ISSN 0115-4974

Asian Aquaculture

VOL. III NO. 2 TIGBAUAN, ILOILO, PHILIPPINES FEBRUARY 1980

Aquaculture Financing in Asia

A motive power in the business of aquaculture development is credit. It enables countries and private enterprises to efficiently translate technological developments into production increases and socio-economic development. The crucial role of credit comes to fore before and during an industry's take-off stage. And experts agree that the aquaculture industry of most Asian countries is at pre-take-off and rather slow in gathering momentum. A responsive financing program could facilitate the adoption of new technologies in these countries and, combined with the other industry development accelerators, could nudge aquaculture closer to take off point.

While many Asian countries have embarked on credit financing for aquaculture, these attempts have been ineffective and have fallen short of governments' expectations. This was the assessment of a dozen credit and financing specialists as well as fisheries and aquaculture scientists and policy makers from nine (Indonesia, India, Sri Lanka, Thailand, Japan Bangladesh, Singapore, Nepal and the Philippines) Asian countries who were among those who met in Manila late in 1978 to develop an aquaculture development strategy for the region.

The credit task force organized during that conference-workshop was composed of high-ranking officials of government banks and financing institutions from India, Bangladesh, Nepal, Thailand, Sri Lanka and the Philippines and were joined by aquaculture economists, fisheries researchers and policy men from Japan, Singapore and Indonesia, as well as fishfarmers from the Philippines.

Crystallized by the task force are the following problems and issues regarding the role of and need for credit in support of Asian aquaculture: (a) target clientele must be identified and its socio-economic profile, financing needs and location must be studied and defined; (b) bank credit terms must be matched with the financial and sociological attitudes of the clientele; (c) there is no link between policy makers and fishfarmers as evidenced by the lack of institutions at the grassroots serving aquaculturists; (d) fragmentation of thrusts in credit delivery due to the orientation of credit programs toward the commodity instead of the clientele; (e) the low priority given to aquaculture.

Specifically, here is how the Asian region stands in terms of financing programs for aquaculture:

Except for Sri Lanka and Singapore, the other countries represented and reviewed by the credit task force are financing aquaculture projects under existing credit programs for fishery. And, with the exception of India and the Philippines, these credit schemes do not provide any specific program for aquaculture development as a separate sector. The experts attributed this to the fact that in some countries aquaculture development is only just beginning.

Aquaculture financing is a recent

(Continued on page 2)

Orient credit programs to requirements of borrowers rather than commodity. Credit packages for small aquaculturists should include their production needs, marketing and processing requirements, as well as family subsistence. (Photo taken inside Iloilo Province branch of the Development Bank of the Philippines by D. Valenzuela).

Aquaculture financing . . .

(From page 1)

development, as in Bangladesh which started only in 1977. Sri Lanka and Singapore are in the developmental stage so that their banks have not yet undertaken aquaculture financing.

Countries which have extended credit to fisheries and aquaculture have experienced varied growth rates. In India, growth rate was deemed insignificant while in Nepal, Thailand and the Philippines, it ranged from moderate to high -- 30 percent for Thailand, 23.6 percent for the Philippines.

Programs now implemented by Asian countries generally provide financing for production, development and post-harvest. Production loans refer to operating capital needs and are short term in nature while development loans are for building infrastructures. Post harvest loans cover purchase and construction of marketing and processing facilities. Development and post harvest loans are medium and long term loans.

Credit programs in Asia tend to favor group lending. In India, cooperatives have a better chance of getting fishery loans than individuals. In Thailand, the formation of fishermen groups and cooperatives is being encouraged by lending to them at lower interest rates so that these can be re-lent to members at the prevailing rate of agricultural loans. The group guarantee is accepted by banks in lieu of the usual collaterals and, as in Bangladesh, cooperatives are given larger loan amounts. Except for the Philippines and, to some extent Thailand, other credit programs are not in the nature of supervised credit in which the borrower is assisted by farm management technicians. This is due to the lack of expertise of technicians in aquaculture working for lending institutions and the government.

Lending to the fisheries sector has been primarily undertaken by government banks except for Thailand's Bank of Agriculture and Agricultural Cooperatives. BAAC finances less than 10 percent of the total loans and this is because a large number of borrowers in Thailand are the middle and upper income groups of fishermen who can easily get loans from commercial banks. Government subsidies generally come in the form of technical supervision and advice, marketing, processing, and storage facilities.

Interest Rates. Interest rates charged by the region's financial institutions range from 9-12 percent varying according to type of borrower and loan maturity. India, Nepal and Bangladesh charge on all types of fishery loans 11 percent. However, medium and long term loans in Bangladesh are charged one-half percent higher than short-term loans. Thailand and the Philippines charge 12 percent per annum on fishery loans.

Thailand is the only country where lower rates are charged (9%) to loans availed of by groups and cooperatives. Proceeds of these loans can be loaned out by the cooperatives to its members at 12 percent per annum or used to finance group projects.

In general, interest rates charged on fishery or aquaculture loans are lower than those charged in other sectors of the economy and are largely subsidized by governments, a reflection of the priority being given to aquaculture development in the region.

Loan ceilings. Policies on ceilings are varied. While in India only 85 to 95 per cent of the project cost is provided by the bank, Nepal bases the loan size per borrower on the total requirement of the project. Thailand sets a ceiling of 20,000 baht per borrower for short term loans but has no maximum loan value for medium and long term loans. In Bangladesh and the Philippines, ceilings are applied to all loan types with a higher amount provided for medium and long term financing. Bangladesh provides a higher loan value for medium and long term loans availed of by cooperatives.

Furthermore, while the basis of ceiling differs among countries, this also varies according to financial institutions. In India and Nepal, this is on a per project basis, in Thailand it is per borrower, in Bangladesh and the Philippines it is per unit area.

Collaterals. Asian financing institutions generally require some form of collateral especially for individual lending. Preferred collaterals are real properties and other fixed assets. Thailand, Nepal (under the small farmers development program) and the Philippines encourage borrowing by accepting group guarantee in place of real estate or other tangible assets.

Maturity. Short-term loans usually mature in a year's time. Medium and long term loans in India mature in 5 to 7 years while it is only 3 to 5 years in Nepal. Most medium term loans in Thailand mature in 1 to 3 years. For Bangladesh, medium term loans are for 4 to 5 years while long term loans mature in 7 to 20 years.

Repayment. Payment schedule basically depends on the project's income flows with grace periods up to 1 year for medium and long term loans. Nepal and Bangladesh grant a grace period of 2 to 6 months on production loans.

Rediscounting. Of the five countries extending aquaculture financing, India, Nepal and the Philippines have rediscounting facilities but only the Philippines enjoys loan advances from its Central Bank. Rediscount rate for government-supported supervised lending is 1 percent in the Philippines and 7 percent in Nepal.

There are various types of guarantee arrangements for loans granted to fishermen. The guarantee schemes in India, Philippines and Nepal are some examples. In Bangladesh, what the government guarantees is the loan of the financial institution from the Central Bank.

To direct funds to the agricultural sector, which includes fisheries and aquaculture, the government through the Central Bank directs financial institutions to set aside a portion of their deposits of loanable funds for this type of lending. This is done in Nepal, 7 percent of deposit liabilities; Philippines, 25 percent of loanable funds; Thailand, 10 to 15 percent of loanable funds; and Bangladesh, 100 percent of loanable funds of development banks.

Problems and Issues

Information. The lack of knowledge by lending institutions of the standards of aquaculture production operation has been one of the main difficulties faced by these banks in formulating effective credit norms. The standardization of production economics or the development of viable models of production has to be based on actual field operations, not on laboratory experimental results. Banks need information on yields per unit, profile of target clientele, physical and chemical parameters, and technical and economic viability of aquaculture projects so that they can develop decision-making standards.

Profit vs equity. Collateral and economic profitability are considered by most Asian banks as the main criteria for lending. However, a majority of the fishfarmers in the region has neither the land nor the capability to adopt new technology for higher production. Thus, in a lending system where economic considerations are strong, the small or marginal fishfarmers are paid little attention. When national plans begin to put more emphasis on the goal of equity and redress of poverty, banks become faced with the problem of balancing profitability and social obligation.

Who is the clientele. The inability of programs to identify and categorize their target clientele has given rise to problems in credit program planning and imple-

FARMING FISH IN THE BASEMENT

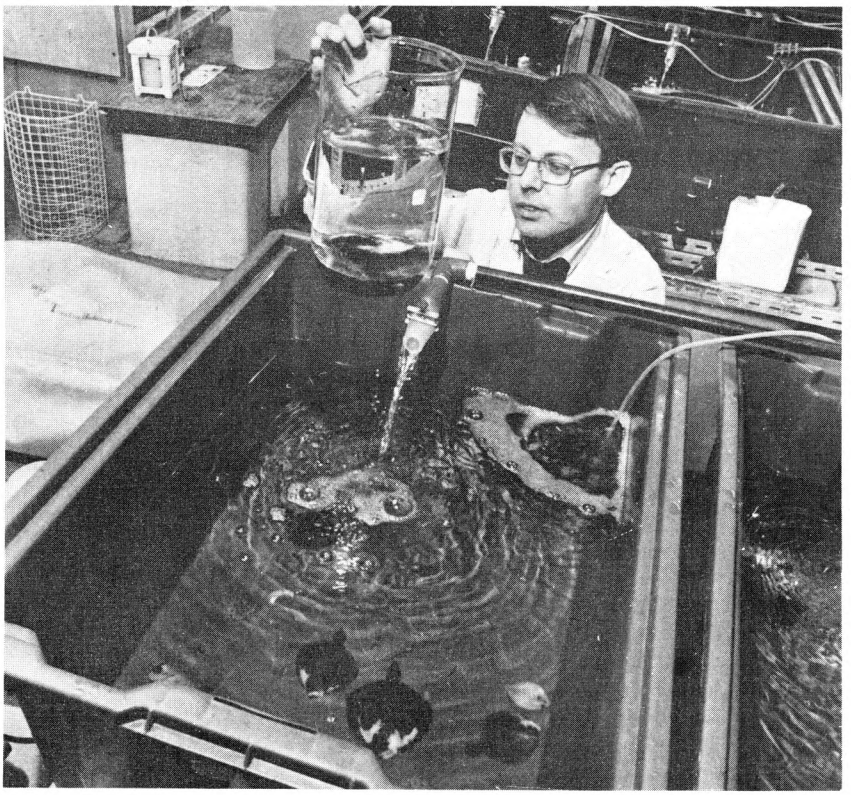
Here in the basement of a British university healthy flatfish are being bred by a research team using a technique which allows fish to be farmed almost anywhere -- even in the home and at industrial locations far from the sea and rivers.

Dr. Mike Poxton, a biologist at Heriot-Watt University in Edinburgh, Scotland, is shown viewing one of the specimens bred in tanks which are supplied with constantly recycled water filtered by standard methods. The researchers have already been able to breed fish in the same water for three years and there seems to be no reason why the process could not continue indefinitely.

Natural clean water supplies in any given area will support only a limited number of fish farms because fresh water is used only once before being returned to river, lake or stream. Dr. Poxton maintains that filtration would enable fish farms to thrive in depressed areas or in densely population regions, right on the doorstep of both labour and consumer markets.

An attraction of the system is that it gives the fish farmer strict control of the environment to boost productivity. "Fish have to devote energy to maintain the salt content of their body fluids so, if the salinity of the water is kept at the same level, this energy can be diverted into extra growth," says Dr. Poxton.

(British Information Services) ●



mentation. The credit needs of the different groups of aquaculture producers -- marginal, small, medium and large -- are not similar. The credit program should have to be packaged to cater to the special needs of each segment. For instance, financing packages with capital assistance and large subsidy elements should be undertaken for marginal and submarginal farmers while credit programs with commercial interest rates, maturity and terms should be extended to large-scale operations.

Policy. An inherent conflict exists between the borrower and lender with the former asking for liberal terms to make his project viable and the lender imposing stringent loan requirements to offset the high-risk low-yield nature of the enterprise and the absence of credit track records of the borrower.

Lack of institutions. The credit experts noted the lack of effective support institution for the aquaculture industry at the grassroots level. Specialized lending institutions are inadequate or non-existent. This is compounded by the lack of cohesive fishfarmers organizations that can effectively receive technologies and implement policies affecting the industry. While there is a lack of liaison between fishfarmers and decision makers of governments, the need for adequate and strategically located marketing, processing and

(Continued on page 6)

Aquaculture in Guatemala

Aquaculture was introduced to Guatemala 30 years ago. Before that the only sources of fishery products were the inland waters and the sea. The government has started to expand and disseminate the practice of rural aquaculture as part of its program to improve the diet of the people. The Division of Fauna of the Ministry of Agriculture together with the fishery biologists of the U.S. Peace Corps Volunteers has started a program to develop aquaculture. It involves the collection of data and organization of work. The initial phases are: inventory of aquatic resources, studies to improve and rehabilitate the national fishery centers, farm production sampling of different fish species to determine the levels of production, and the technical training of Guatemalans who would carry on the program.

The farm sampling of yields of different species gave promising results. In the warm climate of Baja Verapaz, Tilapia (*Sarotherodon niloticus*) is being cultured in small earthen ponds. The production level has reached the equivalent of 3,500 kg per ha/yr. Construction and management of small ponds (25 to 200m^2) is common. These are fertilized with animal manure at the rate of 1,000 kg per ha/yr. The Guapote Tigre (*Cichlasona managuense*) is being used as the predator to control the population of Tilapia.

In regions whose altitudes are more than 1,500 meters, water temperature is low (15-20^{o}C) for the culture of Tilapia so that the culture of common carp was chosen. Yields have averaged about 1,500 per ha/yr.

Special projects were also implemented within the program including fisheries in Lake Atitlan, with special emphasis on the biological control of aquatic plants using herbivorous carps (*Ctenopharyngodon idella*). Likewise, there is a project on the recycling of human waste for aquaculture and another on the establishment of small fishery stations in remote areas. ●

* Translated by C. V. Recio of the Institute of Aquaculture, SEAFDEC from ***Revista Latino Americana de Acuicultura***, Sistema Economico Latino Americano; Comite de Accion de Productos del Mar y de Agua Dulce, San Luis, Lima Peru, September, 1979.

Economic analysis of single-commodity and integrated farming in Taiwan*

Seven farming systems -- three single-commodity (crop, fish and livestock) and four integrated (crop-fish, crop-livestock, fish-livestock and crop-fish-livestock) enterprises -- were compared as to their economic aspects. The study examined the impact of different types of farming on resource use; analysed the benefit-cost ratio of different types of farming; measured the production efficiency and farm income in different types of farming; and compared the integrated crop-livestock-fish farming system with the other systems in terms of efficiency.

Four economic indicators were used in the comparative analysis: benefit-cost ratio, rate of farm income, factor productivity, and elasticity of substitution (see p. 5 for the formula used for each indicator).

The results of the analyses showed that integrated farming made a significant impact on (1) benefit-cost ratio and rate of farm income and (2) on factor productivity and elasticity of substitution.

Integrated farming increased not only the overall agricultural output but also the family farm income (Table 1). From the point of view of farm income aspects, the benefit-cost ratio is highly related to the different types of farming; the simpler one-commodity farms showed a lower farm income and benefit-cost ratio than the integrated farming systems. While the diversity of farm enterprise increased, the rate of farm income also increased. Crop farms gave the lowest rate of farm income while fish-livestock provided the highest rate (Table 1).

Table 1: Benefit-cost ratio and rate of farm income of different types of farming

Items / Patterns	Farm Receipts 1	Production Cost 2	Farm Income 3 = 1 -- 2	Ratio Farm Income / Production Cost (Benefit Cost) 4 = 3 / 2	Rate of Farm Income 5 = 3/2 (100)
Crop	145,472	85,385	60,087	0.7037	41.31
Fish	170,055	89,207	80,848	0.9063	47.54
Livestock	732,047	340,977	391,070	1.1469	53.42
Crop-Fish	222,485	107,968	114,517	1.0607	51.47
Crop-Livestock	262,417	110,739	151,678	1.3697	57.80
Fish-Livestock	354,546	131,203	223,343	1.7023	62.99
Crop-Livestock-Fish	350,299	140,054	210,245	1.5012	60.02

In terms of factor productivity – which measures how much a farming system contributes to the growth of land, labor and capital productivities -- integrated farming showed a certain significant relationship with the factor productivity which varied among the different types of farming. Factor productivity per hectare increased considerably with the adoption of intensive agricultural operations i.e. integrated farming.

The factor productivity of integrated fish-livestock farm remarkably increased which was attributed to the increase of production per hectare and the profitable prices of fish and livestock. In Taiwan, factor productivities are seen as important indicators of the level of economic effi-

Table 2: Productivity and factor-factor ratio in different types of farming

Pattern / Items	Per Labor Capital Input C/N NT$/man-day)	Per Capital Labor Input N/C (man-day/ NT$)	Per Capital Hectare Input D/C (ha/NT$)	Per Hectare Capital Input C/D (NT$/ha)	Per Labor Hectare Input D/N ha/man-day)
Crop	316.44	.0032	.00026	78,335	.0037
Fish	386.83	.0026	.00050	39,824	.0043
Livestock	351.72	.0028	.00006	318,670	.0010
Crop-Fish	295.23	.0034	.00028	60,656	.0027
Crop-Livestock	238.68	.0042	.00015	135,048	.0022
Fish-Livestock	229.89	.0044	.00024	84,105	.0018
Crop-Fish-Livestock	222.54	.0045	.00021	74,497	.0016

*From the paper, "An economic analysis of the integrated crop-livestock farming in Taiwan," presented by Professor Chaur Shyan Lee at the seminar Workshop on Agribusiness Systems for Integrated Crop-Livestock-Fish Farming, held at the Philippine Council for Agriculture and Resources Research, Los Baños, Laguna, Phil., 19-25 Nov. 1979.

Professor Lee C.S. is director and professor of the Research Institute of Agricultural Economics, National Chung Hsing Univ., Taichung, Taiwan.

ciency of production in small farms. The economic analysis has clearly shown that integrated farming contributed significantly to the growth of land, labor and capital productivities.

The fourth economic indicator, elasticity of substitution, measures production efficiency or technological change. The study showed that technological effects on the productivities of resources in the different types of integrated farming were significant. Labor saving technology considerably occurred in the integrated farming systems. The high elasticities of substitution between capital and labor in integrated farming were primarily in the fish-livestock and crop-livestock-fish farming systems. In other words, capital inputs increased relative to labor inputs and thus provided a significant substitute to labor, an indication of the contribution of technology or labor-saving capital input to the increase in farm productivity. In the crop-livestock-fish farming system, the value of elasticity of substitution was greater than 1; this is because the amount of capital input grew more rapidly than that of labor input. (Table 2).

As to resource use, the average man-equivalent per hectare in single-commodity farms (except livestock) is lower than in integrated systems. Also, the amount of farm capital input per hectare is higher in integrated farming systems than in single-

(Continued on page 6)

Per Hectare Labor Input N/D (man-day/ ha)	Land Productivity Q/D (NT$/ha)	Labor Productivity Q/N (NT$/man-day)	Capital Productivity Q/C (NT$/ NT$)
269.83	145,472	539.13	1.70
230.61	170,055	737.41	1.91
969.46	732,046	755.11	2.15
365.71	222,485	608.37	2.06
463.96	262,417	565.60	2.37
570.71	354,546	621.24	2.70
629.34	350,299	556.61	2.50

Edible Crustaceans in the Philippines*

15. *PANULIRUS ORNATUS* (FABRICIUS)

English name: Ornate crayfish or Spiny lobster.

Philippine name: Banagan (Tagalog, Ilongo and Cebuano).

A common species within the Indo-West Pacific region including Australia, this is the biggest spiny lobster in the genus *Panulirus,* the male attaining 43 cm in body length and about 2.8 kg in body weight. The species of the genus *Panulirus* carry cylindrical spiny carapace and round abdomen becoming flattened towards the tail. A pair of supra-orbital spines are strong, having six or seven white cross bands. The walking legs are strong; the first pair being the shortest but most robust and the third being the longest. No abdominal somite has transverse groove.

Ground color is grey brown. The numerous spines on the carapace are orange, and walking legs striped with black and whitish yellow. Each abdominal segment has a pair of lateral white spots which are bigger and more prominent than those on *P. homarus.* Swimmerets and tail fans are orange margined with white.

A large number of them are transported by air from the Mindanao area to Manila in headless-chilled condition for the local market as well as for exportation. The flesh in the abdomen and proximal portion of the antennae is particularly tasty.

The species is distributed commonly in the Indo-Pacific region.

They are sold at the fish market at retail price of P35/kg.

*by H. Motoh, 15th in a series

Aquaculture financing . . .

(From page 5)

storage facilities appear to be more important in most of the Asian countries reviewed.

Low priority to aquaculture. Little attention has, until recently, been devoted to aquaculture development by governments and financing institutions. This has largely been attributed to the recent emergence of the industry and the consequent lack of knowledge on its potential.

Credit orientation. Credit programs tend to be oriented towards the commodity rather than the clientele, looking after the requirements of producing a specific commodity but failing to consider the integrated requirement of the farming household. This is especially true where the marginal and small farmers are concerned. A credit package for small producers should be able to service not only their production needs but also the entire range of marketing and processing requirements, as well as family subsistence. It must be able to promote farming systems which can increase family incomes and viability of operations, such as integrated farming.

Recommendations

Six common areas were considered by the credit task force as priority for cooperative programs in aquaculture credit among Asian countries. These include: (a) an exchange of credit information and expertise; (b) documentation and dissemination of information on successful aquaculture financing programs; (c) setting up of pilot fishfarming projects to evolve models which may have general application in the region; (d) insurance for aquaculture projects (e) formation of a regional aquaculture credit forum that would periodically provide for a meeting among bankers, researchers, and government planners and serve as a medium for the exchange of experiences; and (f) the involvement of international and regional organizations in bilateral and multilateral assistance schemes. International and regional organizations may be involved in project identification and appraisal missions in Asian countries for presentation for credit assistance from the World Bank, the Asian Development Bank and other assistance agencies.

Priority Projects

All the countries represented in the workshop choose credit assistance for production as one area for credit program implementation. On the regional level, credit for existing fishponds appear feasible. Bangladesh, India and the Philippines pinpointed credit support for the establishment of fry and juvenile banks as a possible program under the production loan category.

For marketing and processing, Nepal's preference is a program for the acquisition of chilling and icing facilities while the Philippines would like a financing scheme for feedmeal plants. The Philippines also suggests credit assistance for an integrated aquaculture project covering production, marketing and processing.

Among credit-related projects, Nepal considers as priority such activities as techno-economic feasibility studies of present aquatic practices and their potentials; training for extension men and farmers; technical assistance in the control of diseases and predators, hatchery management, nutrition, pond engineering and construction, aquaculture techniques, identification and analysis of herbs as possible poisons against predators and parasites; study course designs; and fish-farm demonstration.

Sri Lanka sees the need for pre-investment techno-economic survey on the suitability of tanks for fish culture, viability of seeds and other inputs, and training programs for technical people and bankers.

On the whole, financing and credit programs for aquaculture in Asia are being developed as fast as the pace of the industry's development allows or demands. The ADB, for instance, recognizing the potential contribution of fish-farming to economic development, has granted a large percentage of its total lending for fisheries development for aquaculture and inland fisheries projects. Among the latest aquaculture projects funded by ADB are those of the Philippines, Burma, Thailand, Bangladesh and Nepal. The World Bank on the other hand has recently provided assistance to Philippine fisheries including aquaculture in the form of a loan for the government's supervised credit scheme along the lines of the country's proven crop (rice) production program.

A good dose of credit may yet enable the region's aquaculture industry to catch up with the rest of the agricultural sector. ●

Economic analysis . . .

(From page 5)

commodity farms (Table 3).

In summary, integrated farming contributed to the maximum use of farm resources such as farm land, labor and capital which resulted to a higher farm income, higher labor productivities, and a more equitable distribution of farm labor.

From the standpoint of production efficiency and farm income, the study showed that fish-livestock farming in Taiwan was economically superior to other types of integrated enterprises. However, from the standpoint of factor substitution as measured by the elasticity of substitution, the integrated crop-livestock-fish enterprise is more significant than that of the other integrated farming systems.

Scope of Study

The study was done in 1979 and involved a purposed sampling technique; a sample comprising 320 farm households representing the different types of farming systems in Southern Taiwan was initially selected. Of this number, 175 farm households were reselected for the study. Seven farming systems were represented and 20-25 farm households were sampled for each type of farming system.

Method

Benefit-cost ratio of the specific enterprise was measured through the following formula:

$$(1) \quad K = \frac{FE}{PC}$$

FE stands for farm earnings and PC represents the production cost. Farm earnings is equal to the difference between farm receipts and production cost.

Rate of farm income is computed by the formula:

$$(2) \quad R = \frac{FI}{FR}$$

FI is the farm income and FR the farm receipts. From the farm management viewpoint, farm receipts equals farm income and farm expenses. Based on this equation therefore, the larger the rate of farm income, the higher the production efficiency.

Factor productivity, a reciprocal concept of production efficiency, can be measured by output per unit of input. If farm output is Q, input of cultivated land is D, labor input is N, and capital input is C, land productivity could be

Notes from our readers

The Marine Products Export Development Authority is implementing a scheme of popularizing prawn farming in India. We have much appreciation for the pioneering work the SEAFDEC Aquaculture Department is doing in the field of prawn breeding and culture. We will be requiring your publications in the field of Mariculture/Coastal Aquaculture, Brackish water Prawn/Fish culture, etc. If you have a ready list of publications for distribution, kindly send us a copy of the list of publications along with the prices and air-freight charges.

P.U. Verghese
Deputy Director
The Marine Products Export Development Authority
Cochin

I am interested in obtaining a copy of your publication entitled "The Small Scale Sugpo Hatchery" and to subscribe to your magazine ASIAN AQUACULTURE on a permanent basis.

G.E. King
Arabian Bechtel Company Ltd.
Jubail, Saudi Arabia

The Fisheries Department Sabah has found your ASIAN AQUACULTURE, very interesting and informative, and we wish to continue in your mailing list.

Joseph Wong Tung Sang
Director of Fisheries, Sabah

In past issues of the ASIAN AQUACULTURE in the section entitled Aquaculture Research and Development Notes you published a series of articles with photographs on the Edible Crustaceans in the Philippines by H. Motoh. I have the following 5th, 7th, 8th in a series.

Since these are very useful for our Marine Biology course at Xavier University, I would like to complete the series by obtaining the 1st, 2nd, 3rd, 4th, 6th, 9th, 10th etc. . . If you have back issues of the ASIAN AQUACULTURE, I would be happy to receive them and to pay for the cost of the publication and for mailing.

Fr. James A. McKeough SJ
Director, Institute of Marine Biology
Xavier University
Cagayan de Oro City, Philippines

We appreciate receiving ASIAN AQUACULTURE on an exchange basis with our International Center for Aquaculture. It certainly has been informative, and useful in our aquaculture classes, which have had many Filipino students.

R. Oneal Smitherman
Auburn University, Alabama

Your address came to me from the AQUACULTURE DIGEST.
I would be much obliged if you can send me more information on the publication, ASIAN AQUACULTURE.

A. Goldman
Goldman Amir
Hod Hasharon, Israel

Please let us continue to receive ASIAN AQUACULTURE, because it is very useful in our Institute.

Ai-Chin Chou
The Institute of Fishery Biology, Taipei

(Continued on page 8)

explained by Q/D, labor productivity is Q/N, and capital productivity is Q/C. Actually, factor productivity can be derived by the relationship between factor productivity and factor-factor ratio. For example, labor productivity can be explained by the relationship between labor productivity and land productivity and per labor land input by the following formula:

(3) $\frac{Q}{N} = \frac{Q}{D} \cdot \frac{D}{N}$ while the relationship between labor productivity and capital productivity and per labor capital input can be expressed by the following:

(4) $\frac{Q}{N} = \frac{Q}{C} \cdot \frac{C}{N}$ From equation 3 one can see that if the per capital land input (D/N) is held constant, then the increase of labor productivity (Q/N) is entirely the contribution of the increase in land productivity (Q/D). And, with equation 4, if the per labor capital input (C/N) remains constant, then one can say that the increase of labor productivity (Q/N) is totally the contribution of the increase in capital productivity (Q/C).

The *elasticity of substitution* of the two factors of production, labor and capital, is represented by:

$$e = \frac{(\frac{C}{N})\ d(\frac{N}{C})}{(\frac{f_N}{f_C})\ d(\frac{f_C}{f_N})}$$

In this equation, f_N and f_C are the marginal product of labor and marginal product of capital, respectively. The elasticity of substitution is the proportional change in the relative factor inputs to a proportional change in the marginal rate of substitution between labor and capital. Elasticity of substitution is one of the important indicators in measuring the production efficiency (or technological change). For this study, a CES (constant elasticity of substitution) production function was applied to measure the elasticity of substitution. (In the original paper, the author presented the derivation of the CES production function). ●

Table 3: Resource use in different types of farming

	Land Area (ha)	Man-Average Man-Equivalent per hectare	Labor Requirements per hectare (man-day)	Capital Inputs per hectare ($NT)
Crop	1.09	0.73	269.83	85,385
Fish	2.24	0.69	230.61	89,207
Livestock	1.07	2.76	969.46	340,977
Crop-Fish	1.78	1.04	365.71	107,968
Crop-Livestock	0.82	1.39	463.96	110,739
Fish-Livestock	1.56	1.71	570.71	131,203
Crop-Livestock-Fish	1.88	1.85	629.34	140,054

Notes from...

(From page 7)

In response to your request for limiting the circulation of your ASIAN AQUACULTURE, please note that my name can be removed from your mailing list. There are opportunities here in Rome to borrow it from other colleagues.

M.N. Mistakidis
Deputy Programme Leader
Aquaculture Development and Coordination Program
Fisheries Department
Food and Agricultural Organization of the United Nations, Rome

We would like to inform you that we find this magazine most helpful to stay in touch with aquaculture activities in South East Asia, and would like to continue to receive it regularly.

Maria Olson
Secretary
International Foundation for Science, Stockholm

I would very much appreciate being included in your mailing list of ASIAN AQUACULTURE. Should there be any expenses to be covered, please advise me and I will be glad to remit the amount immediately.

Franklin Kwai-Ben
Production Manager
Agromarina de Panama

Now available

PROCEEDINGS OF INTERNATIONAL WORKSHOP ON CAGE AND PEN CULTURE

The *Proceedings of the International Workshop on Pen and Cage Culture of Fish* is now available.

The 179-page (8-1/2" x 11") publication is being distributed free to workshop participants, and selected libraries and organizations. Individuals who wish to get a copy should send P50 (local) or US $20 (foreign) to:

The Director
SEAFDEC Institute of Aquaculture
P.O. Box 256
Iloilo City, Philippines

Sponsored by the International Development Research Centre (IDRC) of Canada and the SEAFDEC Aquaculture Department, the workshop was held from February 12 to 21, 1979 at Tigbauan, Iloilo and Binangonan, Rizal in the Philippines. It was attended by 81 aquaculturists from 15 countries, the IDRC and SEAFDEC.

Will you please keep us on your mailing list as we wish to continue receiving ASIAN AQUACULTURE.

Carl R. Sulvan
Executive Director
American Fisheries Society

I recently saw a copy of Asian Aquaculture, and would be most grateful if you would add my name to your mailing list for this most interesting and informative publication.

Dr. G.C. Philipps
Unilever Research
Aberdeen, Scotland

ASIAN AQUACULTURE is published monthly by the SEAFDEC Institute of Aquaculture, Aquaculture Department SEAFDEC.

Asian Aquaculture

P.O. Box 256
Iloilo City 5901, Philippines

(Entered as second class mail matter at the Iloilo City Post Office on August 28, 1978.)