

# Fish and nutrition in India

George Kent

**A 1966 survey of possibilities for increasing food production to meet India's minimum nutritional requirements concluded that a national programme could be formulated for making better use of India's vast potential in fisheries. This article gives an account of the current production and disposal of fisheries products in India. The three major phases of fisheries operations are distinguished, and actions are proposed that could be taken in each phase to help alleviate malnutrition in India. Finally the article discusses how such actions could be undertaken within a comprehensive national programme designed to increase the contribution of fisheries to the alleviation of India's malnutrition problem.**

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<sup>1</sup>V.K.R.V. Rao, *Food, Nutrition, and Poverty in India*, Vikas Publishing House, New Delhi, 1982, p 49.

<sup>2</sup>Recent studies on fish and malnutrition include Wolfgang Krone, 'Fish as food: present contribution and potential', *Food Policy*, Vol 4, Nov 1979, pp 259–268; Paul Lunven, 'The role of fish in human nutrition', *Food and Nutrition*, Vol 8, No 2, 1982, pp 9–18; Food and Agriculture Organization of the United Nations (FAO), *The Potential of Fisheries in Alleviating Undernutrition*, FAO Fisheries Circular No 761, Rome, 1983; George Kent, *National Fishery Policies and the Alleviation of Malnutrition in the Philippines and Thailand*, FAO Fisheries Circular No 777, Rome, 1984; David James, 'The future for fish in nutrition', *INFOFISH Marketing Digest*, No 4, 1984, pp 41–44; George

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In a 1966 survey of possibilities for increasing food production to meet India's minimum nutritional requirements, it was observed that fish

is the one item in our requirements of food that has the largest potential for increased production causing, at the same time, no strain on India's limited land resources. . . . For a country with such low levels, qualitatively of food consumption, as India, fish ought to command high priority in the solution of India's long term food problem.<sup>1</sup>

A national programme could be formulated for making better use of India's vast potential in fisheries for alleviating malnutrition.<sup>2</sup> To suggest how this might be done, this article begins with a brief description of the nutritive value of fish, followed by an account of the current pattern of production and disposition of fisheries products in India. Then, India's nutrition and malnutrition problems are described and the three major phases of fisheries operations – production, processing and distribution – are distinguished. Actions are proposed that could be taken in each phase to help alleviate malnutrition in India. Finally, the article discusses how such actions could be undertaken within a comprehensive national programme designed to increase the contribution of fisheries to the alleviation of malnutrition in India.

Fishery products can be used to alleviate malnutrition either indirectly, through their commodity value, or directly, through their consumption value. When people who fish sell their catch to buy other food, they use the fish only indirectly for their personal nutrition; for them, the nutritive character of the product they sell is only incidental. In this study, the focus is on fish as food – the use of fish for its direct consumption value, not its commodity value.

In India, as elsewhere, projections show that in the future the supply of fish may not be adequate to meet the demand.<sup>3</sup> The studies which make these projections urge that something should be done to increase production and thus minimize the anticipated shortfall. Their concern is primarily with market demand – demand that is backed up by purchasing power. In this study, however, the purpose is to find ways to respond to current problems of malnutrition. The concern here is with the problem of meeting needs, as distinguished from fulfilling market demand.

## Nutritive value of fish

Fish is a good source of readily digested, high-quality animal protein. It is high in lysine and sulphur amino acids which makes it particularly suitable for complementing the high-carbohydrate diet prevailing in

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much of India. Fish can serve as a valuable source of preformed vitamins A and D if its oil is ingested. Fish is also a good source of minerals such as phosphorus and iron. Fish bones, which may be eaten in small fish such as sardines, are particularly rich in calcium and phosphorus. Marine species have significant levels of iodine and of omega-3 fish oils, which are effective in maintaining safe levels of blood cholesterol and triglycerides. Since fish, including its meat, bones and organs, contains good amounts of vitamin A, iron and iodine, it may be useful in combating the specific nutritional deficiencies which can result in nutritional blindness, anaemia and goitre.

Most malnutrition in India, as in the rest of the world, is protein-energy malnutrition resulting from a lack of energy foods, not a lack of protein intake. The apparent protein deficit commonly observed in cases of severe malnutrition results from the fact that, when there is inadequate energy intake, the protein that is obtained is diverted by the body to fulfilling immediate energy needs. Thus, the protein that is taken in is not available for the body-building and maintenance functions normally fulfilled by protein. Often, the best remedy is to supply inexpensive energy-rich foods rather than more expensive animal protein.<sup>4</sup>

In some cases, however, there is a genuine protein deficit, particularly where the diet consists almost exclusively of cereals. Where the variety of plant foods consumed is not sufficient to provide an adequate intake of all essential amino acids, animal protein supplies (including dairy products) may be of critical importance. In such cases, fish can serve as an excellent protein source.

Fish also has value as an energy source. It can be difficult to get sufficient energy from rice and other bulky carbohydrates, especially for small children. With its high nutrient density, fish – especially oily fish – can make an important contribution to the energy supplies of people at risk of malnutrition.

Apart from the specific nutrients it can provide, fish has a number of distinctive qualities. Many find its taste and texture to be appealing. It is easily cooked and readily digested, and it is widely available. As a flavouring it can help to make rice and other bland foods more palatable, and thus promote their consumption in larger quantities. Fish reduced to a paste or powder form can be very useful as a protein-rich weaning food.

On a unit weight basis, fish is relatively expensive in comparison with vegetables and grains, but it is frequently less costly than alternative animal protein sources. In relation to its nutritional value it can be quite inexpensive, even compared with vegetable protein sources.

The major disadvantage of fish is its high perishability. However, there are numerous methods for preserving fish such as drying, smoking and canning. Such processing can also increase its attractiveness and its convenience for use.

The appropriateness of fishery products for alleviating nutritional deficiencies depends on particular local circumstances, taking into account issues of their acceptability, availability and cost in relation to alternative sources of the required nutrients.

## Production and disposition

In 1983, India produced about 2 520 000 metric tons of fisheries

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Kent, 'Fisheries and undernutrition', *Ecology of Food and Nutrition*, Vol 16, 1985, pp 281–294; George Kent, 'Aquaculture: motivating production for low-income markets', *Ceres*, Vol 19, No 4, pp 23–27.

<sup>3</sup>S. Sreenivasa Rao, 'An overview of the marine fish marketing in India', and M. Raghavachari, 'Marine fish supplies: trends and projections', in U.K. Srivastava and M. Dharma Reddy, eds, *Fisheries Development in India: Some Aspects of Policy Management*, Concept Publishing Company, New Delhi, 1983, pp 3–23 and 61–99. For the world as a whole, see M.A. Robinson, *Prospects for World Fisheries to 2000*, Food and Agriculture Organization of the United Nations, Rome, 1982.

<sup>4</sup>D.S. McLaren, 'The great protein fiasco', *Lancet*, Vol 2, 1974, pp 93–96; P.V. Sukhatme, 'The protein problem: its size and nature', *Journal of the Royal Statistical Society*, Ser A, Vol 137, 1974, pp 166–200; P.V. Sukhatme, 'Human protein needs and the relative role of energy and protein in meeting them', in F. Steele and A. Bourne, eds, *The Man/Food Equation*, Proceedings of a Symposium held at the Royal Institution London, September 1973, Academic Press, London, 1975, pp 53–75.

products – more than in any preceding year. India's catch constituted about 3.3% of that year's world total catch of 76 470 600 tonnes.<sup>5</sup>

India's marine fisheries include a traditional sector operating inshore with non-mechanized craft, a modern sector consisting of small motorized boats operating nearshore and an ultra-modern sector consisting of large motorized vessels capable of operating in deep seas far offshore. The traditional sector accounts for about two-thirds of the total volume of production and most of the employment in fisheries production.

Inland fisheries in India consist of capture and culture fisheries operating in rivers, lakes, irrigation canals, tanks and reservoirs. Except for river fishing, 'the inland water resources of the country, by and large, are under-exploited. The yield levels are far below the potential yields'.<sup>6</sup> State governments have been doing a great deal to promote culture fisheries through the establishment of Fish Farmers' Development Agencies, providing subsidies for renovation of tanks and providing subsidized seed supplies.

Fish goes into the domestic food supply, into non-food uses such as fish meal for animal feed and into export. In 1979–81, about 88% of the total quantity of fish produced in India was used (either fresh or dry) for domestic food supply, about 8% went to non-food uses, and about 6% was exported. No significant quantity of fish was imported.<sup>7</sup>

#### *Fish consumption*

In 1974–76, fish accounted for 22.4% of India's animal protein supply – a relatively large share. However, since the level of animal protein consumption in India is low, fish accounted for only 2.3% of the total protein supply.<sup>8</sup> Fish accounts for only a small share of the diet. On a national basis, the supply per person is only about 3 kg per year. India ranks 136th among 162 countries in fish supply per capita, a level even lower than that of many land-locked countries.<sup>9</sup>

This low level of supply may be surprising, but it is even more extraordinary when set against the fact that in recent years India has ranked as the seventh largest fish-producing nation in the world, behind only Japan, the Soviet Union, China, the USA, Chile and Norway.<sup>10</sup> India as a nation is a large producer of fish but, with its population of over 700 million, on a per capita basis it is only a small producer. Only about 3.4 kg per person are produced each year. Technically, much more fish could be produced, particularly from the 200 nautical mile Exclusive Economic Zone which India declared in 1977 and from under-utilized inland water resources.

Of course, fish consumption is much higher in some areas than in others. Fish constitutes an important part of the diet in many coastal areas of India, particularly in the fish-consuming southern states: Andhra Pradesh, Karnataka, Kerala, Orissa, Tamil Nadu and West Bengal. The coastal states and union territories, with only half of the country's population, together account for almost 98% of the domestic consumption of marine fish.<sup>11</sup> As Table 1 shows, in the 1960s Kerala was the major fish-consuming state:

In Kerala over 77 per cent reported fish consumption. Even in the lower income groups the proportion of families that consumed fish was as high as that observed among the lower/middle and the middle income groups and it was higher than that observed in the upper income group. Fish is the major source of animal protein.<sup>12</sup>

<sup>5</sup>Food and Agriculture Organization of the United Nations, *1983 Yearbook of Fishery Statistics: Catches and Landings*, FAO, Rome, 1984, p 72.

<sup>6</sup>M.L. Dantwala, 'Foreword', in Srivastava and Reddy, eds, *op cit*, Ref 3, p vi.

<sup>7</sup>Food and Agriculture Organization of the United Nations, *1983 Yearbook of Fishery Statistics: Fishery Commodities*, FAO, Rome, 1984, p 175.

<sup>8</sup>Helga Josupeit, *The Economic and Social Effects of the Fishing Industry: A Comparative Study*, FAO Fisheries Circular No 314, Revision 1, FAO, Rome, 1981, pp 5–7.

<sup>9</sup>FAO, *op cit*, Ref 7, pp 73–75.

<sup>10</sup>FAO, *op cit*, Ref 5, p 72.

<sup>11</sup>V.K. Gupta, *et al*, *Marine Fish Marketing in India*, Vol 1, *Summary and Conclusions*, Indian Institute of Management, Ahmedabad, India, 1984, p 49. This comprehensive six-volume study of marketing aspects of India's marine fisheries has been followed with an *All-India Inland Fish Marketing Study*, also undertaken by the Indian Institute of Management.

<sup>12</sup>C.H. Shah, S.D. Sawant and B.I. Sanghavi, *Nutrition Gap: An Economic Analysis*, Himalaya Publishing House, Bombay, 1983, pp 27–28.

**Table 1. Proportion of families consuming fish preparations and average daily quantity of fish consumed in selected southern states.**

State	Overall	Income group			
		Low	Lower middle	Middle	Upper
Kerala					
families (%)	77.3	76.5	78.4	79.6	72.3
consumption (g)		99.7	101.3	130.3	153.1
Andhra Pradesh					
families (%)	3.6	3.5	3.4	4.7	1.6
consumption (g)		5.1	5.3	6.3	2.1
Karnataka					
families (%)	10.7	13.1	7.9	9.2	6.1
consumption (g)		14.5	12.8	12.9	11.0
Tamil Nadu					
families (%)	5.6	5.1	6.2	5.8	8.7
consumption (g)		5.3	8.4	4.8	7.8

Source: Protein Foods Association of India, *Food Habits Survey*, 1969, as reported in C.H. Shah, S.D. Sawant and B.I. Sanghavi, *op cit* text, Ref 12, pp 37–39, 47–50.

The high levels of fish consumption in Kerala have been partly due to the low price of fish. In a comparison of many different foods, whitebait fish yielded far more protein per rupee than any other animal product. The only cheaper protein sources in terms of protein yield per rupee were Bengal gram (dhal) and cow peas, both of which are significantly inferior protein sources.<sup>13</sup>

The pattern of fish consumption in Kerala probably has changed since these data were collected as a result of the increasing relative price of fish:

Kerala's population is essentially a fish-eating population; the level of fish consumption in Kerala is four times the national average. Until very recently fish was a relatively cheap source of protein. In the early part of the 1970s, fish consumption stood at 15 kg per capita per annum. This figure has, however, been declining, but the fact remains that even in the humblest of households there is at least one meal with fish.<sup>14</sup>

### Exports

India's fish exports have grown rapidly, partly because of the active promotional efforts of the Marine Products Export Development Authority (MPEDA) established in 1972. From 1961 to 1979 the quantity of exports increased at 10.2% per year, and from 1974 to 1979 at 14.5% per year.<sup>15</sup> The growth in the value of exports has increased even more rapidly;<sup>16</sup> in 1981, the average price of exported marine fish was five times the average domestic price. The largest foreign exchange earners have been shrimp, frog-legs and lobster.

Shrimp has been dominant, accounting for 87% of the export value and 72% of the export quantity in 1981.<sup>17</sup> In 1983 it was reported that 'India has remained the world's largest producer of shrimps during the last decade, except in 1972 . . . and in 1978 and 1981. . . . It is also the world's largest exporter of shrimp in quantity terms'.<sup>18</sup> India has been the largest supplier of shrimp to Japan and one of the largest suppliers of shrimp to the USA, following only Mexico, Ecuador and Panama. In 1982, India provided the USA with 50 million dollars worth of shrimp.<sup>19</sup>

In the early 1980s there was stagnation of export growth, due largely to competition from other developing countries in the world shrimp market. The decline has also been partly due to declining yields from over-exploited nearshore shrimp fisheries. The export of fisheries products is warranted for products such as shrimp which draw high

<sup>13</sup>*Ibid*, pp 99–100.

<sup>14</sup>Leela Gulati, *Women in Fishing Villages on the Kerala Coast: Demographic and Socio-Economic Impacts of a Fisheries Development Project*, World Employment Programme Working Paper No 128, International Labour Organisation, Geneva, 1983, p 4.

<sup>15</sup>G.S. Gupta, P.S. George and B. Subrahmanyam, 'Marine fish: consumer behaviour and demand forecasts', in Srivastava and Reddy, *op cit*, Ref 3, p 53.

<sup>16</sup>Gupta *et al*, *op cit*, Ref 11, Vol III, say (on p 80) that marine fish 'export increased by more than five fold in quantity and by more than six fold in value between 1961 and 1979'. However, this estimate of the increase in value does not take account of inflation in the value of the rupee over the time period.

<sup>17</sup>S.N. Rao, 'Product development for export', in Srivastava and Reddy, *op cit*, Ref 3, pp 211–218.

<sup>18</sup>*Shrimps: A Survey of the World Market*, International Trade Centre UNCTAD/GATT, Geneva, 1983, p 46.

<sup>19</sup>National Marine Fisheries Service, *Fisheries of the United States 1982*, NMFS, Washington, DC, 1983, p 44.

Table 2. Utilization pattern of marine fish in India.

Year	Fresh (%)	Dry edible (%)	Fish meal (%)	Export (%)	Total (tonnes)
1966	71.2	17.8	7.2	3.8	890 300
1969	57.5	25.0	11.4	6.1	913 600
1972	50.1	29.2	13.8	6.9	980 000
1975	47.5	31.0	14.1	7.4	1 422 700
1978-79	43.0	31.5	14.7	10.8	1 529 700

Source: Amarjeet Singh and V.K. Gupta, 'Marketing of marine fish: some policy issues', in *op cit* text, Ref 3, p 106.

prices overseas and for which there is little domestic demand (before the shrimp export trade began in the early 1960s, shrimp was used as fertilizer for coconut trees). However, the promotion of exports can sometimes go too far and have significant negative effects on domestic nutrition.

In India and elsewhere, many export fisheries are quite independent of fisheries for domestic markets. For example, offshore fisheries for export products may have no noticeable impact on inshore traditional fisheries or on domestic consumers. In some cases, however, the linkages may be very significant. Large trawlers seeking products for export often operate nearshore, thus interfering with small-scale fishing operations. Apart from direct conflict on the fishing grounds, there may be competition for labour, for capital, for processing and marketing infrastructure, and for governmental support. As more of the productive resources available to the fishing industry are devoted to producing for middle and upper classes, whether within the country or abroad, less is produced for the bottom end of the market.<sup>20</sup>

### Prices

Tables 2 and 3 provide data on disposition and relative prices for marine fish alone. As Singh and Gupta observe with regard to these data:

It is important to note that there was a continuous decline in the share of production of domestic fresh fish in the total marine fish production. The share of domestic fresh fish consumption was 71.2 per cent in 1966. It declined to 43 per cent in 1978-79. As a result, the availability of the net domestic fresh fish virtually remained almost static between 1966 and 1978-79. This resulted in a steep rise in the fish price indices. Price indices of fish reached 1851.4 (base 1961-1962) during 1978-79 as against 366.4 for food articles and 366.5 for all commodities.<sup>21</sup>

Exports can be judged excessive when they result in noticeable increases in domestic fish prices. As shown in Table 3, fish prices have indeed increased in India. Many expert observers attribute this increase to the rapid increase in fish exports:

Table 3. Annual average indices of wholesale prices of fish, food and all commodities (1961-62 = 100).

Year	Fish	Price indices of	
		Food articles	All commodities
1970-71	-	203.9	181.1
1971-72	384.9	210.3	188.4
1972-73	484.7	239.5	207.1
1973-74	757.1	295.6	254.3
1974-75	1021.3	364.0	313.9
1975-76	1271.3	347.7	302.7
1976-77	1397.4	330.1	310.7
1977-78	1599.0	368.9	336.5
1978-79	1851.4	366.4	366.5

Source: Amarjeet Singh and V.K. Gupta, 'Marketing of marine fish: some policy issues', in *op cit* text, Ref 3, p 105.

The developmental efforts in the fishing industry, notwithstanding the objective of increased domestic supplies of protein rich foods at reasonable prices, have led mainly to an increase in exports over the years. Despite the growth of fish landings at an annual rate of 3.5 per cent the domestic markets have faced shortages of fish and fish products, and consequent fast rising prices. It is now being realized that increased landings do not necessarily result in increased supplies in domestic markets, particularly for human consumption.<sup>22</sup>

A group of Indian fishermen made a similar analysis:

To add to our country's misery, the developed world is now making strident demands for our other varieties of fish, like sardines, tuna, mackerels and pomphrets which have also been promoted as delicacies in their countries. If this trend continues the Indian population will have to do without fish since the foreign buyers are ready to pay ten times the amount of money a poor Indian could hardly afford. Can we allow our fish which is our vital food resources to be exported at the cost of the protein-starved population of our country, even if the principle involved is the highly questionable foreign-exchange earnings?<sup>23</sup>

The studies which make projections into the future and predict shortfalls in supplies ask what would happen if prices remained relatively constant. In reality, there never is an actual gap. When supplies are short, prices go up, and effective demand is reduced to match whatever supply may be available. In India, partly because of exports, supplies have become short and prices have gone up. It should not be assumed that with decreasing supplies and increasing prices everyone reduces consumption by a similar amount. The supply which remains moves toward the wealthier classes, so that the poor suffer the greatest reductions in supply.

It might be argued that India has turned to exports because its domestic market is saturated. Market demand may have been met, but this does not mean that needs have been fulfilled. The apparent saturation of the market is an artefact of low purchasing power. If Indians had the means, they undoubtedly would purchase and consume far more fish than they do now.

## **India's nutrition**

### *Cereals and pulses*

The Indian diet is based on cereals. Rice and wheat are the most important staple foods, but a variety of coarse grains such as barley, corn, millet and sorghum are important in many areas. Rice and wheat production have increased rapidly since the 1970s, largely due to the adoption of high-yielding varieties of rice and wheat in India's 'green revolution'. As a result, domestic food-grain stocks have been kept at high levels, and since 1979 India has been a substantial exporter of rice and wheat.

Pulses such as lentils are important for the poor, especially for the protein they provide. Thus it is significant that 'there has been a long-run secular decline in pulse production as the area cultivated in more profitable crops, including rice and wheat, has expanded. Because of the role of pulses in providing low-cost protein, this decline is a continuing problem for the Indian agricultural sector'.<sup>24</sup> Similarly, the increasing production of wheat and rice at the expense of coarse grains undoubtedly results in an overall shift of grain supplies away from the poor.

<sup>22</sup>U.K. Srivastava and M. Dharma, 'Editor's note', in Srivastava and Reddy, *op cit*, Ref 3, p vi.

<sup>23</sup>National Forum for Catamaran & Country-Boat Fishermen's Rights & Marine Wealth, 'India - ban anti-national multi-million fishing complex at Colaba, Bombay, or anywhere else in India', in *For a Society Overcoming Domination: International Study Days, Case Study 1122*, Support Service for Intercommunication, Paris, 1980.

<sup>24</sup>John A. Dixon and Rodney Tyers, 'India's food security: supply, demand, and signs of success', in Anthony H. Chisholm and Rodney Tyers, eds, *Food Security: Theory, Policy and Perspectives from Asia and the Pacific Rim*, Lexington Books, Lexington, Massachusetts, USA, 1982, p 194.

### *Animal foods*

Historically, animal protein sources such as fish, meat, eggs and milk have played a very small role in the diet of the average Indian. However, the majority of Indians are not wholly averse to eating meat:

In fact, nutritional surveys have shown that 71 per cent of the people could be called non-vegetarians if consuming meat even once in a year could be so defined, and undoubtedly lack of purchasing power is a major factor in the dominance of the vegetarian diet in India. But it is also a fact that economics alone is not the reason for choosing a vegetarian diet. There is a real preference for a vegetarian diet in India, not only among Hindus but also among other communities like Christians and Muslims. . . . Vegetarianism is a part of the Indian tradition.<sup>25</sup>

Perhaps the surest way to estimate the extent to which the operative constraints are economic rather than religious and cultural would be to determine the price and income elasticities of demand for animal products for different economic classes and for different religious and cultural groups.<sup>26</sup>

### *Malnutrition*

India can now claim to be self-sufficient in rice and wheat in the sense that bulk imports of these cereals are no longer undertaken on a regular basis. With the large buffer stocks that are now maintained, the threat of famine from episodic disturbances in supplies has been greatly diminished. However, these achievements do not mean that the problem of chronic malnutrition has been solved. On the basis of a variety of definitions and measurement techniques, estimates of the proportion of the population affected by malnutrition range from about 15% to about 50%.<sup>27</sup> India's sixth Five Year Plan (1980–85) acknowledges that:

The problem of malnutrition is widely prevalent across the various socio-economic groups, particularly among those below the poverty line, landless agricultural labourers, people in slum and remote tribal areas and those who are affected by constant calamities like drought. . . . Children, pregnant women and nursing mothers are seriously affected by malnutrition. . . .<sup>28</sup>

Most apparent protein deficiency encountered in India and elsewhere is associated with deficiency in energy intake. In a study done in Kerala, however, a little over 10% of the people sampled had pure protein deficiency: their intake of energy food was adequate but their protein intake was inadequate. Most of the cases were among children and among expectant and lactating mothers.<sup>29</sup>

Protein intake levels on the average and for the low-income group in Kerala were the lowest in the four states surveyed. The existence of protein deficiencies in Kerala, despite the very high average level of fish consumption, might be explained by a significant skew in the distribution of the fish consumed.

### *Remedies*

To augment the general development efforts that have been undertaken, many different programmes have been launched specifically to combat malnutrition. For example, the distribution of grains is partly controlled by the government's Food Corporation of India (FCI). The FCI purchases grain domestically or imports it and then markets it at

<sup>25</sup>Rao, *op cit*, Ref 1, p 146.

<sup>26</sup>Religious and cultural constraints on fish consumption are described in F.J. Simoons, 'Fish as forbidden food: the case of India', *Ecology of Food and Nutrition*, Vol 3, 1974, pp 185–201.

<sup>27</sup>Some of the measurement and analysis problems are described in P.V. Sukhatme, ed, *New Concepts in Nutrition and Their Implications for Policy*, Maharashtra Association for the Cultivation of Science, Pune, India, 1982, pp 223–234. Also see Shah, Sawant and Sanghavi, *op cit*, Ref 12.

<sup>28</sup>*Sixth Five Year Plan, 1980–85*, Planning Commission, Government of India, New Delhi, 1981, p 377.

<sup>29</sup>Shah, Sawant and Sanghavi, *op cit*, Ref 12, pp 126, 132–133. Food consumption surveys consistently show Kerala to rank lowest among Indian states in energy and protein intake. However, it ranks high in most health indicators. See C.R. Soman, 'Inter-relationship between fertility, mortality and nutrition – the Kerala experience', in P.V. Sukhatme, *op cit*, Ref 27, pp 223–234.

controlled prices through a network of over 200 000 fair-price shops. In some years the public distribution has accounted for almost one-fifth of all food grains available.<sup>30</sup> Many states also have organized public food distribution programmes.

In the first three national Five Year Plans spanning the period 1951 to 1966, nutrition formed one of the components of the health sector. However:

In the Fourth Plan an Integrated Nutrition Programme . . . was introduced. It was observed that production of 'more food' was needed. Stress was laid on the development of agriculture along with animal husbandry and fisheries. . . . The Applied Nutrition Programme (ANP) was first introduced in 1960. . . . This programme was introduced to spread the concept of balanced diet, production and consumption of protective foods and proper techniques of cooking. The Special Nutrition Program (SNP) was introduced in 1970-71 as a crash scheme. . . . The mid-day meals programme which was initiated in 1962-63 was extended in subsequent years. It provides supplementary nutrition of 300 calories with 8-12 grams of protein to children in the age group of 6-11 years.<sup>31</sup>

The Special Nutrition Programme and the Mid-Day Meals Programme are the major nutrition activities in the overall Minimum Needs Programme (MNP). Food is also distributed through the Food for Work Programme, now the National Rural Employment Programme. This programme uses grain as wages to pay for labour devoted to building public works such as roads and dams.

By 1980, the Special Nutrition Programme had reached over 8.2 million children, pregnant women and nursing mothers. The Mid-Day Meals Programme had reached over 13 million children. However, there has been general disappointment with the effectiveness of these and other nutrition programmes that have been undertaken.

In 1975, Integrated Child Development Services (ICDS) was launched to provide health and educational services to small children and pregnant and lactating women. Services are delivered at village focal points called '*anganwadis*' – courtyards for child care. Nutrition-related interventions include nutritional supplements, immunizations, health check-ups and primary medical care. The programme appears to be effective in reducing the incidence of malnutrition.

It seems clear that ending malnutrition will require ending poverty. It seems equally clear that, in the interim, direct nutrition intervention programmes will still be necessary.

### **Policy options**

India's fisheries policies now are oriented much more to producers than to consumers. Indeed, the objectives of fisheries development as listed in the sixth Five Year Plan speak of increasing production and improving the socio-economic conditions of fishermen, but make no reference to the fulfilment of nutritional needs. However, increased production of any food does not in itself assure that the food will be consumed by those who need it most. This should be clear from India's recent history in agriculture, in which 'the low purchasing power of large numbers of consumers has meant that many people have not been able to increase their food intake and that inadequate nutrition continues to coexist with production "surpluses"'.<sup>32</sup>

In general, new increments in fish supplies are likely to be targeted to those who can best afford it, whether within the country or abroad. New

<sup>30</sup>A detailed account by a former chairman of FCI is provided in R.N. Chopra, *Evolution of Food Policy in India*, Macmillan India Limited, New Delhi, 1981.

<sup>31</sup>*Sixth Five Year Plan, 1980-85, op cit*, Ref 28, p 378. Also see p 225.

<sup>32</sup>Dixon and Tyers, *op cit*, Ref 24, p 192.



supplies are not likely to reach the poor. Even worse, fisheries development for the higher end of the market may reduce the supplies available to the poor. This can happen because the productive resources are reallocated to respond to wealthier sections of the market, or simply because of the general upward movement of prices.

Despite these prevailing patterns, there are many ways in which fisheries might make a larger contribution to the alleviation of malnutrition in India. Activities in the fishing industry may be divided into three major interacting phases: production (catching or culturing), processing, and marketing or other forms of distribution. In each phase there are things which could be done to help alleviate malnutrition. Activities in production, processing and distribution designed to help alleviate malnutrition can at the same time help develop the fishing industry itself.

### *Production*

The potential contributions of India's fisheries are very different in the modern and traditional sectors of marine fisheries and in the various kinds of inland fisheries. In the marine fisheries, the modern sectors yield higher foreign exchange earnings, but the traditional sectors make a much larger contribution to domestic food supplies, especially for the rural poor. Since the 1970s, the government has provided strong support for the development of the modern export-oriented fishing industry, but it has not provided comparable support for fisheries producing for domestic consumption (support might be in the form of technical assistance, infrastructure development, extension services or subsidies). The support that has been provided has been directed at prospects with high commercial potentials. Some programmes have been designed to protect small-scale fishing communities when they have been threatened by large-scale trawling operations encroaching on their customary nearshore fishing grounds. No help has been provided to traditional fisheries specifically because of their contribution to fulfilling local nutritional needs. Re-examination of that contribution might indicate that increased support of some traditional fisheries would be warranted not for conventional economic reasons but because they can – and already do – help in alleviating local malnutrition.

The modern sectors supply great quantities of low-cost, popular species such as seer, Indian mackerel and sardine. Conceivably they could pursue presently under-utilized species, especially in the still under-exploited Exclusive Economic Zone. However, because they are capital intensive and because they are linked to major marketing networks, the large-scale private operations are consistently motivated to pursue the more highly profitable high-cost species. In the absence of special subsidies for the purpose, the modern sector is not likely to take new initiatives in developing fisheries specializing in low-cost products.

It now appears that the most promising new frontier for promoting nutrition-oriented fisheries production is in the inland fisheries, both capture and culture. These fisheries occupy otherwise under-utilized surface area, and they can be undertaken near to the poor, rural population. Inland capture fisheries can be improved through introductions (the one-time transfer of species new to a waterbody) or through stocking (the repeated transfer of fish into a waterbody) and by other management measures such as fertilizing, feeding and water control.

India has had considerable experience with introductions and

stocking of lakes and reservoirs, with common carp (*Cyprinus carpio*), Chinese carps, gourami, tilapia (*Oreochromis hornorum*) and a variety of other species.<sup>33</sup> Many such efforts have been successful. However, success has been assessed in terms of levels of production and economic returns, not in terms of nutritional impacts. It would be useful if such programmes were also explicitly and systematically assessed according to the extent to which they help alleviate local malnutrition.

Many people supplement their families' diets by subsistence fishing either along the coast or inland. For many of the poor, 'hunting' for fish remains important long after hunting for land animals has become impractical. Government should take responsibility for intensive stocking of public waters with fish fry, not for commercial reasons, but for the significant nutritional benefits such stocking can yield for the poor. Where such operations are not actively managed the yield may be modest, but if the cost of stocking is very low that would not matter very much. In fact, for the purpose of alleviating malnutrition the stocking of low-value fish such as tilapia might be preferable to stocking high-value fish; there might then be a higher likelihood that they would be left for the poor to catch. Repeated attempts to displace tilapia by introducing more 'economic' species, particularly in Tamil Nadu, may have been a distinct disservice to the local poor.

Government should take positive steps to assure that the poor have free access to fish in public waters on a subsistence basis. Waters to which the poor traditionally have had free access should not be privatized to allow the culturing of products for export, unless some alternative arrangements are made for the poor.

To assure some return on the effort invested, actively managed aquaculture operations cannot be undertaken in publicly accessible waters, but normally must be conducted in private or community controlled waters. Public waters sometimes can be used for private culturing operations through the use of pens or cages for the cultured fish, but these practices are not yet common in India.

In supporting inland fisheries through the Fish Farmers' Development Agencies and other means, government should give special attention to those types of inland fisheries operations which make the most substantial contribution to alleviating malnutrition. These operations should be promoted and, where feasible, they should be reproduced. Existing operations should be adapted to conform with the more effective kinds of operations.

Support for tank development sometimes takes the form of food-for-work programmes administered by the Panchayat Unions. In the multi-purpose rural development programme undertaken by the World Food Programme in Mahendergarh District in Haryana, food-for-work was provided for the enlargement of existing ponds, excavation of water supply channels to link the irrigation canal system to those ponds, establishment of five regional nurseries and the establishment of a model fish farm. Fish produced in these ponds were expected to be sold in the Delhi market.<sup>34</sup> Such food-for-work programmes should also be used to create pond operations to produce fish for local consumption in poor rural areas. It would be especially fitting if the food-for-work rations included fish from successful neighbouring ponds.

Policies regarding the right to fish in existing inland fisheries such as reservoirs vary a great deal from state to state, but the basic alternatives can be categorized as follows:

<sup>33</sup>Indo-Pacific Fishery Commission (IPFC), *Report of the Joint Workshop of the IPFC Working Party on Inland Fisheries and the IPFC Working Party on Aquaculture on the Role of Stocking and Introductions in the Improvement of Production of Lakes and Reservoirs*, New Delhi, India, 24–25 January 1984, Food and Agriculture Organization of the United Nations, Rome, 1984.

<sup>34</sup>*World Food Programme Assistance for Fisheries Development in Third World Countries and The Use of Fish Products in Food Aid*, World Food Programme, Rome, 1984, p 25.

- direct fishing by a government fishing authority;
- lease by outright auction;
- single lease on a royalty basis;
- multiple licences to fishers and fishers' cooperative societies.<sup>35</sup>

These methods for controlling access each have different direct and indirect nutritional impacts on the local poor. Leasing to individuals, for example, can result in an excessive concentration of benefits in the hands of the lessee, and thus raise strong local resentments:

On one occasion, after the fish farmer had harvested the tank, the locals gathered around and refused to allow him to take the fish to be sold outside the village. They insisted that since the tank was common property they had the right to get the fish reared in it at half the market price offered in the town areas.<sup>36</sup>

The effects of different forms of control should be studied in very concrete terms and should be taken into account in the shaping of access policy. Other considerations such as incomes to fishers and contractors, ease of management, environmental protection and vulnerability to corruption should be taken into account, but at the same time nutritional effects should not be ignored. The Central Inland Fisheries Research Institute, in its studies of the management aspects of inland fisheries, might be the appropriate lead agency for investigating the nutritional impacts of alternative forms of organization.

Aquaculture operations usually are conducted under private or governmental control, but some are conducted by communities or cooperatives of some form. Government might provide special support for such cooperative arrangements because of the nutritional and other social benefits that they yield. The government of Thailand, for example, has established a Village Fish Pond programme specifically to relieve poverty and alleviate malnutrition in target impoverished areas. Poor villages can request the Department of Fisheries to prepare and seed ponds for them. The ponds are then managed by locally elected village committees. In some of these village ponds the committee sells licences to fish, and the licence fees go into a community fund which supports other food production projects. Residents of the local village are allowed to purchase fish from the pond at lower prices than outsiders. To minimize the likelihood that the fish will be resold to outsiders, they are allowed to purchase no more than about 5 kg at a time.

School fish ponds are another form of community-managed aquaculture. In the Philippines and Thailand, school ponds are used to provide fish for school lunch programmes, thus reducing the cost of meals and helping to assure that students are well nourished. They also provide students with the opportunity to learn about operating ponds and about preparing fish from the ponds.

Not all inland fisheries make good contributions to the alleviation of malnutrition. Some allow for self-provisioning not by the poor but by the well-to-do, as in the case of farmers who use their irrigation wells to raise fish for themselves. Some are sound commercial ventures but have little effect on malnutrition because most of the product goes to consumers who are already well nourished. The prawn-culturing operations, for example, have no direct nutritional benefit because the products are exported.

In promoting marine or inland fisheries for the purpose of alleviating

<sup>35</sup>Pradeep K. Yadav, 'Reservoir fishery management: major policy issues for government intervention', in Srivastava and Reddy, *op cit*, Ref 3, pp 433-457.

<sup>36</sup>John Kurien, *Pisciculture Potentials in Dharmapuri District, Tamilnadu*, Centre for Development Studies, Trivandrum, India, 1980, pp 12-13.

malnutrition, it should be recognized that increasing production in a given area does not necessarily mean increasing supplies available for consumption in that area. While small-scale fishing operations are likely to sell in the immediate vicinity, highly commercialized operations are more likely to market their catch in major urban markets or export it. Even small-scale operations may have their products bought up by middlemen who transport them to larger towns and cities. To alleviate malnutrition, it is generally better to have local production for local consumption in order to limit costs of processing and distribution. Where feasible, production should be supported directly in those regions in which malnutrition is most prevalent.

#### *Processing*

Most fish consumed in India is fresh or preserved by sun-drying. Fish is also smoked, salted and fermented. Freezing and canning are not carried out to any large scale, except for the export market. Canning and freezing generally are too expensive for products destined for poor people. Even if they were not expensive, they might not be advantageous for the poor. One major effect of preservation is that it increases the likelihood that the product will be shipped to markets at great distances from the point of production. The modernization of fisheries in general, and improved preservation in particular, regularly result in moving fish away from the poor. Poor people in remote areas might not get any fish at all if it were not so perishable.

However, there are some cases in which processing might be helpful to the poor. Improvements in traditional low-cost processing techniques can be sought specifically for those products that are favoured by the poor but are not particularly attractive to the middle and upper classes. For example, work done at the College of Fisheries in Mangalore indicates that salted and pressed sardine and dried whitebait might provide higher quality dried fish than is obtained currently by sun-drying fish on the beach. This dried sardine product can be important for bridging the three-month monsoon period when fresh fish is not available. Undoubtedly there are many ways in which traditional preservation techniques can be improved to reduce wastage and improve the quality and durability of the product.

In India and elsewhere, much attention has been given to the improved utilization of 'trash' fish, so that instead of being discarded or used as animal feed it is used for human consumption. Processes have been developed for producing attractive edible products. For example, the Gujarat Fisheries Aquatic Sciences Research Institute has developed good-quality salted and dried fish fillets with a long shelf life. The institute has also used trash fish to make fish protein concentrate, and used this product to make several different food items popular in Gujarat (papad, papadi, chakri, sev, ganthia, sakkarpara, salted biscuits).<sup>37</sup> Much of this sort of work in India and elsewhere has been geared to the preparation of products for the regular commercial market, and not for products targeted for the alleviation of malnutrition. However, some products such as the Gujarati fish fillets have been well received by the local poor. Whether products designed for the poor can be commercially viable remains an open question. If there is no subsidy, processing for middle-class markets or for animal feed is likely to be more profitable.

Many inland fisheries suffer from very uneven production schedules.

<sup>37</sup>Niranjan D. Chhaya, 'Recent advances in commercial utilization of trash fish for edible use in Gujarat', in Srivastava and Reddy, *op cit*, Ref 3, pp 203–210. Also see Gupta, *op cit*, Ref 11, pp 84–85.

In some districts the tanks dry up in the summer, with the result that all have to be harvested almost simultaneously. Local demand is saturated and the fish farmers are obligated to dispose of the fish at very low prices, often to outsiders. If production schedules cannot be smoothed out, an alternative remedy would be to develop appropriate preservation techniques so that the fish can be consumed locally throughout the year.

#### *Distribution*

Fisheries products intended to be used to help alleviate malnutrition can be distributed through conventional marketing, through social (subsidized) marketing such as fair-price shops, through institutional feeding programmes, or through established nutrition intervention programmes. There is also the possibility of self-provisioning through subsistence fishing or backyard pond operations, but in such cases there is no distinct distribution phase.

If the open market is to be used to promote the use of fish to alleviate malnutrition, the key is to focus on low-cost products which are favoured by the poor. Some forms of dried fish, for example, would be particularly suitable. New products such as the Gujarati fish fillets might be developed and promoted specifically for this purpose. With sound promotional programmes, some of these fisheries products might prove to be commercially viable, and not require any direct subsidies at all.

A social marketing scheme specifically devoted to supplying poor customers with fish was established in Egypt in 1964. In India, social marketing of fisheries products could be conducted through the established system of fair-price shops. The products selected should have a high price elasticity of demand among the poor and a low price elasticity of demand among middle- and upper-class consumers. Otherwise anything that is done to reduce prices would subsidize middle and upper classes as well.

Marketing services should be attentive not only to prices but also to delivery mechanisms, to assure that poor communities have ready access to points of sale. Support services should be provided to fish retailers and vendors in poor areas.

Institutional feeding programmes include all programmes in which the delivery of food to consumers is organized by persons other than the consumers themselves. Such feeding programmes may be found in schools, prisons, hospitals and many other contexts. In institutional feeding programmes, decisions regarding the choice of foods are made by a manager rather than by the final consumers. The manager is likely to be acutely cost conscious, and is likely to be more concerned with the nutritional value of the food that is purchased than the average consumer.

While they do not reach the large numbers of poor children who do not attend school, school lunch programmes can be useful for reaching some mildly or moderately malnourished children. The Mid-Day Meals Programme already operating in India provides a good opportunity for delivering appropriate fisheries products. Day care centres for pre-school children, congregational dining arrangements for adults, take-home meals, or home-delivered meals and other direct feeding programmes, should be considered as well.

Commercial fisheries production and processing operations generally are most responsive to the middle and upper classes because they have

the money to create a market demand. However, the production of uniform products in very large numbers for institutional feeding programmes can make it profitable to be responsive to the needs of the poor. Such programmes are commercially attractive because of the consolidation of demand in a single decision-making centre, resulting in potentially large economies of scale. The fact that school lunch programmes often are subsidized adds to their commercial attractiveness.

Established nutrition intervention programmes, whether within or outside the Mid-Day Meals Programme and the Special Nutrition Programme, should be reviewed to determine whether some form of fish product might be suitable for the protein component. For example, the preserved sardine and whitebait being developed at the College of Fisheries in Mangalore might be used in the local *anganwadi* programme for providing food to needy women and children. Also, fish might be used as part of the ration in food-for-work programmes such as those sponsored by the World Food Programme.

### An action programme

Food policy experts agree that the problem of malnutrition in India cannot be solved simply by increasing overall food production. It is important also to assure that the incomes of the poor increase so that they can obtain the food that is produced.<sup>38</sup> Fisheries development can make a great contribution in this respect by providing adequate levels of income to workers in the industry. In that approach, however, fish is simply another commodity. The fact that the product is food is irrelevant to the producer because it is sold rather than eaten. The emphasis in this study, in contrast, is on ways in which fish as food could make a greater contribution to the alleviation of malnutrition.

The states of India vary in their physical endowments, cultures, level and nature of malnutrition, availability of and interest in fisheries products, and so on. In some areas, the price elasticities of demand for fish are high and in others they are low. With these great variations among the states of India, there cannot be any generally applicable programme regarding the use of fisheries in alleviating malnutrition. The major work will properly be at the state level. However, the national government could do a great deal to provide leadership and support for the effort.

Historically, national planning for food and nutrition in India has focused on cereals, pulses, edible oils and milk. In view of the low level of consumption of protein from animal sources and the high potential of fisheries resources, it might be timely for the government of India to formulate a systematic programme for the use of fisheries products for the alleviation of malnutrition.

A national level programme could begin with governmental endorsement of increasing use of fisheries for alleviating malnutrition. This could be included as one of the explicit objectives of fisheries development.<sup>39</sup> Then the national government could help to identify areas which would be most likely to benefit from such action. Nutrition status surveys could give increasing attention to the detection of pure protein deficiency as distinguished from the more common protein-energy malnutrition. The national government could help to identify the major types of activities through which fisheries could make a larger

<sup>38</sup>John W. Mellor, *The New Economics of Growth – A Strategy for India and the Developing World*, Cornell University Press, Ithaca, New York, 1976. Also see V.K.R.V. Rao, *op cit*, Ref 1, and John Dixon and Rodney Tyers, *op cit*, Ref 24.

<sup>39</sup>A formulation something like this might be considered: 'The objective of fisheries development in India [or any of the states] is to increase the production of fish and fisheries products, increase the incomes of workers in the industry, earn foreign exchange, create better opportunities for employment, and contribute to the nation's food supplies, especially for those most at risk of malnutrition.'

contribution to the alleviation of malnutrition. Model programmes could be designed and implemented at the state level with the assistance of the national government.

A programme for increasing the use of fisheries products for the alleviation of malnutrition should be formulated through close co-operation between the fisheries and nutrition agencies of government at both the national and state levels. Broadly, the fisheries agencies would serve as surrogate suppliers, while the nutrition agencies would serve as surrogate consumers. Nutrition agencies could provide guidance regarding what kinds of nutrients are needed where, to help assure that the demand for nutrients is more effectively matched to the supply. Fisheries agencies could help to find or develop products which would be useful in specific nutrition-oriented activities.

The possibilities for action in the production, processing and distribution stages of fishing operations have been described in this article in general terms. To be implemented they would have to be shaped to fit specific local circumstances. It should not be expected that new nutrition intervention programmes would be devised specifically for the purpose of using fisheries products. Rather, existing activities in fisheries and in nutrition should be reviewed to assess how they might be adapted to make more effective use of fisheries products for the alleviation of malnutrition. For example, modest changes in the management of established reservoir fisheries might strengthen their local nutritional impacts. The fair-price shops might be used as a major distribution outlet for selected products. Direct-feeding programmes such as the Special Nutrition Programme and the Mid-Day Meals Programme could be examined to see whether some form of fisheries product might be used for the protein component. Prevailing practices in the feeding of fisheries products to small children could be studied to determine how they might be improved. Of course, the local poor should be fully engaged in the planning of new or adapted programmes.

If fish is to make a larger contribution to the alleviation of malnutrition in India, systematic and deliberate efforts would have to be undertaken to connect those most vulnerable to malnutrition with suitable supplies of fisheries products. In order to strengthen the linkages it would be necessary to identify target groups with concretely assessed nutritional deficiencies, to identify particular fisheries products which could meet those needs, and to carefully design programmes to provide those products to those who need them, whether through market or non-market mechanisms. Some of the policy options have been outlined here. A decisive action programme could be formulated, perhaps in the context of preparation for India's eighth five-year development plan. With appropriate leadership from the national government, particularly from the Department of Fisheries, and with good co-ordination among interested agencies both within and outside of government, a coherent and effective programme could be mounted.