

3-3 Outlook and Potentials of Development

3-3-1 Policy Orientation and Strategic Measures

With respect to fisheries, a sector strategy similar to the PRONAGRO on agriculture and livestock has not been formally announced. However, the Subsecretariat of Fisheries, the Secretariat of Agriculture, Livestock and Fisheries, is said to be currently preparing a national plan for fishery development. Taking into consideration major on-going policies and the issues discussed in the preceding sections, policies under consideration for the prospective plan would probably cover the following five items: namely, (1) control of fishing efforts in accordance with resource endowments, (2) renovation and modernization of the fishing capacity, (3) utilization of unused or underused resources, (4) product development for export promotion, and (5) improvement of the investment environment. Major issues and policy implications with respect to these items will be discussed below.

(1) Effective management of fishing efforts in accordance with resource endowments

Marine fisheries in Argentina chiefly employ the trawling method. In this respect, if fishing efforts become excessive, there will be a possibility of depleting before long the accessible fishery resources. At the present moment, there is practically no control of resource exploitation in Argentine waters except in the case of prawn fishing for which the upper limit is set on the catch. In order to promote the stable growth of the fishing industry, however, it would be important to institute an effective system of resource management, not only by limiting the level of catches but also by controlling the fishing periods and grounds, fishing methods, mesh sizes of fishing nets, sizes of fish to be caught and so on. Furthermore, it would be necessary to control the size of the fishing fleet by limiting the number and types of boats during the process of promoting the renovation and modernization of the fleet.

In addition, it is important to undertake more accurate resource assessment and thereby to update fishery statistics, because the distribution of fishery resources are variable over time. Effective resource management should be based on such regular resource-base assessments.

With respect to the fishing operations within Argentina's exclusive zone, the government policy seems to be in regulating the entry of foreign fishing boats on its respective merit in such a manner that the decision would benefit the growth of the domestic fishing industry and realize the optimization of exploitation in accordance with resource endowments.

(2) Renovation and modernization of fishing capacity

(a) Renovation of the fishing fleet

Renewal of deep-sea fishing boats equipped with freezing and processing equipment is not a pressing need, because most of them were

introduced into the country in relatively recent years. But deep-sea conventional boats and coastal fishing boats are generally very old, requiring considerable time for maintenance and repair. As a result, their operating rate is low and operating costs are high, making their fishing expeditions low in efficiency and profitability. Moreover, the navigation and fishing of each boat requires special techniques and experiences, and this is causing the stagnation and ageing of the crew.

The current legislation stipulates that in principle fishing boats must be built by domestic shipyards in order to encourage the domestic shipbuilding industry. The import of second-hand fishing boats is permitted, but conditions are strict. The age of vessels must be five years or less and the tariff rate is 50%. The restriction regarding the age of vessels is not realistic, because the international market of second-hand fishing boats consists mostly of ships aged seven or more years. Furthermore, although the fishing industry is an important foreign exchange earner, no incentive is given to its import of boats and equipment. Under the circumstances, the fishing industry, particularly small- and medium-scale companies with limited financial resources, is forced to refrain from importing boats and necessary equipment. Besides, production costs are generally high at domestic shipyards which handle mostly ordinary ships with no special experience in building fishing boats.

In connection with the introduction of new fishing boats, it is important to carefully examine the appropriate total fishing capacity, because the total physical capacity of the existing fleet is larger than the presently estimated total MSYs, although it must be pointed out that there is a need to assess the resource base more accurately and regularly. In order to preserve the fishery resources, it would be necessary to adopt a scrap-and-build scheme, by having the capacity of a new boat at least not surpass that of the vessel to be scrapped. Improvement of productivity and reduction in the operating costs could be realized by keeping the operating rate of the new, more efficient fishing boats.

With regard to fishing technology, the current predominance of trawl fishing implies the possibility of depleting resources if fishing efforts become excessive. From the viewpoint of resource management and stable growth of the fishery industry, it will be necessary to introduce or develop fishing boats suited to selective fishing in accordance with the types of fish to be caught, such as pole-and-line fishing, squid angling, gill nets, longline fishing and bottom longline fishing.

(b) Renewal of fishing equipment

Renewal and modernization of fishing equipment are also important to improve the productivity of the fishing fleet. Most of the fishing companies have a positive attitude in connection with the renewal of engines, fishing apparatuses, communication equipment, navigation instruments and fishing gear, which would help realize efficient fishing. In reality, however, they are forced to hold off purchases, because products of domestic manufacturers must be given preference to encourage the domestic industry, and because import tariffs are very

high and the import procedures very cumbersome. Some equipment and apparatuses for fishing are produced domestically, but given the limited domestic market with annual landings of up to 500,000 tons, it would be very difficult for the domestic manufacturers to develop and produce fishing equipment with quality and at price competitive with those manufactured in countries with developed fishing industry.

Generally speaking, domestic products are lower in reliability and less efficient, and last less compared with the imported products. For example, trawling nets which are most popularly used in Argentina are manufactured by domestic makers, but heat treatment for knot-fixing after knitting is inadequate. In connection with electronic equipment especially fitted for fishing, the limited demand including neighboring countries would not merit their domestic production with adequate international competitiveness. Except for some expendable articles, the use of imported products would be more advantageous for reducing the operating costs of the fishing industry, because the manufacturing costs would be too expensive in the case of domestic production in small lots. Considering the fact that the fishing industry earns approximately 7% of foreign exchange, it is desirable to relax selectively the present policy of import substitution which heavily protect the domestic manufacturers.

(c) Improvement of fishing port facilities

Projects that must be urgently implemented in this connection are the removal of the sunken ships and unused fishing boats in the Mar del Plata port. The maintenance of this port is not adequate despite the fact that it is a strategic base for the fishing industry. Improvement is urgently required to ensure the safety of fishing boats and timely landing of the catches, thereby contributing to the efficient operation of the fishing industry.

Fishing ports in Patagonia are flourishing thanks to the intensifying activity of the fishing companies in this region in recent years. But it must be noted that many fishing boats and processing facilities on the shore are suffering from inconveniences because these ports have not been built specifically as fishing ports. Fishing boats have to do double and triple mooring, and in some cases are forced to wait offshore, because the ports are not equipped with special piers for fishing boats. Moreover, no attention was paid to the movement of landings in the design of the ports. The transportation of catches to the processing plants results in the loss of operational efficiency. Still more, the processing of fish is unstable and inefficient, because the facilities to supply water, power and fuel have limited capacities.

Both piers and landing yards must be large enough, because fishing boats operating in the Patagonian waters mainly consist of freezing and processing boats of 1,000 tons or more, although their number is small. However, the period of time these fishing boats spend at their base ports annually is relatively short, because their fishing trips last longer. Under the circumstances, it is necessary to examine carefully the economic feasibility of constructing fishing ports. For the time being, it will be necessary to build the piers

and wharfs serving commercial and civil use as well as fishing boats. It will be necessary in the long run to construct at least one multi-purpose port equipped with fishing functions in each province of the Patagonian region, because new fishing companies are expected to come to this area and the existing ones are trying to expand their fleets.

A serious problem both at the Mar del Plata and Patagonian ports is the inadequate facilities for maintenance and repair of fishing boats and equipment. There are some maintenance and repair facilities at Mar del Plata, but they are not functioning satisfactorily. In the Patagonian region, there is no repair facility at all. In both regions, large-sized vessels must be brought to the Buenos Aires area for repairs. The construction of full-scale maintenance and repair facilities in the Patagonian region is economically unfeasible for the time being, but it would be necessary to establish back-up facilities for simpler maintenance and repair of fishing equipment and boats.

(3) Utilization of unused or underused resources

(a) Pelagic and migratory fish

At the present moment, only a small number of pelagic fish species like anchovy and mackerels are exploited partially, and therefore it is possible to increase the exploitation. Gill nets, lampara nets and the like are suitable for catching pelagic fish. A limited number of coastal fishing boats use such methods, but no large-scale fishing boats are engaged in this kind of fishing. Generally speaking, pelagic fish species are low-priced, and their exploitation in commercial scale will be difficult unless a large demand, mostly external, exists on the long-term basis. There is a possibility of producing fish meal from anchovy, but the competition with low-priced products of good quality from Chile, Peru and elsewhere would make it unfeasible, considering the current high production costs in Argentina. As for mackerels, it would be possible to develop the demand for whole frozen fish in the African market. There is some possibility of developing the market for canned anchovy, but it would be necessary to take measures to reduce the production costs of the canned goods.

As for migratory fish species like tuna and bonito, it is necessary to carry out resource assessments in order to ascertain their stock base and behaviors. Argentina currently imports tuna and the like as canning materials, and it is possible to exploit these resources for substituting imports. Suitable fishing methods are pole-and-line fishing, gill nets, and long line fishing, which are not employed in Argentina. Detailed studies will be required in this connection to examine the economic feasibility of such investments.

(b) Demersal fish

There are possibilities of discovering new viable fishing grounds, as was the case with prawn in 1982. The area south of 50°S Lat. is particularly promising, because only a few fishing boats are operating there. The varieties of demersal species which have some

possibilities at the present stage of knowledge are crab (centolla), Merluza de cola and Merluza de polaca. As for centolla, pound cage fishing is being carried out in small scale near Ushuaia, but investigations of the available resources will be necessary in this connection. With regard to Merluza de cola and Merluza de polaca, it will be necessary to develop appropriate fishing techniques and improve fishing boats in addition to the resource assessments.

(c) Unused catches

Fish caught by trawling but without commercial value are currently discarded on the ocean. Their quantity is not known, but it is roughly estimated to be 10 - 20% or even more of the total catches. Even if discarding is prohibited, fishing boats will not take them back ashore as long as they have no economic value. If, for example, mariculture and aquaculture could be developed in the brackish waters or coastal areas around Bahia Blanca, it would be possible to consider the utilization of these low-grade fish catches as feed. There is also a possibility of using them for human consumption through the development of appropriate processing techniques. The research institutions will need to study the present state of discarding and identify methods for utilizing the catches.

(d) Residues from processing

Except for the processing boats equipped with a fish meal plant, residues from processing on board such as heads and viscera of Merluza are discarded on the ocean. Most of the processing residues are not utilized to produce fish meal, fish oil and the like, because it is not profitable. It must be borne in mind, however, that these residues contain useful proteins, and it would be necessary to examine possibilities of using them effectively through developing suitable processing techniques and/or making appropriate marketing efforts.

(4) Product development for export promotion

(a) Surimi and related products

The INIDEP is already carrying out experiments on surimi products. In Japan, caught fish are quickly ground to surimi on board, and then brought back frozen to the processing plants on the shore, where surimi is processed into various products. It must be noted that surimi production on board becomes economically feasible when the supply of fresh raw materials is 150 tons/day or more. Supposing that Merluza is used as raw materials, it would not be economically feasible in Argentina, firstly because the present catch per boat is too small, and secondly because surimi thus produced would not be competitive with the similar product from North Atlantic Merluza. If new fish paste products like artificial crab meat are developed and the domestic demand for such products increases sufficiently, surimi production would become feasible. As things now stand, it does not appear practical to start commercial operations in surimi production.

(b) Quality improvement of processed products

The sanitary control regulation of processed marine products is well developed in Argentina, partly because it is based on the standards developed for meat. The chemical, biochemical and microbiological analyses of fish used for processing are carried out adequately. However, if the objective is to develop high-quality fishery products and thereby to expand export markets, there is room for further improvement.

From the viewpoint of taste, there is room for improvement. Consumers' preferences over taste, appearance and methods of preparation are not sufficiently fed back to the processing industry, and the processing industry does not appear to be interested in the importance of such feedbacks. Accordingly, many marketed products do not appeal to the consumers. The incorporation of consumers' preferences into processing is also inadequate in products destined for exportation. In this regard, it will be useful to refer to the example of a leading processing firm at Mar del Plata, which improved the quality of its products through technical cooperation arrangement with a Japanese fishing company, and is successfully exporting to the Japanese market. As can be seen from this example, the development of processed products which appeal to the consumers in taste, appearance and methods of preparation will be very important in expanding the demand, both external and domestic.

(5) Improvement of the investment environment

With respect to the Patagonian region, various incentives, largely fiscal in nature, are provided for investments in fisheries as part of the regional development policy. The reinvestment of the export tax, exemption of stamp duties and value-added taxes for the duration of ten years and other fiscal incentives have been effective in encouraging investments in the fishing industry. However, the companies which took advantage of such incentives were chiefly the larger, established fishing companies, or similarly large companies in the petroleum or meat processing industries, which by and large have adequate financial resources or easier access to external financing.

The promotional policies effective in the Patagonian region have been effective in attracting foreign capital. In fact, many of the companies which established themselves in Patagonia since the late 1970s were joint ventures, and the entry of new joint companies continued during the period of economic destabilization in the early 1980s, partly influenced by the discovery of new prawn fishing grounds. Because these joint-venture companies were established primarily to export to the countries of the capital's origin, they generally have stable export markets.

The promotional policies for the Patagonian region are not designed specifically for joint ventures with foreign capital, but nonetheless they favor such ventures which have easier access to financial resources and external markets. The companies operating in the Patagonian waters are required to establish processing plants on the shore, which makes it less easy for them to retreat once the

investment is made, but if landings continue to decline, or production costs stay higher than elsewhere, there is a possibility of their abandoning operations, or of discouraging new joint ventures. In this sense, it is very important to develop adequate port facilities and industrial support services in the Patagonian region.

In contrast to the Patagonian region, the fishing industry based at Mar del Plata mostly consists of medium-scale enterprises, which are vexed by the low efficiency and profitability because of their antiquated boats and equipment. Due to the prolonged economic slump, most of them lack financial resources for renovation, while their access to external financing is extremely limited.

Institutional financing for the fishery sector in Argentina is currently provided by the National Development Bank (BANADE). But the access to and the utilization of such financing have declined in recent years due to the shortage of funds and the high interest rate. The World Bank loan for the renovation of fishing boats, which is now being negotiated, will contribute to the replacement of obsolete boats. In this respect, it will be necessary to establish the strategy for selective renovation, including special preferential arrangements for smaller fish companies.

From the viewpoint of improving the investment environment, it will be also important to relax the present regime of import restrictions selectively for those fishing companies which actively pursue export expansion and diversification.

3-3-2 Market Prospects

(1) Asia in World Production and Trade

(a) World trend

World fisheries expanded in the 1960s primarily due to increased catches by Japan and other Asian countries and the explosive increase in anchovy production used as fish meal by Peru. From the 1960s through the beginning of the 1970s, world production grew at an annual rate of 8% (Table II-3-13). However, the production by countries with developed fishing industry was stagnant, showing an annual increase of only 2 - 3% during the 1970s, because distant water fisheries were affected by the rise in fuel costs after the first oil crisis and the institution of the 200-mile economic territorial waters since 1977. The increase in fishery production during the 1970s was primarily achieved by intensified coastal and fresh-water fishing efforts by developing countries, but not by industrialized distant water fisheries by the developed nations. A large increase in production cannot be expected in the future, because fishery resources are already fully exploited in many fishing grounds and the development of new fishing grounds is often not economically feasible. Therefore, there are many objectives that must be attained in the coming age of low growth, such as steady increase of production in off-shore and coastal waters, production of high-grade/high-priced fish by aquaculture, and efficient utilization of fish protein through improved storage and processing.

Table II-3-13 Production and Trade of Marine and Inland Fish

(1,000 tons)

	ANNUAL AVERAGE				
	1964/1966	1969/1971	1974/1976	1979/1981	1982/1983
1. WORLD TOTAL					
CATCH	54133	67200	67359	72874	76468
- MARINE	46616	58240	60443	65172	67822
- INLAND	7517	8960	6916	7702	8646
EXPORT	6264	7282	7574	9965	10704
IMPORT	6200	7340	7622	9262	10230
2. ASIA TOTAL					
CATCH	20123	23000	27917	30453	33920
- MARINE	14026	16643	20542	25890	28398
- INLAND	5297	6357	7375	4563	5522
EXPORT	791	894	1511	1991	2273
IMPORT	619	858	1278	1844	2368
SELF-SUFFICIENCY (%)	101	100	101	100	100
3. BY COUNTRY					
1) JAPAN					
CATCH	6787	9274	9997	10348	11013
- MARINE	6652	9114	9804	10121	10789
- INLAND	135	160	192	227	224
EXPORT	538	525	583	705	605
IMPORT	230	336	1351	1011	1164
SELF-SUFFICIENCY (%)	105	102	93	97	96
2) NICs-3					
A) KOREA REP.					
CATCH	647	962	1898	2206	2341
- MARINE	647	961	1889	2166	2295
- INLAND	0	1	8	40	46
EXPORT	48	64	284	416	392
IMPORT	12	18	12	61	79
SELF-SUFFICIENCY (%)	106	105	117	119	115
B) HONG KONG					
CATCH	64	118	150	189	185
- MARINE	63	116	146	182	178
- INLAND	1	2	4	7	8
EXPORT	14	10	78	38	55
IMPORT	70	64	83	106	145
SELF-SUFFICIENCY (%)	53	69	97	73	67
C) SINGAPORE					
CATCH	13	17	18	16	20
- MARINE	13	17	17	16	19
- INLAND	0	0	0	1	1
EXPORT	18	25	30	69	79
IMPORT	87	113	131	162	167
SELF-SUFFICIENCY (%)	16	16	15	15	18
3) ASEAN-4					
A) INDONESIA					
CATCH	1090	1228	1397	1815	2056
- MARINE	659	797	1004	1359	1538
- INLAND	431	431	393	456	518
EXPORT	-	11	42	64	86
IMPORT	-	2	12	38	91
SELF-SUFFICIENCY (%)	100	101	102	101	100
B) MALAYSIA					
CATCH	261	376	506	743	712
- MARINE	235	350	503	740	696
- INLAND	26	26	3	3	16
EXPORT	63	92	99	104	119
IMPORT	43	72	105	167	174
SELF-SUFFICIENCY (%)	106	106	99	92	93
C) PHILIPPINES					
CATCH	678	1006	1402	1561	1813
- MARINE	660	933	1169	1161	1265
- INLAND	18	73	233	400	548
EXPORT	1	4	15	70	50
IMPORT	51	70	69	46	54
SELF-SUFFICIENCY (%)	93	94	96	102	100
D) THAILAND					
CATCH	647	1430	1576	1909	2185
- MARINE	562	1328	1420	1762	2044
- INLAND	85	102	156	148	142
EXPORT	18	41	105	274	322
IMPORT	10	14	22	56	53
SELF-SUFFICIENCY (%)	101	102	106	113	114

Source: FAO, Fishery Yearbook.

World imports and exports increased rapidly after the institution of the 200-mile territorial waters in the latter half of the 1970s. Countries with developed fishing industry found it increasingly difficult to fish in the territorial waters of other countries, and started to import fishery products to fill the drop in supply. In addition, marine products caught by one country within territorial waters of another country began to be recorded as exports from the latter country.

(b) Trend in Asia

The Northwestern Pacific waters around Japan is one of the richest fishing grounds in the world, producing 29% of the world total catches. When marine waters around Southeast Asia and inland waters are added, the share of Asia rises to 44%. The region increased its production steadily by about one million tons every year, and the countries in the region produce enough to feed their populations, with high rates of self-sufficiency. However, the region exports high-grade fish, such as prawns and tuna, to the USA, Canada and Europe, and import fish meal from Chile and Peru.

The region's imports of fish meal from other parts of the world has increased in recent years, along with its expanding demand for feedstuffs in animal husbandry and culture of high-priced fish.

(c) Trend in Selected Asia

Japan

Due to expanded distant-water fisheries and the use of powered fishing boats, Japan's postwar production had increased by 0.8 million tons a year until the mid-1970s, reaching 10 million tons. Affected by the oil crisis and the 200-mile territorial waters, however, the annual increase of production dropped to a low of 0.3 million tons in the later 1970s, and Japan began to import one million tons or more of fishery products every year to fill the gap. Japan mainly imports high-grade/high-priced seafood such as tuna, prawn and shrimp, salmon and trout, and in addition, squid, octopus, fish roes and shellfish, and its import standards on quality, freshness and shape are very high.

NICs-3

After achieving production of over one million tons in the early 1970s, Korea's fishing industry grew rapidly through the buildup of distant-water fishing fleets and the improvement of fishery infrastructure. Though the rate of growth fell slightly in 1982/83, Korea continued to increase its fishery production by about 65,000 tons per year. Korea exports most of high-priced fish to Japan, and has begun to increase the export of canned seafood to North American and African markets. Korea's import largely consists of medium-priced fish as materials for processing and fish meal for livestock feed.

Hong Kong produces less than 0.2 million tons and the domestic market is relatively small. The country imports fishery products

mainly from China and Taiwan chiefly to export processed products to Japan and North America.

Fishery production of Singapore is even smaller than Hong Kong at 20,000 tons per year. The country imports seafood mostly from neighboring Malaysia and Indonesia, and exports part of the processed products to Japan and North America. The volume of its import, however, stopped to increase after 1979.

ASEAN-4

All ASEAN countries increased their fish catches markedly since the beginning of the 1970s. Except for Malaysia where production stayed below one million tons due to limited resources, their respective production reached more than 1 - 2 million tons in the latter half of the 1970s. The combined annual output of Indonesia, Malaysia, the Philippines and Thailand was 6.76 million tons in 1982/83. Though the fishing environment is different among these countries, few profitable fishing grounds remain undeveloped and production has remained more or less at the same level in recent years.

ASEAN countries, except for Malaysia, achieved a self-sufficiency during the 1970s. Thailand exports fresh or frozen high-priced fish to the Japanese market, and a large quantity of fish meal, processed from by-products of trawl fishing, to Indonesia, Singapore and Malaysia. Other ASEAN countries also export high-priced fish to Japan. The import of each country consists of medium-priced fish for processing, such as sardine, mackerel and skipjack and fish meal.

(2) Characteristics and prospects of consumption in Selected Asia

(a) Fishery products in food consumption

Fishery products are consumed for food and non-food purposes. According to the 1981 FAO statistics, about 70% of the total world production of 70 million tons was used as food and the remainder for non-food purposes. Fishery products are classified into fresh or frozen products and processed products such as salted and dried, canned, smoked or fish paste. Non-food items are fish meal, fish oil and organic fertilizer. Though the pattern of consumption varies among countries, the ratio of food to non-food uses is generally high in developing countries, and small in developed Western countries where large quantities of fishery products are used as livestock feed. However, some developing countries such as Peru and Chile use a larger volume for non-food purposes, because fish meal production is the basis of their fishery industries. Conversely, France consumes 88% of its supply as food.

According to FAO statistics, 50.5 million tons of fishery products were consumed as food in 1980 in the world (Table II-3-14). The annual rate of increase in total catch in the world was stagnant at only 0.72% in the 1970s, but the volume used for food increased steadily by 1.86% every year. However, per capita annual consumption showed little change at 11.4 kg, because the world population increased at an annual rate of 1.83%.

Table II-3-15 shows consumption of fish and seafood in Selected Asia based on the food balance sheets prepared by FAO. Compared with the world average shown in Table II-3-14, per capita consumption of fish and seafood in the Selected Asian countries, except for Indonesia, is notably high. In particular, Japan and Korea, where per capita consumption rose to 84.6 kg and 50.7 kg in 1979/81, are the highest fish-consuming countries in the world next to Iceland. The fact that all of these countries are endowed with accessible fishing grounds along their long coast lines must have had a great deal to do with such high levels of consumption. For most of the countries, fish and seafood are as important as, or more important than, meat in daily calorie intake, but Hong Kong and Singapore depend much more on meat than fish and seafood.

Table II-3-14 World Supply and Consumption of Fishery Products

	1970	1975	1980	Rate of increase over 10 years (%)	Annual rate of increase (%)
World population (million)	3,696	4,066	4,432	19.9	1.83
Total amount of fish caught (million tons)	67.2	66.4	72.2	7.4	0.72
Consumption as food (million tons)	42.0	45.9	50.5	20.2	1.86
Consumption as non-food (million tons)	25.2	20.5	21.7	-13.9	-1.48
Per capita consumption (kg/year)	11.4	11.3	11.4	--	--

Source: UN, World Population Prospects as Assessed in 1980;
FAO, Fishery Yearbook, various issues.

(b) Per capita income and consumption

The level of animal protein intake is on the whole correlated with per capita income. Whether a rise in income results in an increase of meat or seafood intake is affected by such factors as traditional eating habits and preferences and differences in price between meat and fish. Except for Japan, the countries selected for the present study have possibilities of expanding fish consumption as income levels continue to rise. In Japan, per capita consumption of fish as a whole has begun to level off. The demand has been shifting to prawn and shrimp, tuna, and other high-grade/high-priced fish, or to squid and shellfish, and consumers prefer of fresh seafood.

Countries with large Muslim population like Malaysia and Indonesia have a taboo on pork consumption, and eat chicken, hen's eggs, mutton and fish as major sources of animal protein. Seafood,

Table II-3-15 Per Capita Consumption of Fish and Seafood in Selected Asia during 1975/77 and 1979/81

	Indonesia	Malaysia	Philippines	Thailand	Hong Kong	Korea	Singapore	Japan
1975/77 Average:								
Animal products in total daily calorie intake (%)	2.4	10.9	10.4	6.3	28.7	6.4	21.3	18.7
Fish and seafood in total daily calorie intake (%)	1.0	2.4	3.3	2.1	3.2	2.1	2.8	6.2
Meat in total daily calorie intake (%)	0.9	3.0	5.1	2.8	19.9	3.1	10.0	5.6
Fish and seafood consumption (kg/year)	7.9	29.8	29.0	20.6	44.3	37.6	33.3	42.7
1979/81 Average:								
Animal products in total daily calorie intake (%)	2.2	14.0	9.5	6.5	30.3	8.8	21.8	20.7
Fish and seafood in total daily calorie intake (%)	1.0	3.1	2.7	1.6	3.2	2.2	2.0	6.8
Meat in total daily calorie intake (%)	0.8	4.0	4.5	3.7	18.0	3.6	12.6	6.3
Fish and seafood consumption (kg/year)	11.6	45.1	31.4	19.2	49.5	50.7	31.6	84.6
Increase over 1975/77 (%)	46.8	51.3	8.3	-6.8	11.7	34.8	-5.1	98.1

Source: FAO, Food Balance Sheets: 1975-77 Average, 1980, and 1979-81 Average, 1984.

Note : Animal products include meat, eggs, milk, fish and seafood, and animal oils and fats.

especially medium-priced fish are widely consumed as a cheaper source of protein. In Indonesia, for example, fish consumption increases with rises in income (Table II-3-16). Compared with the other three ASEAN countries, the level of fish consumption in Indonesia is low, and thus it is likely that the country continues to increase its consumption in the future. Thailand, Malaysia and the Philippines are also likely to increase their consumption, though probably at lower rates than Indonesia.

As food low in calorie and cholesterol but high in protein, new demand for fish as health food is increasing in Japan, Korea, Singapore and Hong Kong. Some people in higher income brackets are beginning to change their eating habits, under the influence from the USA and other developed countries. At the same time, the spread of fast food restaurants in these countries is expanding the demand for white meat fish fillets.

Table II-3-16 Per Capita Annual Consumption of Fishery Products by Income Class in Indonesia 1980

Monthly income (rupia)	Per capita annual consumption of fishery products (kg)
2,000 or less	2.08
2,000 - 2,999	6.00
3,000 - 3,999	6.60
4,000 - 4,999	11.96
5,000 - 5,999	13.52
6,000 - 7,999	17.68
8,000 - 9,999	21.32
10,000 - 14,999	26.52
15,000 or more	28.08
Average	11.44

Source: Indonesia Fisheries Office

(c) Asia as export market

Most of East and Southeast Asian countries export part of high-grade/high-priced fish they catch to Japan, and import medium- and low-priced fish for domestic consumption and fish meal for livestock feed (Table II-3-17). Exports of prawn caught or cultured in their own waters to the Japanese market account for 62% of the entire fishery trade of six Southeast Asian countries (Hong Kong, Singapore, Indonesia, Malaysia, the Philippines and Thailand). Next to Japan, Hong Kong and Singapore provide intra-regional markets for ASEAN countries, importing prawn, fresh fish, dried fish, beche-de-mer and seaweed, though, unlike in Japan, high-grade/high-priced fish are not necessarily required. However, these two markets are not large enough for exporting countries. Skipjack used to be exported to Japan

Table II-3-17 Southeast Asian Countries in Fishery Export 1979

Destination	Fresh and Frozen Fish	Salted, Dried and Smoked Fish	Shrimp and Prawn (Fresh and Frozen)	Squid (Fresh and Frozen)	Salted and Dried Squid	Other Mollusks (Fresh, Frozen or Salted and Dried)	Canned Fish	Canned Shrimp and Mollusks	(US\$ million)	
									Total	Distribution (%)
Japan	33,458	7,052	435,097	51,173	13,084	33,375	97	2,945	576,281	60.5
USA	6,824	1,859	54,308	357	824	1,127	12,903	15,218	93,420	9.8
Canada	741	505	6,900	378	97	297	432	1,873	11,223	1.2
Europe	1,304	978	31,741	26,688	242	1,667	9,854	24,697	97,171	10.2
Australia	652	174	4,848	291	82	326	4,052	1,538	11,963	1.3
and New Zealand										
Sub-total	42,979	10,568	532,894	78,887	14,329	36,792	27,338	46,271	790,058	83.0
Six South-east Asian Countries ¹⁾	21,163	10,821	24,181	1,338	7,814	8,972	4,718	3,962	82,970	8.7
Middle East	601	-	-	-	-	-	-	14	710	0.1
Africa	-	-	52	-	-	-	95	9	818	0.1
Others	3,984	889	758	135	1,623	2,173	152	393	10,107	1.1
Sub-total	25,748	11,710	24,991	1,473	9,437	11,145	5,722	4,378	94,605	10.0
Other Countries	1,356	1,135	34,259	343	455	9,567	14,012	6,835	67,962	7.1
Total	70,083	23,413	592,144	80,703	24,221	57,504	47,072	57,484	952,625	100.0
Distribution (%)	7.4	2.5	62.2	8.5	2.6	6.0	4.9	6.0	100.0	

Source: SEAFDEC, Fishery Statistical Bulletin for South-China Sea Area 1979, 1981.

Note : 1) Indonesia, Malaysia, Philippines, Thailand, Singapore and Hong Kong

like prawn and other high-priced seafood, but after the sudden slump in price since 1981, the fish began to be consumed domestically or exported to Thailand for canning. On the whole, ASEAN countries will continue to promote their domestic fishery industries, partly for exporting to developed markets and partly for domestic or intra-regional consumption.

Japan, the largest market in Asia, imported 0.95 million tons of edible fishery products in 1981, which were valued at US\$3.736 billion. 0.35 million tons, or 32% of the total import, was from East Asian countries and comprised 26.7% of high-priced fish (CIF ¥700 or more per kg) and 52.7% of medium-priced fish (CIF ¥300 - ¥700 per kg). 0.19 million tons, consisting of salmon, trout and fish roes, was imported from North America. This included 47.3% of high-priced and 17.1% of medium-priced fish. From Southeast Asia, Japan imported about 99,000 tons, consisting of 48.5% of high-priced and 34.7% of medium-priced fish. Japan also imported certain tonnage from other areas, such as 84,000 tons from Europe, 59,000 tons from Southwest Asia, 54,000 tons from Africa, 49,000 tons from South America and 36,000 tons from Oceania.

Japan's imports of fishery products, as shown above, largely consist of high-priced and medium-priced fish. Although quality standards for imports are very high, Japan will continue to be the largest market for fishery products in the world because of high prices. Therefore, exporters have a fair chance to enter the Japanese market by carefully noting its requirements such as tastes, standards, and seasonal changes in supply and demand.

Korea imported a total of 68,000 tons in 1983, which were valued at US\$47 million. This included 31,000 tons of codfish (US\$11.8 million) from Taiwan, Japan and the USA, herring and salmon from the USA and Europe, and squid from Argentina. Korea's import reached 80,000 tons (US\$56 million) in 1982, but declined slightly in 1984. By entering foreign markets and establishing joint ventures there, Korea is expected to increase its imports in the future.

Hong Kong imported 141,000 tons (US\$484 million) in 1983. The transit trade with China will continue to dominate the country's trade in fishery products. The country imports prawn and shrimp and other fresh fish from China, dried seafood for Chinese dishes from Southeast Asia, and sardine and mackerel for canning from all over the world. Its imports will be around 140,000 - 150,000 tons per year.

Singapore imported 166,000 tons (US\$203 million) in 1983, and engages in transit trade like Hong Kong, importing materials for canned products from Indonesia and Malaysia and dried seafood for Chinese dishes from Southeast Asia. The country is expected to maintain imports of 160,000 - 170,000 tons per year.

Malaysia imported 146,000 tons (US\$85 million) in 1983, 76% of which coming from Thailand, the largest exporter to Malaysia. It also imported canned sardine and other processed seafood from Japan. Due to the export of high-priced fish to Singapore, Malaysia is a net importer in quantity and a net exporter in monetary value.

Indonesia imported 63,000 tons of fishery products (US\$38 million) in 1981, of which fish meal accounted for 85% in quantity and 87% in value. Almost all of the imports were from Thailand, with about 3% of fish meal originating in Chile. The country has been promoting domestic fishery industry through various protective measures, and is likely to restrict its imports to fish meal used for livestock feed.

The Philippines imported 46,000 tons (US\$36 million) of fishery products in 1981, of which 30,000 tons was canned products mainly from Japan, and the next largest quantity was fish meal from Chile and Thailand. The country's imports of canned products will probably decrease due to the on-going development of canning factories and domestic pelagic fisheries, but its fish meal import is likely to continue.

Thailand is a net exporter of fishery products, but imports fresh and frozen fish as materials for processing. Its imports in 1981 amounted to 47,000 tons (US\$23 million), of which 23% in quantity and 35% in value were materials for processing. The country has been increasing the import of shrimp paste for domestic consumption and of ingredients for Chinese dishes. Its import of processing materials will continue to expand because of the on-going rapid development of the domestic processing industry. Thailand recently has begun to diversify origins of its imports to Indonesia, Burma and Southwest Asia.

(d) Prospects of consumption in Selected Asia

Japan's imports of fishery products have been over one million tons (over ¥ trillion) since 1982. East Asian countries, such as Korea, China and Taiwan, are the largest supplier, making up one third of the total. Due to the geographical proximity to Japan, these countries mainly supply a variety of fresh fish. The second largest exporter is North American countries like the USA and Canada, which supply high-priced seafood such as salmon, trout, herring roe and salmon roe. Japan also imports many kinds of seafood, though in smaller quantity, from all over the world, including prawn and shrimp from Southeast Asia, India, Mexico and Nigeria, sea bream from New Zealand and Argentina, abalone from Australia and Chile and smelts from Norway.

In order to sustain production in its territorial waters, Japan has been making every effort to improve the resource management and raise the efficiency of fishing efforts, while developing technologies, including advanced biotechnology, in aquaculture and fish farming in inland and coastal waters. As for distant-water fisheries, Japan has been expanding technical and economic cooperation programs for fisheries in developing countries, while engaging in orderly international negotiations to fish in foreign territorial waters. Through such efforts, the bulk of domestic demand, which is estimated to increase from 11.9 million tons in 1978 to 13.96 million in 1990, would be met by domestic production. But Japan will continue to depend on imports of fish and seafood from various parts of the world, which would possibly increase at an annual rate of 2% to 5% in

the near future. It must be repeated, however, that Japan's domestic market demands freshness and high quality for fish and seafood.

Mainly because of the growth of livestock and poultry raising and fish culture, the demand for fish meal in Japan increased substantially from 2.3 million tons in 1970-1973 to 3.0 million tons in 1977-1979. The import increased from the average of 275,000 tons (12% of total demand) to 573,000 tons, or 19% over the period. The major suppliers to Japan were not Southeast Asian countries, because the fishing grounds surrounding these countries are not particularly rich in low-grade pelagic fish which are used to make fish meal. Catches of pelagic fish in given fishing grounds could vary widely depending upon changes in ocean currents and other marine environments, and this influences the international market of fish meal. During 1982-1984, for instance, Japan's imports of fish meal declined to the average of 315,000 tons, or 8% of the total demand of 3.7 million tons, reflecting the increased catches of low-grade pelagic fish in its territorial waters. Therefore, although Japan's demand for fish meal is expected to be large in the future, its import requirements will vary depending upon the level of catches of pelagic fish species in its offshore waters.

Korea has actively and successfully developed domestic fishing industry during the last decade, as seen in its growth of production and exports. The development plan (1982-1986) envisages that the production of fish and seafood would annually increase by 2.9% in terms of volume from 1980 to 1986, and the exports by 8.9% in terms of value over the same period. In production, higher growth of over 5% is expected in offshore and inland water fisheries, but in export, distant-water fish and seafood are expected to grow by 9.5% compared with 6.3% for coastal and offshore fish and seafood. For this purpose, efforts are being made to improve fishing technologies and related infrastructure for aquaculture and for the efficient use of marine resources in territorial waters, while cultivating better diplomatic relations with other countries. The country's demand for fish and seafood has been, and will be, more than adequately met by domestic production, and therefore, its imports of fresh and processed fishery products are not expected to increase, except for fish meal and fish oil as livestock feeds.

ASEAN countries, except for Malaysia, already have a self-sufficiency rate of more than 100% for fishery products, and export high-priced fish to Japan, North America and Europe. Their imports are largely restricted to mackerel and skipjack used for processing. Moreover, policies in these countries, as stated in their development plans, all aim to promote various types of domestic fisheries, partly to increase domestic consumption of fish and seafood as generally cheaper sources of animal protein than meat, and partly to increase exports to the developed markets like Japan and North America.

Indonesia's current development plan (1984-1988) expects that the fishery sector grow in value terms at an annual rate of 2.4% in order to raise the income of fishermen, improve nutrition and increase exports. For this purpose, the plan promotes the intensification and

modernization of fisheries in coastal, offshore and deep-sea waters and aquaculture in coastal and inland waters, including the development of ports and harbors and marketing infrastructure.

Thailand's development plan (1982-1986) expects to attain an annual growth of 5.4% for the fishery sector. Because the easily accessible marine resources around the country are nearly fully exploited, development efforts focus on aquaculture in inland and coastal waters, on the one hand, and deep-sea fishing, including territorial waters of other countries, through joint ventures, on the other.

The Philippines has much the same policy orientation as Indonesia and Thailand, and emphasizes the promotion of deep-sea fishing and aquaculture in addition to the improvement of efficiency and sustainability of fishing efforts in traditionally fished marine waters.

The Fifth Malaysia Plan (1986-1990) states that it will modernize fishing efforts and upgrade infrastructural facilities, while carrying out a fishermen resettlement program "in view of the depleting fisheries resources" relative to the number of fishermen. The plan also promotes conservation of fisheries stocks and aquaculture in inland and coastal waters.

The ASEAN countries have been making substantial progress in the development of domestic fishing industries and the production of exportable surpluses, and would continue to do so. Therefore, their imports are likely to be restricted largely to fish meal used as feeds for livestock or fish culture.

4. SUGGESTIONS

4-1 Crop Sector

Considering the crop sector's unrivalled contribution to the country's foreign exchange earnings, it is of utmost importance to consolidate and advance the technological progress the sector has achieved in the last couple of decades and thereby to increase output and export. The present Government has already announced the National Program of Agriculture and Livestock (PRONAGRO) and proposed basic strategies and major policy instruments which serve to activate the potential productive capacity of agriculture and to guarantee economic incentives and returns to producers who participate in the process of realizing technological progress. Thus, the remaining task is basically to implement the commitments as early as possible as a coherent system of policies.

In terms of their expected fundamental impacts on production and marketing, especially important measures announced by the Government are as follows.

- Reduction and flexible application of export taxes, assuming the introduction of the new land tax
- Expansion and strengthening of the National Grain Board's (JNG) system of support prices for producers
- Continuation of the JNG's program of fertilizer distribution with the express aim of remedying the long-standing distortion in the domestic market of this agricultural input
- Construction, and financial supports thereof, of grain handling and storage facilities
- Strengthening of the INTA's regional activities in developing and diffusing more technified systems of farming suitable for local conditions
- Increased provision of credit to facilitate the improvement of farming productivity

In addition to the policies indicated in the PRONAGRO, it will be necessary to consider the following possibilities in order to improve the productivity and efficiency of agricultural production and commercialization.

1) Possibility of further privatization of grain handling facilities

In expectation of increased grain exports in the future, it will be necessary to increase the capacity of grain storage and handling facilities and improve the efficiency of their operation. In this connection, it is advisable to assess the economic effects of reducing the JNG's direct involvement in the operation of port elevators through further privatization, while increasing its indirect participation in the improvement and development of storage and grain

handling facilities (e.g., equity participation, leasing, credit provision for private investments, etc.)

The further privatization of grain handling facilities does not imply the reduced role of the JNG in grain marketing. On the contrary, the continued deterioration of international prices of Argentina's major export grains calls for an increased role of the JNG, especially in the strengthening of its price support system and export promotion efforts along with the flexible application of export taxes. At the same time, it will be necessary for the JNG to explore ways to reduce the costs of commercialization through modernization and more efficient operation of grain handling facilities. Further privatization and/or the JNG's increased indirect, instead of direct, participation in grain handling and storage as indicated above appear to be some of the possibilities in this regard.

2) Formulation of a coordinated policy for plant protection

The present multiplicity of suppliers and different brands compared with the concentration of consumption in terms of active substances seems to justify a certain degree of consolidation among the domestic pesticide manufacturers and distributors. It will be necessary to formulate a national strategy of plant protection, which includes the possible restructuring of the domestic pesticide industry for import substitution and measures for enhancing the industry's research and development capability.

3) Cost reduction and development of farm machinery

In terms of the existing productive capacity, the domestic supply of farm machinery is not considered by the Government as a constraint to increased agricultural production. However, it is desirable to promote the reduction of manufacturing costs through economies of scale and to encourage product development efforts by the manufacturers. It will be useful to develop a system to facilitate the standardization of parts designs and the establishment of engineering and performance codes for agricultural machinery.

In view of the on-going development of modern biotechnology and a great impact expected therefrom on agriculture, it is considered important that the INTA plays an increased role in the research for varietal development through biotechnology, in addition to strengthening the technology development and diffusion which it has been pursuing. For this purpose, it would be essential to take the following steps.

4) Formulation of a national strategy and establishment of research priorities in biotechnology development

In order to expedite the progress of research and development in the fields of modern biotechnology effectively and efficiently, it is important first of all to formulate a basic long-term national strategy on the basis of a comprehensive study, which assesses the possible impacts of biotechnology development on the world at large and on Argentina in particular. It is desirable to appoint an interdisciplinary committee of experts to supervise the study.

It is also important to establish, on the basis of the national strategy, short- and long-term priorities on specific research program objectives, by emphasizing basic technologies of broad impacts, and by evaluating their socio-economic, international and environmental significance to the country's needs.

5) Creation of a centralized system of biotechnology research

Because biotechnology is multidisciplinary by its nature, it is important to establish a centralized system of research which expedites the joint efforts of the public sector research institutes, universities and private industries. The centralized system would not only undertake joint projects at the research facilities it directly manages, but also finance and support projects carried out at outside institutions. It is desirable to appoint an advisory council which reviews the progress of research and advises on new directions of research.

6) Development and promotion of biomass technologies

Starting from the basis of the existing sugar industry, it is desirable to develop microbial biotechnology, the key technology for genetic engineering, and thereby to expedite the growth of new bio-industries in the medium and the long terms.

4-2 Livestock Sector

The livestock sector, especially beef cattle farming which is its mainstay, has reduced its relative economic importance during the last decade mainly because of the reduction of its traditional export market and its increased opportunity costs relative to crop cultivation in the major cattle farming areas. In order to aid the recuperation of cattle farming and the related meat-processing industry, the present Government already announced its basic strategies and major policy instruments in the PRONAGRO. As is the case with the crop sector, therefore, the remaining task is basically to implement them in a consistent manner to achieve the desired objectives.

In terms of their expected fundamental impacts on production and marketing, especially important measures announced by the Government are as follows.

- Diffusion of better and more efficient herd and pasture management technologies which will enhance the stability and efficiency of grazing, fattening and breeding and enable more effective use of land resources
- PLANARSA to eradicate the foot-and-mouth disease and minimize losses due to animal health problems
- Establishment and execution of effective sanitary standards of meat products for the domestic market
- Measures for restructuring meat distribution and marketing (reduction and flexible application of export taxes, strengthening

the functions of the JNC in domestic marketing and export promotion, fiscal and financial supports to better performing frigorificos, etc.)

In view of the urgent need to regain the stability and profitability to cattle farming and to reactivate the meat-processing industry, it will be necessary to direct special policy attention to the following points.

- 1) Increased provision of effective fiscal and financial incentives to cattle producers who make efforts for productivity improvement
- 2) Long-term sustained efforts by both the government agencies in charge of enforcing vaccinations and other necessary animal health measures and by the producers themselves in order to strictly implement the PLANARSA
- 3) Promotion of the export-oriented development and diversification of processed meat products not only in accordance with the sanitary and quality codes of the importing markets but also in accordance with consumers' preferences over tastes, cooking methods, appearances, etc.

4-3 Fishery Sector

The fishery sector rapidly expanded its export-led production in the later 1970s, but has lost the impetus in the beginning of the 1980s. In order to stimulate the sector's recovery from the current slump and ensure its stable growth on the long-term basis, it would be necessary to formulate a national policy framework emphasizing the following five issues. The basic principle of the framework must be to reduce production costs through improving the efficiency of fishing and processing operations, and thereby to enhance the competitiveness of the fishing industry.

- 1) Effective management of fishing efforts in accordance with resource endowments

The trawl fishing, as is chiefly practiced in Argentina, has an implicit possibility of depleting the fishery resources, if exploitations become excessive relative to the level of resource endowments. It will be important to institute an effective system of resource management in order to facilitate the orderly growth of the marine fisheries. In this regard, however, it is important to undertake more accurate resource assessments on a regular basis for because effective resource management.

Resource management must include not only the control over the upper limit of annual catches but also over fishing periods and grounds, fishing methods, mesh sizes of fishing nets, sizes of fish to be caught and so on. In this connection, it would be necessary to consider the possibility of controlling the total fishing capacity by limiting the number and types of boats and methods of fishing to be employed.

2) Renovation and modernization of fishing capacity

The total physical capacity of the existing fleet is larger than the currently estimated MSYs. Therefore, it will be necessary to adopt a scrap-and-build scheme for facilitating the renovation and modernization of the antiquated and inefficient boats, primarily those engaging in coastal and conventional deep-sea fishing. In this connection, it would be necessary to consider the appropriate types of fishing boats to replace them with, from the viewpoint of introducing new fishing methods suitable for the resource management mentioned above.

Because most of the fishing and processing establishments based at Mar del Plata lack financial resources for renovation and modernization, it is urgently necessary to expand the institutional financing.

In order to improve the efficiency of fishing operations, it is also necessary to renovate fishing equipment. In this regard, it will be important to relax the current restrictions on imports of equipment for which there are domestic products. Considering the fishery sector's contribution to foreign exchange earnings, it would be possible to give foreign exchange quotas in accordance with export performance. The same applies to the imports of boats, including the relaxation of the restriction on the age of second-hand boats which is not realistic vis-a-vis the current international market of such boats.

3) Improvement of fishing port facilities

The harbor of Mar del Plata Port needs the salvaging of sunken boats and the clearing of moored obsolete boats in order to facilitate more efficient port operations.

Considering the increasing importance of fishing operations in the Patagonian waters, it will be necessary to improve piers and cargo handling facilities catering to fishing boats at the existing ports. In addition, steps need be taken to provide better facilities for supplying power, fuel and water to processing plants on the shore, and to set up workshops for simpler maintenance and repair of fishing equipment and boats.

4) Utilization of unused or underused resources

There seem to be considerable development potentials of demersal fish south of 50° S. Lat. and pelagic and migratory fish. It will be necessary to develop suitable fishing methods for their commercial exploitation on the basis of resource assessments.

Fish caught by trawling but without established commercial value and residues after processing on board are now discarded on the ocean. Research is thus needed to ascertain possibilities of putting them to use. For instance, if fish culture in the coastal areas or in brackish waters around Bahía Blanca are found technically and economically feasible, they can be used as feeds.

5) Product development for export promotion

It is important to develop new products which not only qualify for the sanitary and quality codes of the export markets but also appeal to the consumers' preferences thereof on tastes, appearances and cooking methods. For this purpose, it is necessary to strengthen the efforts to collect relevant information on prospective export markets and feed it to the domestic processing industry.

The INIDEP is currently experimenting on processed fishery products including fish paste (surimi). Given the present conditions of fishing operations, it does not appear economically feasible now to start surimi production for external markets, largely because of the expected lack of competitiveness. However, it might be possible to develop the domestic demand for fish paste products through appropriate promotional campaigns.

Appendix to Chapter II EQUATIONS USED FOR DEMAND ESTIMATION

Y = per capita demand X = per capita income

HONGKONG

rice	$Y=450.2-337.429 \ln X$	$R^2=0.9990$
wheat	$Y=34.193+0.0842 \ln X$	$R^2=0.9949$
maize	$Y=-262.783+31.0223 \ln X$	$R^2=0.9993$
soybean	$Y=7.924-0.4088 \ln X$	$R^2=0.9948$
meat	$Y=-183.341+24.928 \ln X$	$R^2=0.8980$
beef	$Y=-60.850+7.0357 \ln X$	$R^2=0.9989$
pork	$Y=-12.812+5.178 \ln X$	$R^2=0.9962$
poultry	$Y=-119.916+13.657 \ln X$	$R^2=0.9440$

KOREA

rice	----	$R^2=0.9959$
wheat	$Y=1.938+7.5934 \ln X$	$R^2=0.9996$
maize	$Y=-42.592+0.1027 X$	$R^2=0.9996$
soybean	$Y=-0.630+0.0173 X$	$R^2=0.9995$
meat	$Y=-0.796+0.0123 X$	$R^2=0.9995$
beef	$Y=-0.345+0.0036 X$	$R^2=0.9991$
pork	$Y=-0.258+0.0057 X$	$R^2=0.9995$
poultry	$Y=-0.038+0.0026 X$	

SINGAPORE

rice	$Y=293.632-23.7184 \ln X$	$R^2=0.9959$
wheat	$Y=47.475+0.158 \ln X$	$R^2=0.9843$
maize	$Y=-716.556+93.7811 \ln X$	$R^2=0.9856$
soybean	$Y=-55.725+8.0029 \ln X$	$R^2=0.9975$
meat	$Y=-199.623+27.872 \ln X$	$R^2=0.9590$
beef	$Y=2.415+0.0001 \ln X$	$R^2=0.9980$
pork	$Y=-51.505+7.8728 \ln X$	$R^2=0.9998$
poultry	$Y=-120.669+16.317 \ln X$	$R^2=0.9998$

JAPAN

rice	$Y=383.05-38.15 \ln X$	$R^2=0.9997$
wheat	$Y=14.27+5.02 \ln X$	$R^2=0.9994$
maize	$Y=-448.321+73.3905 \ln X$	$R^2=0.9997$
soybean	$Y=-111.015+20.1077 \ln X$	$R^2=0.9987$
meat	$Y=-188.237+29.522 \ln X$	$R^2=0.9998$
beef	$Y=-0.512+0.0034 X$	$R^2=0.9480$
pork	$Y=-62.111+10.1328 \ln X$	$R^2=0.9998$
poultry	$Y=-51.284+8.1884 \ln X$	$R^2=0.9998$

INDONESIA

rice	$Y=-290.688+75.0866 \ln X$	$R^2=0.9999$
wheat	$Y=-212.641+0.0412 X$	$R^2=0.9996$
maize	$Y=-53.932+0.0338 X$	$R^2=0.9976$
soybean	$Y=1.091+0.0147 X$	$R^2=0.9999$
meat	$Y=1.359+0.006 X$	$R^2=0.9994$
beef	----	
pork	$Y=0.127+0.0017 X$	$R^2=0.9981$
poultry	$Y=-0.383+0.0044 X$	$R^2=0.9994$

MALAYSIA

rice	$Y=425.959-38.194 \ln X$	$R^2=0.9973$
wheat	$Y=-50.548+10.3956 \ln X$	$R^2=0.9958$
maize	$Y=-17.238+0.0153 X$	$R^2=0.9984$
soybean	$Y=-11.291+14.0199 X$	$R^2=0.9963$
meat	$Y=-0.88+0.0045 X$	$R^2=0.9997$
beef	$Y=1.137+0.0002 X$	$R^2=0.9980$
pork	$Y=3.284+0.000004 X$	$R^2=0.9969$
poultry	$Y=-7.438+0.0044 X$	$R^2=0.9996$

PHILIPPINES

rice	$Y=-73.419+20.074 \ln X$	$R^2=0.9992$
wheat	$Y=15.052+0.00008 X$	$R^2=0.9965$
maize	$Y=-413.784+56.3758 \ln X$	$R^2=0.9998$
soybean	$Y=-0.222+0.0001 X$	$R^2=0.9991$
meat	$Y=-4.165+0.0038 X$	$R^2=0.9989$
beef	$Y=-33.228+4.2302 \ln X$	$R^2=0.9963$
pork	$Y=1.659+0.0014 X$	$R^2=0.9979$
poultry	$Y=-3.96+0.0015 X$	$R^2=0.9995$

THAILAND

rice	$Y=715.504+56.5994 \ln X$	$R^2=0.9766$
wheat	$Y=-1.619+0.0004 X$	$R^2=0.9997$
maize	$Y=-198.93+22.4747 \ln X$	$R^2=0.9989$
soybean	$Y=-0.296+0.0002 X$	$R^2=0.9991$
meat	$Y=-1.99+0.0011 X$	$R^2=0.9963$
beef	$Y=12.393+1.768 \ln X$	$R^2=0.9979$
pork	$Y=2.916+0.0001 X$	$R^2=0.9995$
poultry	$Y=-2.909+0.0005 X$	$R^2=0.9995$

JICA