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A highly competitive fish meal market is foreseen as the product finds its place among competitive protein sources.

Fish Meal: International Market Situation and the Future

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INTRODUCTION

During the past several months users of fish meal have been greatly concerned over the shortage and high prices of this protein feed ingredient. The Peruvian anchovy crisis has been a major cause of this concern and makes it difficult to evaluate the market. For protein producers, the situation has presented new opportunities.

SUPPLY

During the 10-year period previous to 1972, the world output of fish meal grew tremendously; then in 1972, it dropped sharply. The annual world output of fish meal more than doubled in the 7-year period 1961-68. Table 1 shows the development only since 1966, because comparable data for each nation are not available for earlier years. After continuous growth, the world output dropped slightly in 1969. World production increased again in 1970, and reached a peak of 5.3 million tons. A slight decline occurred in 1971, and a sharp drop followed in 1972. The 1972 production of 47 countries was 3.9 million tons—24 percent less than in 1971, and about 180,000 tons less than in 1966.

The growth, as well as the decline in world production, is related to developments in Peru. Peru's annual output in 1962 was 1.1 million tons, or 40 percent of the world output. In the following years, Peru more or less held this share of the world production. In 1970, Peru's production of fish meal was at its peak, 2.3 million metric tons—42 percent of the world total. In 1971, Peru's production declined slightly; then in 1972, it dropped to about 900,000 tons—nearly 1,400,000 tons less than the peak year. Peru's production was still about 23 percent of the world total, mainly because of nearly normal production during the first half of the year. The impact of the oceanic condition known as El Niño was to be felt at the end of 1972 and in 1973. According to FAO scientists, overfishing was another factor in the decline. During the first half of 1973 the production of Peruvian fish meal was 370,000 metric tons, a considerable drop from the 1-million-ton average for the January-June period 1968-72.

Figure 1 indicates the strong influence of Peruvian production in the world output. It shows also that the production in the rest of the world has followed a somewhat similar trend. The total annual output of other fish meal producing countries, excluding Peru, expanded from 1961 to 1971 at an average rate of about 8 percent a year. In 1972, the production declined by 7 percent from the previous year, not only because of the drop in the anchovy catch in Chile—production also declined in South Africa, Norway, Canada, and the United States. The annual production of U.S. fish meal has varied between 200,000 and 250,000 metric tons during the past 5 years and has provided an average of about 40 percent of the available fish meal supplies in the United States.

World production data for the first half of 1973 are not available at this writing, but the production figures for the major exporting countries suggest that the world output has declined further. The figures show also that the aggregate output of fish meal in major exporting countries other than Peru in January-June this year had not increased from the same period in 1972 (Table 2).

DEMAND

In general, the size of the poultry and meat markets and the availability of other protein feeds influence the demand for fish meal. However, this generality tends to be more true in regions of the world where livestock feeding has developed into a sophisticated commercial feed mixing industry where computers are used to determine the least costly food formulas. The development of mixed feed industries is highly correlated with the level of general economic development of the area. In the less developed regions, livestock depend on what feed they can find.

Mixed feed industries are still largely limited to Western Europe, North America, and Japan (Table 3). The United States alone produced 52 percent of world mixed feeds in 1965. In 1971, U.S. production was 34

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percent of the mixed feed production of 16 selected countries. This development indicates the expansion of formula feeding in the world. In recent years, other countries, especially in East Europe, have developed formula feeding. Table 3 shows a fast growth of the feed mixing industry in the Soviet Union.

World output of meat is another factor boosting the demand for fish meal and other high protein feed. World output of poultry meat increased at an average rate of 5.5 percent during the past 9 years, and the production of pork increased during the same time at an annual rate of 3 percent. U.S. broiler placements increased at an average annual rate of 4.9 percent during the same 9-year period, 1963-72.

The number of cattle in the world increased at an average rate of 1.5 percent during the same 9-year period. All these numbers indicate increasing demand for feed in the world, and together with the expansion of formula feeding suggest continuously increasing needs for high protein feeds, including fish meal.

PRICES

Simultaneously with the increase in the world consumption and production of fish meal until 1972, the prices of fish meal have fluctuated widely. After a sharp increase during the second half of 1965, prices of fish meal declined continuously until the first quarter of 1968. The quarterly average quotation in New York for 65 percent protein Peruvian meal was at that time $118 per short ton. Large stocks in the world were the major reason for the price decline.

Figure 2 shows the price development for fish meal and soybean meal from 1968 to 1973. Prices recovered quickly from the 1968 low, and by the last quarter of 1969, prices had surpassed the 1965 record level. The quotation in New York was about $200 per ton during the last quarter of 1969. After a decline during the

Table 1.—Annual production of fish meal (1000 metric tons).

Country	1966	1967	1968	1969	1970	1971	1972[1]
1. Peru	1471	1816	1922	1611	2253	1935	897
2. Japan (meal[2] and cakes)	359	410	484	580	656	670	580
3. USSR	239	294	326	348	369	406	410[8]
4. Norway	422	492	404	310	352	384	376
5. U.S.: meal	192	182	205	221	233	256	249
solubles[3]	38	34	33	37	43	50	61
6. S, SW Africa	268	355	476	411	308	273	245
7. Denmark	125	176	244	247	245	222	227
8. Chile	218	163	232	181	197	213	83
9. Angola	48	42	47	99	64	63	131
10. United Kingdom	87	81	88	86	85	91	89
11. Canada	90	91	124	128	112	91	72
12. Iceland	176	112	51	62	67	64	66
13. Germany F.R.[4]	82	83	82	78	72	73	54
14. Poland[2]	20	22	25	26	29	51	51[8]
15. Spain	34	33	39	40	34	34	45
16. Bermuda[5]	—	—	—	1	5	26	32
17. Mexico[2]	10	10	12	15	19	22	25
18. Thailand[6]	7	7	2	3	15	19	19[8]
19. France	14	13	14	14	20	25	18
20. Morocco[6]	37	25	38	28	30	19	17
21. Pakistan	8	7	9	12	13	10[7]	17[7]
22. Argentina	22	25	19	15	14	13	13[8]
23. Faeroes	8	11	15	12	15	16	13
24. Singapore[6]	7	9	10	11	11	9	10
25. Sweden	7	7	8	8	9	9	10
26. Panama[6]	12	12	9	4	7	11	9
27. Venezuela	5	6	7	8	8	8	8[8]
27 countries	4006	4518	4923	4595	5278	5063	3827
Other countries (20)	45[8]	38[8]	32[8]	46[8]	45[8]	50[8]	50[8]
47 countries	4051	4556	4955	4641	5323	5113	3877

[1] Preliminary data derived from miscellaneous sources.
[2] Including dry weight equivalents of small quantities of solubles.
[3] One-half of wet weight.
[4] Average moisture content 10 percent.
[5] UK import data.
[6] Export data.
[7] West Pakistan only.
[8] Preliminary or estimated
Source: Digest of 1967-1972 world statistics;
International Association of Fish Meal Manufacturers

Table 2.—Production of fish meal in eight major exporting countries.

Countries	January-December 1971	January-December 1972	January-June 1972	January-June 1973
	Thousand metric tons			
Angola	63.0	130.7	57	71
Canada	91.2	72.2	24	18
Chile	213.3	83.0	54	40
Denmark	221.6	226.7	100[1]	70[1]
Iceland	63.9	66.3	62	82
Norway	384.4	375.5	255	211
Peru	1,935.0	897.0	843	370
South Africa	272.7	245.4	154	187
Total	3,245.1	2,096.8	1,549	1,049

[1] FEO estimate.

Table 3.—Production of mixed feed in selected countries.

Country	1970	1971	1972
	Million metric tons		
Austria	0.66	0.71	4.66
Belgium	4.28	4.28	4.66
Denmark	2.57	2.55	2.60[1]
France	7.58	8.36	9.61
Germany, FR	9.73	9.86	10.66
Iceland	0.97	1.06	1.18
Italy	3.63	3.71	4.02
Luxemburg	0.05[1]	0.08	0.10
Netherlands[2]	7.85	8.60	9.12
United Kingdom[3]	11.01	10.60	10.85
Canada[4]	7.06	7.35	7.99
U.S.[5]	56.60	55.05	55.05[1]
Argentina	0.98	1.23	1.58
South Africa	1.02	0.99	0.99[1]
Japan[6]	14.95	15.66	16.00[1]
USSR	23.70[1]	26.50[1]	28.00[1]
Total	152.64	156.99	167.07

Source: Digest of 1967-1972, World Statistics, IAFMM.
[1] Preliminary or estimated.
[2] August-July year.
[3] Compounds, balancers, concentrates.
[4] Actual tonnage of complete feed manufactured, plus estimated tonnage of complete feed from concentrates and supplements sold as such.
[5] Primary manufacturers only.
[6] Includes pet foods.

Table 4.—World output of poultry meat and pork.

	1961–65[1]	1970	1971	1972
	Thousand metric tons			
Poultry meat	11,603	17,673	18,200	18,992
Pork	30,784	37,142	39,708	40,154

[1]Annual average

next 2 years, prices increased sharply during the third quarter of 1972 in response to the Peruvian anchovy problem. The December average price for Peruvian meal in New York was $241 per short ton, and by May 1973 quotations averaged $480 per ton. The prices of domestic menhaden meal (60 percent protein) follow fairly closely the pattern of prices of Peruvian meal. In June 1973 when Peruvian meal prices were no longer quoted because of lack of supplies, menhaden meal prices reached an average of $508 per ton, compared with $175 a ton a year earlier. In July 1973, Peruvian meal reached $750 per metric ton, CIF Hamburg, West Germany. Expectations of the beginning of the Peruvian fishery and a high soybean crop reduced fish meal prices since midsummer 1973. New York quotation for menhaden meal was $410 to $430 per short ton in the middle of October 1973, and Peruvian meal CIF Hamburg on October 11, 1973 was quoted at $503 per metric ton ($457 per short ton).

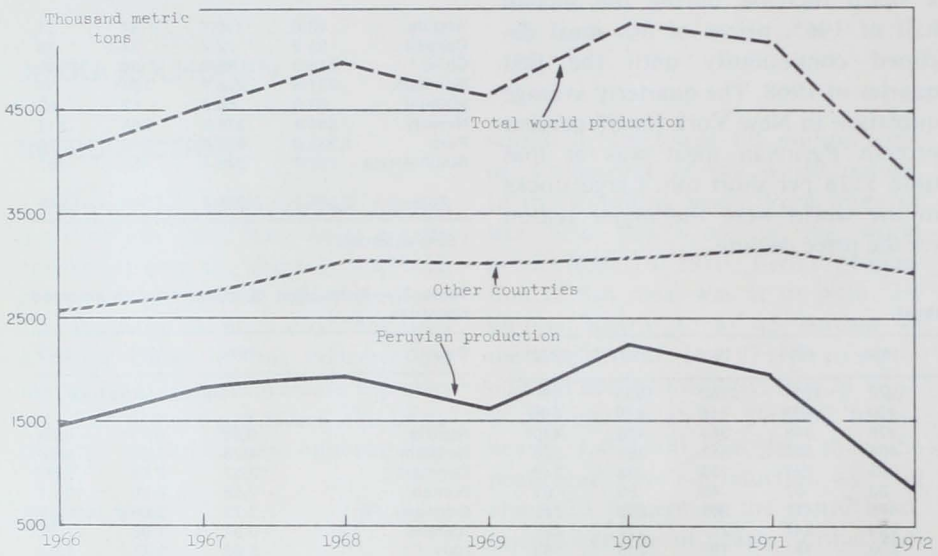

Figure 1.—World production of fish meal. Total world production figure includes data from 47 countries.

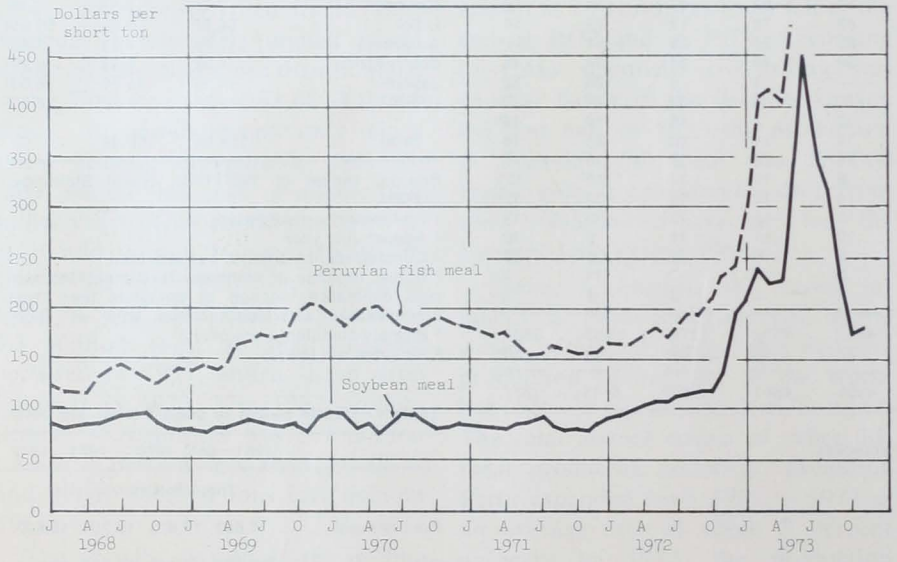

Figure 2.—Prices of Peruvian fish meal (65 percent protein, bulk, FOB east coast ports) and soybean meal (50 percent protein, bulk, at Decatur, Ill.) in the United States.

Except for price increases in the third quarter 1966 and 1972-73, the prices of soybean meal, which is the main competitor of fish meal, have been relatively steady over the past 7 years, fluctuating within 10 percent, up or down, of the average level for this period. In 1973, soybean meal prices quoted at Decatur, Ill., increased to a monthly average of $450 per ton in July, compared with $105 per ton a year before. Heavy export sales of soybeans and weather damage to the U.S. soybean crop in 1972 accentuated the protein shortages in the world and caused the price increase.

Because of the influence of wide fluctuation of prices of fish meal and the relatively steady price of soybean meal, with above-mentioned exceptions, the monthly average ratio of the price of fish meal to the price of soybean meal has fluctuated between 1.40 to 1, and 2.63 to 1 in the United States (Figure 3). In other words, a ton of fish meal has been from 1.4 to 2.6 times more expensive than a ton of soybean meal. Consequently, the percentage of fish meal in the feed mix has fluctuated. In broiler feed formula the fish meal percentage varies between a minimum of 2 percent and a maximum of 8 percent, depending on the relative prices of competing protein sources. This assumes, of course, that fish meal is available. The price ratio of fish meal to soybean meal has been very favorable to the use of a high percentage of fish meal in 1972 and 1973, if the alternatives between soybean meal and fish meal are considered. The effect of prices of fish meal and soybean meal on U.S. use of fish meal indicates a high degree of substitutability among these ingredients. The use of fish meal tends to change in the opposite direction with the price ratio of fish meal to soybean meal.

COMPETING PRODUCTS

The main competitors of fish meal as sources of protein are oilseed meals, mainly soybean meal, and various by-product meals, for example, meat and

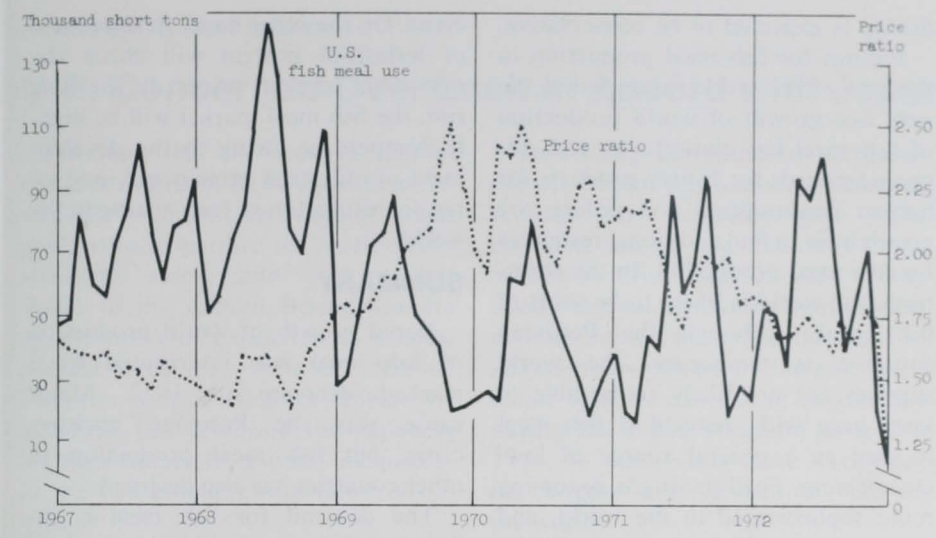

Figure 3.—United States fish meal use and fish meal-soybean meal price ratio.

bone meal. Although there is considerable substitution among various ingredients of high protein feeds, the interchangeability of these ingredients is limited owing to nutritional factors that arise primarily from differences in protein content and amino acid makeup of the protein.

Amino acid makeup is the crucial factor in the combination of feed ingredients to a feed formula. One reason that fish meal is regarded highly is that it is rich in lysine and methionine, which have particular nutritional importance. Vegetable proteins, and particularly the cereals, are deficient in lysine and methionine. Soybean meal is somewhat exceptional among vegetable proteins in having a high level of lysine, although it is deficient in methionine. Meat and bone meals are also good sources of lysine, but poor sources of methionine. The high levels of lysine and methionine in fish meals enable these deficiencies in the amino acid balance of the other feed ingredients to be corrected in a feed formula.

Several of the essential amino acids can also be produced synthetically, and as a result synthetic methionine and lysine are now being commercially manufactured. About 6 million pounds of methionine were used in poultry feed in the United States in 1961. By 1965, the use had doubled. The production capacity of manufacturers of synthetic methionine has greatly increased in recent years. The capacity of two Japanese firms almost doubled in 1971-72. In 1973 a French firm increased its capacity, a German firm decided to build a factory in Holland, and an Italian firm started production. The world shortage of fish meal has caused an increased demand for methionine and has given a permanent boost to the use of this product.

Lysine is a reasonably new product. It was manufactured first in 1967, and found a market in protein-rich feed formulas. Lysine has not had the same success as methionine, mainly because of its high price and its relatively great availability in soybean meal and fish meal. Nevertheless, the current protein crisis has created very strong demand for lysine, because it can replace some soybean meal in a feed formula. World supply is concentrated in two Japanese plants and reportedly one American plant. A French plant was scheduled to start production by late 1973 or early 1974.

The steep rise in fish meal prices in 1972 appears to have stimulated the development of other protein products also. Some 10 firms are currently concerned with production of single cell protein, which is more commonly known as protein from petroleum. By-products of the paper industry and the sugar industry provide similar opportunities for protein production.

The properties of single cell proteins are quite similar to the properties of fish meal (Table 5). Protein content in most single cell protein products is around 60 percent (fish meal 60-65 percent). Lysine content is generally slightly higher than in fish meal, but methionine content slightly less than in fish meal. Consequently, single cell proteins appear to have capability to replace fish meal in feed rations.

Single cell protein is produced currently by British Petroleum,[1] which plans to double production in 1974. An ICI plant in the United Kingdom is planned for 1976. Three firms in France are interested in producing single cell protein. Capacity of the existing plant will be increased by 1975, and two other plants may be completed in 1977. Japan has three plants under construction, but the work was interrupted at the request of public health officials. The construction may continue early in 1974. Construction of a plant in Italy was announced officially and should start production in 1974. Two other plants are planned.

OUTLOOK

It is estimated that the production of single cell proteins in the abovementioned countries could reach ½-million metric tons by 1977-78, and perhaps a million tons by 1980. This total is equal to about half the Peruvian fish meal production and about one-fifth of the world's production of fish meal before the Peruvian crisis.

The success of industrial protein products will depend greatly on the relationship between the prices at which these products can be sold and the prices of proteins from natural sources. If the plants producing single cell protein can increase productivity

[1] Use of trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

Table 5.—Main characteristics of fish meal, soybean meal and various single cell proteins.

	As a percentage of the dry matter		
	Total Crude Protein	Of Soluble Lysine	Of Soluble Methionine
Fish meal (65%)	65.0	5.33	1.95
Soybean meal (50%)	50.0	3.30	0.65
Single cell proteins			
Enterprise A	57-63	6.4	1.5
Enterprise B	59	7.1	1.0
Enterprise C	60-63	7.5	1.8
Enterprise D	60	4.5	0.7
Enterprise E	66	7.8	1.6
Enterprise F	83	4.7	2.2

Source: OECD, Production and use of nitrogenous products of agricultural, marine, and industrial origin for animal feeding.

considerably, or if the prices of natural proteins increase or continue at the levels of last summer, industrial protein would become a serious competitor of fish meal.

The prices of fish meal and soybean meal have been declining since summer, 1973. Large soybean crops in the United States in the fall of 1973 (according to an October estimate, 24 percent higher than a year before), and increased Brazilian production are likely to cause a further decline in soybean meal prices in the short run. The decline in fish meal prices, although influenced by the soybean meal prices, is slowed somewhat by Peru's decision not to open its anchovy fishery this year. The earliest expected opening of the fishery would be this month (March 1974), and even then, fishing is expected to be conservative.

Figures for fish meal production in the rest of the world suggest that the very fast growth of world production of fish meal has come to an end. Increasing needs for fishery products for human consumption will reduce the possibilities to find additional resources for fish meal production. In the short-term, the world is likely to be short of fish meal. Although the Peruvian situation is temporary, the world supplies are not likely to be able to keep pace with demand if fish meal is used as a general source of low-cost protein. Feed mixing is becoming more sophisticated in the world, and the emphasis will be on amino acids, rather than on total protein content. As a result, the role of fish meal will change.

In the next 5-10 years, the fish meal industry will go through a revolution in the use of the product. In the long run, fish meal will be used as a unique small-quantity ingredient in high-quality feeds, rather than as a high-amount protein source. Fish meal will probably be used as an additive to human food also. This may be objectionable in some countries, but according to some European producers, fish meal is currently sold for human consumption.

Consequently, fish meal prices are expected to find a level considerably higher than prices before the Peruvian crisis. On the other hand, development of industrial protein will check the maximum level of prices. In the long run, the fish meal market will be highly competitive owing to the development of industrial protein and increasing sophistication of feed mixing in the world.

SUMMARY

Rapid growth of world production of fish meal was interrupted by a marked decrease in 1972. Major cause was the Peruvian anchovy crisis, but fish meal production of other countries has also declined.

The demand for fish meal is influenced by: (1) the development of sophisticated commercial feed mixing industry; (2) the size of the markets for poultry and meat; and (3) the availability of other protein feeds. All these three areas have been growing.

Fish meal prices increased substantially after 1972, but now there has been a slight decline because the world supplies of soybean protein are expected to improve.

Production of industrial protein is growing rapidly in the world. Single cell protein appears to have properties similar to those of fish meal.

The role of fish meal will change in the next 5 to 10 years. Fish meal will be used as a unique small-quantity ingredient in high-quality feeds rather than as a high-amount protein source.

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