Therefore, it is suggested that the government liberalize its loan requirements for the industry, e.g., the DBP fisheries loan program should be expanded. A more flexible loan policy could be provided by the government like establishing a fisheries development bank, intended exclusively to extend credit facilities and instruments to the fishing industry.

The project is economically feasible after appraising it using the NPV and IRR investment criteria.

At the minimum price of ₱6.00 a kilo, the project on bangus industry is economically viable to repay its loans.

As bangus farming requires large amount of capital or heavy capital investments for the development of swamps into ponds and for actual operations as shown in this project, it is important to consider costs and returns for alternative sizes of fish farming operations. This action would lead to selection of the most suitable or appropriate size of fish farming operations that would yield the best returns and maybe to a family-size fish farm that would be economically viable for a family. The direct benefits in terms of forward and backward linkages in employment need to be studied further.

One of the problem areas of the bangus industry is the marketing channels. The marketing activity is carried out by brokers, wholesalers, wholesale-retailers and retailers. The whole marketing system relies on trust given by the fish brokers to retailers and consignees. The transfer of the commodity from one agent to another before it reaches the consumers is one factor that brings about the increase in the price of bangus so that there is no guarantee of price stabilization. This is a problem area of the industry, where the demand-supply mechanism plays a major role, and where studies should be undertaken. This study did not consider this problem.

Records of the Bureau of Fisheries and Aquatic Resources show that the first trial commercial shipment of frozen bangus was made in 1969 with 38,199 kilos worth ₱105,780. This gradually increased to 96,801 kg valued at ₱387,775 in 1970; to 151,931 kg worth ₱1,109,323 in 1971; 54,741 kg worth ₱399,963 in 1972; 64,329 kg worth ₱488,559 in 1973; 134,116 kg worth ₱1,186,912 in 1974 and 191,422 kg worth ₱2,652,195 in 1975.

ACKNOWLEDGMENT

I wish to extend my heartfelt thanks to Mr. Ruperto P. Alonzo, my thesis adviser and Professor in Project Analysis and Evaluation for his patience and invaluable guidance.

I wish also to express and extend my grateful and sincerest thanks to NEDA Assistant Director General Eduardo G. Corpuz and to Mr. Ely M. Batangantang, Director, Agriculture Staff, NEDA, for giving me the opportunity to take the course in Development Economics.

My gratitude also to the technical personnel of the Bureau of Fisheries and Aquatic Resources who provided their facilities and provided the technical data, and to other people in the industry who wish anonymity whom I interviewed for the purposes of this study.

Likewise, thanks are due to Mrs. Remedios Ferranco and Mrs. Lydia Medel for their patience in typing the original manuscript.

Finally, special thanks to my wife, Linda, for her understanding and moral support.

This short work is dedicated to my daughters, Marikel and Maricynth and my son, Ian Karl.

BIBLIOGRAPHY

1. Development Bank of the Philippines. Guidelines for Fisheries Industry Loan Programs. Makati, Rizal. n. d. (Mimeo copy).
2. Dosayla, E.D. 1973. Summary of Economic Surveys of Four Economic Surveys of Food Consumption. NFAC Special Studies. Diliman, Q.C. 28p.
3. Gittinger, J. Price. 1972. Economic Analysis of Agricultural Projects. Economic Development Institute, IBRD. John Hopskin Univ. Press.
4. Guerrero, G.V. 1974. Bangus: a look ahead. NFAC Special Studies. Diliman, Q.C. 13p.
5. Mears, L.A. 1969. Economic Project Evaluation with Philippine Cases. UP School of Economics. Diliman, Q.C., UP Press Inc. vols. 1-11.
6. The Organizations for Economic Cooperation and Development. 1968. Manual of Industrial Project Analysis in Developing Countries. vol. 1.
7. Philippine Council for Agricultural Research. 1976. The Philippine Recommends for Bangus. Los Baños, Laguna.
8. Philippines (Republic). Bureau of Fisheries and Aquatic Resources. Four-Year Expanded Fish Production Program FY 1975-1978. Manila.
9. ————. Dept. of Natural Resources. 1974. Philippine Fish Marketing and Distribution Study. Potential for the Export of Phil. Milkfish. Diliman, Q.C. vol. 7 (draft report).
10. ———— National Economic and Development Authority. 1973. Four-Year Development Plan 1974-1977. Manila.
11. ————. Office of the President. 1972. Presidential Decree No. 43 — Fishery Industry Development Decree of 1972. Manila. (Mimeo copy).
12. ————. 1975. Presidential Decree No. 704 — Revising and consolidating all laws affecting fishing and fisheries. Manila. (Mimeo copy).

13. Sinotech Engineering Consultants, Inc. 1975. Smallholder Fishpond Study Project. Taipei, Taiwan.

14. Southeast Asian Fisheries Development Center. 1975. An Integrated Research and Development Project on Milkfish Seed Production and Cultivation. Aquaculture Dept. Tigbauan, Iloilo.

15. Symposium Papers. 1975. National Bangus Symposium sponsored by BFAR/PCARR/SEAFDEC. Phil. Village Hotel, 25-26 July, 1975.

16. Tryon, J.L. and F.E. Cookson. 1966. A Critical Survey of Project Planning. Center for Development, National Planning Assn. Washington, D.C.

17. Union Carbide Corporation. 1968. Compound Interest Tables. Park Ave., New York.

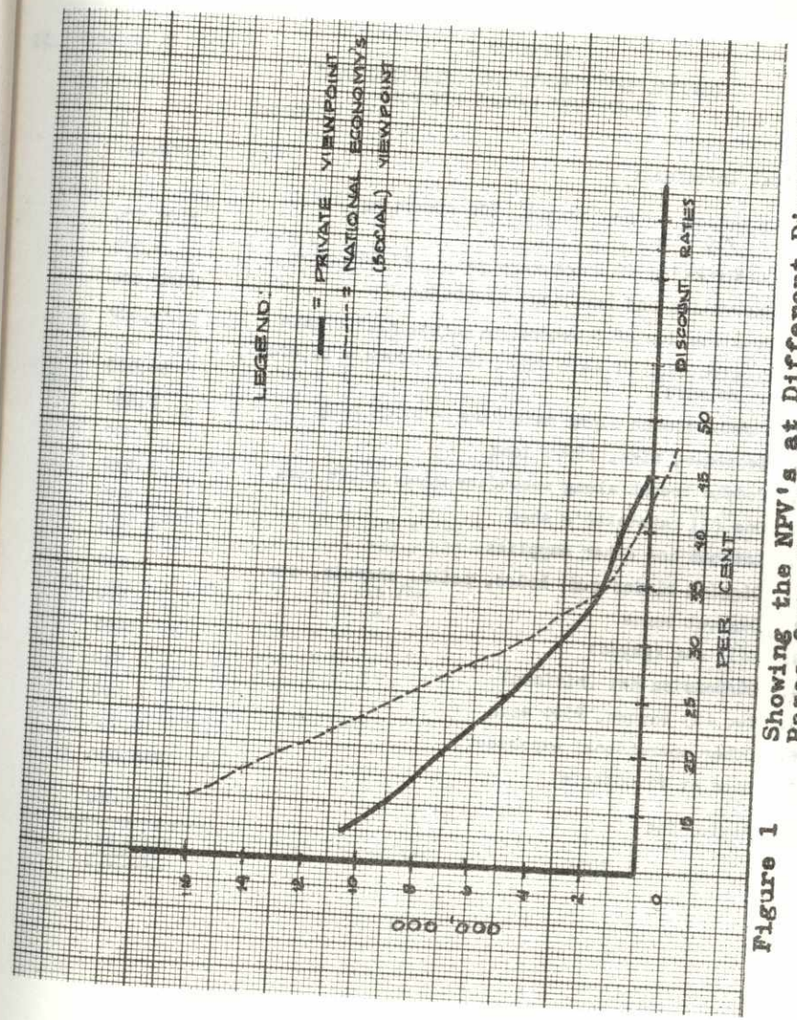

Figure 1 Showing the NPV's at Different Discount Rates from the National (Social) and Private Viewpoints

APPENDIX I

CAPITAL INVESTMENTS AND OPERATING COST 50-HECTARE BANGUS FISHPOND

I. Capital Investment	Pesos
1. Uprooting of tree stumps, 200 stumps/ha., ₱10/stump	₱100,000
2. Construction of 5 concrete gates; ₱3,000/gate	15,000
3. Excavation and Leveling, ₱2,000/ha.	100,000
4. Construction of 5 secondary gates, ₱7,500/gate	25,000
5. Construction of main dike, $6M^2$ x 2000M = 12,000M^3, ₱3.00/M^3	36,000
6. Puddle trench along main dike - 2000M long	3,000
7. Secondary dike, 1500M long	9,000
8. Puddle trench along secondary dike, 1500M long	2,250
9. One (1) caretaker's shed	1,500
10. Bamboos and other supplies	1,200
11. Digging blades e.g. bolos, pails, shovels, etc.	2,500
12. Dug-out banca	500
13. Gill net (gayad)	400
14. Suspension net (bitinan)	350
15. Two (2) bancas, ₱500 each	1,000
16. Other operational expenses	3,000
17. Land at ₱5.00/sq.m.	250,000
18. Rental fee	50
TOTAL	₱548,250

II. Operating Costs		
1. Labor		14,960
a. One (1) Manager at ₱600/mo.	7,200	
b. Two (2) Caretakers at ₱240/mo	5,760	
c. Casual labor	2,000	
2. Fish seeds, at 10,000/ha., ₱25/thousand		
1st year - 10,000 x 10 ha. = 100,000 x ₱25 =	2,500	
2nd year - 10,000 x 20 ha. = 200,000 x ₱25 =	5,000	
3rd year - 10,000 x 45 ha. = 450,000 x ₱25 =	11,250	
4th year - 10,000 x 50 ha. = 500,000 x ₱25 =	12,500	
3. Chemical fertilizer, 10 bags/ha., ₱50/bag		
1st year - 10 bags x 10 ha. = 100 x ₱50 =	5,000	
2nd year - 10 bags x 20 ha. = 200 x ₱50 =	10,000	
3rd year - 10 bags x 45 ha. = 450 x ₱50 =	22,500	
4th year - 10 bags x 50 ha. = 500 x ₱50 =	25,000	
4. Organic fertilizer, 5 tons at ₱250/ton		
1st year, 5 tons x 10 = 50 x 250 =	12,500	
2nd year, 5 tons x 20 = 100 x 250 =	25,000	
3rd year, 5 tons x 45 = 225 x 250 =	56,250	
4th year, 5 tons x 50 = 250 x 250 =	62,500	
5. Agricultural Lime, 500 kls./ha.		
1st year, 500 kls. x 10 ha. =	250	
2nd year, 500 kls. x 20 ha. =	500	
3rd year, 500 kls. x 45 ha. =	1,125	
4th year, 500 kls. x 50 ha. =	1,250	
6. Miscellaneous Expenditures		5,000
7. Rentals; ₱10/ha.		
1st year	100	
2nd year	220	
3rd year	540	
4th year, up to 20th thereafter	700	

8. Brokers Commission; (4th to 20th, 3% of sales)
   1st year; 4% up to 3rd year
   2nd year 2,472
   3rd year 5,932
   4th year 22,246
   27,246

9. Personnels Commission, 3% of sales
   1st year
   2nd year 1,854
   3rd year 4,449
   4th year 16,686
   20,394

10. Transport at ₱0.25/kl.
   1st year
   2nd year 2,500
   3rd year 6,000
   4th year 22,500
   27,500

11. Contingencies 2,000

Total Operating Costs, 1st year ₱ 49,136
2nd year ₱ 79,061
3rd year ₱175,057
4th year ₱198,996

III. Gross Benefits

1. Gross Sale (3 bangus/kilo

at ₱6.00/kl	Area	Productivity	Produce[1/]	Value	Gross Total Value of Sales
1st year	10	1,000 kls.	10,000	60,000	61,800
2nd year	20	1,200 kls.	24,000	144,000	148,320
3rd year	45	2,000 kls.	90,000	540,000	556,200
4th year	50	2,200 kls.	110,000	660,000	679,800

[1/] Miscellaneous produce at 3% like shrimps, crabs, tilapia, etc., plus bangus of 97% in total catch/ha.

1st year	-	1,800
2nd year	-	4,320
3rd year	-	16,200
4th-20th yr.	-	19,800

NOTE : The main source of investment and operating data were provided by Mr. Antonio Mamaril, Senior Fishery Biologist of the Bureau of Fisheries and Aquatic Resources and from an interview of a fishpond operator at Bo. Dampalit, Malabon. Rizal. Other costings were computed by the author based on basic data available at the Bureau of Fisheries and Aquatic Resources Library.

APPENDIX II - Pro-forma Profit and Loss Statement

Year	1	2	3	4	5	6	7	8
Sales	61800	148320	556200	679800	679800	679800	679800	679800
Operating Costs	49136	79061	175057	198996	198996	198996	198996	198996
Interest Payments	55920	55920	55920	55920	53604	51010	48104	44850
Sales Tax	1854	4450	16686	20394	20394	20394	20394	20394
Net Y before Y Tax	(45110)	8889	308537	404490	406806	409780	412306	415556
Y Tax	0	2222	97988	131571	132382	133423	134307	135444
Net 4 after Taxes	(45110)	6667	210549	272919	274424	276357	277999	280112
Total Taxes	1854	6667	114674	151905	152776	153817	154701	155838

APPENDIX II - Pro-forma Profit and Loss Statement (Continued)

Y e a r	9	10	11	12	13	14	15	16-20
Sales	697800	697800	697800	697800	697800	697800	697800	697800
Operating Costs	198996	198996	198996	198996	198996	198996	198996	198996
Interest Payments	41205	37123	32551	27431	21696	15273	8079	0
Sales Tax	20394	20394	20394	20394	20394	20394	20394	20394
Net Y before Y Tax	419205	423207	427859	432979	438714	445137	452331	460410
Y Tax	136050	138150	139950	141542	143549	145799	148316	151143
Net ## after Taxes	282555	285137	287909	291427	295165	299338	148316	151143
Total Taxes	157044	158544	160344	161936	163943	166193	168710	171537

APPENDIX III - Cash Flow, Private and Social Viewpoints

YEAR	0	1	2	3	4	5	6
Sources of Funds							
Loan	466000						
Equity	106318						
Gross Sales	0	61800	148320	556200	679800	679800	679800
Working K, beginning	0	24568	39530	87528	99498	99498	99498
Total Sources	572818	86368	187850	643728	779298	779298	779288
Application of Funds							
K Investment	548250						
Operating Costs	0	49136	79061	175057	198996	198996	198996
Amortization and Interests	0	55920	55920	55920	75222	75222	75222
Taxes 1/		1854	6672	114674	151965	152776	153817
Working K, ending 2/	24568	39530	87528	99498	99498	99498	99498
Total Applications	572818	146440	229181	445140	525681	526494	527533
Net Cash Flow 3/	(106818)	(60072)	(41331)	198579	253617	252804	251765
Social Viewpoint	572818	(2298)	21261	369175	480804	480804	480804

1/ Sales and income Taxes, sales is 3% of gross sales; Y Tax is 25% of the 1st 100,000 and 35% of the remaining.
2/ 50% of operating cost during the first year
3/ Private viewpoint

Appendix III - Cash Flow, Private and Social Viewpoints (continued)

Year	7	8	9	10	11	12
Sources of Funds						
Loan						
Equity						
Gross Sales	679800	679800	679800	679800	679800	679800
Working K, beginning	99498	99498	99498	99498	99498	99498
Total Sources	779298	779298	779298	779298	779298	779298
Application of Funds						
K Investment						
Operating Costs	198996	198996	198996	198996	198996	198996
Amortization and Interests	75222	75222	75222	75222	75222	75222
Taxes 1/	154701	155838	157044	158544	160344	161936
Working K, ending 2/	99498	99498	99498	99498	99498	99498
Total Applications	528417	529554	530760	532260	534060	535652
Net Cash Flow 3/	250881	249744	248538	247038	245238	243646
Social Viewpoint	480804	480804	480804	480804	480804	480804

1/ Sales and Income Taxes, sales in 3% of gross sales; Y Tax is 25% of the 1st 100,000 and 35% of the remaining
2/ 50% of operating cost during the first year
3/ Private viewpoint

APPENDIX III - Cash Flow Private and Social Viewpoint (continued)

Year	13	14	15	16-19	20
Sources of Funds					
Loan					
Equity					
Gross Sales	679800	679800	679800	679800	679800
Working K, beginning	99498	99498	99498	99498	99498
Total Sources	779298	779298	779298	779298	779298
Application of Funds					
K Investment					
Operating Costs	198996	198996	198996	198996	198996
Amortization and Interests	75222	75222	67325		
Taxes 1/	163943	166193	168710	171537	171537
Working K, ending 2/	99498	99498	99498	99498	0
Total applications	537659	539909	534529	470031	370533
Net Cash Flow 3/	241639	239389	244769	309267	408765
Social Viewpoint	480804	480804	480804	480804	580302

1/ Sales and Income Taxes, sales is 3% of gross sales; Y Tax is 25% of the 1st 100,000 and 35% of the remaining
2/ 50% of operating cost during the first year
3/ Private viewpoint