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Factors affecting development of food science and technology and food research in Pakistan

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Experience gained during a recent assignment in Pakistan on behalf of the Food and Agriculture Organization of the United Nations forms the background to this paper. Several years ago the Pakistan Government decided to set up a Council of Scientific and Industrial Research under the Ministry of Industries. Included in the plans was provision for the setting up, within the Council, of an organization for food research and its application to the promotion of the food industries of that country. The reports of this assignment (Corran, 1959), and a previous one (Fidler, 1957), submitted to FAO, contain recommendations which form the basis of this contribution.

Pakistan, with a total population of about 93 million, covers an area of about 370 000 sq. miles. It is divided into two wings, West and East, 1000 miles apart. West Pakistan is bounded by the Mekran Coast in the west, the Hindu Kush mountains in the north, and the western frontier of India in the east. East Pakistan, formerly the eastern part of Bengal, is bounded on the south by the Bay of Bengal, and is enclosed on its east, west and north borders by India. Whereas the area of West Pakistan covers 317 000 sq. miles with a population density of 109/sq. mile, that of East Pakistan is 53 000 sq. miles with a population density of 777/sq. mile. Thus, the population density of East Pakistan is seven times that of West Pakistan. They are essentially Muslim communities.

The southern half of West Pakistan is mainly desert, although wide areas around the river Indus have been brought into cultivation. The northern half, embracing the West Punjab and N.W. Frontier Province, is well irrigated by the five rivers of Pakistan, with a connecting series of canals and irrigation ditches. In consequence, most of the Punjab is highly productive of agricultural products (grain, fruits, sugarcane, tobacco, cotton, jute) and maintains a substantial population of domestic animals (cows, buffaloes, goats, sheep). In general, where water is available, as in the Peshawar Valley of N.W. Frontier Province, in the Quetta Valley of Baluchistan and in the Punjab, crop and fruit yields can be high. Where water is not available the

land is, or becomes, a desert. Consequently, in order to enable Pakistan to grow more food, intensive efforts are being made through irrigation schemes to bring more land into cultivation. Such irrigation schemes include the reclamation of saline land, the sinking of tube wells, the construction of barrages such as the Warsak dam on the Kabul river, and other projects such as the Quetta scheme for the use of underwater springs. Such schemes, coupled with afforestation to counter soil erosion, and the building of fertilizer factories, contribute towards the reclamation of much desert land.

Since East Pakistan contains the rivers constituting the Ganges delta there is, in general, no lack of water. The rainfall is heavy, ranging from 50 to 140 in./year. The soil of Pakistan, however, is capable of providing substantially more than at present, and much of the aid which is being given to Pakistan is designed to accomplish this aim.

In Pakistan, however, there is grave malnutrition, more evident in the crowded Eastern wing. Whereas the people of the Punjab and N.W. Frontier Province are reasonably fed on meat and milk (although there is still much malnutrition), in the Eastern wing the staple diet is rice and fish. The consumption of sea fish is largely confined to the coastal region. Inland, in East Pakistan, there are thousands of so-called fish tanks, which are really small ponds of varying size, for the culture of freshwater fish for consumption. These, with the rivers of the Ganges delta and the paddy fields, can provide a substantial proportion of animal protein (Nazir Ahmad, 1951, 1956, 1957). Eggs are the other main commodity in East Pakistan but, strangely enough, they are largely sold for cash instead of being eaten for nourishment. Fruits, such as pine-apples, bananas and oranges are also grown widely in the Eastern wing. Special mention should be made, however, of the enormous possibilities of better utilization of fish as food, both in East and West Pakistan, to which reference will be made later.

Data on food consumption and nutrition

At the present time, few reliable statistics of agricultural production are available, although a census of production in Pakistan is contemplated and has probably already begun.

There is a serious lack of information on food consumption and nutrition. This lack, coupled with absence of reliable agricultural and similar statistics, makes it impossible to obtain an accurate quantitative picture of the degree and nature of the malnutrition. As far as agricultural raw materials are concerned, there are large citrus plantations (orange, grapefruit, lemon) in the Punjab, N.W. Frontier Province and other provinces; apricots, pomegranates, grapes, pears are grown in profusion in the Peshawar and Quetta valleys; indigenous fruits such as *amla*, rich in vitamin C, are found in various parts of East and West Pakistan; East Pakistan cultivates substantial quantities of pine-apples and bananas; and the harvest of the seas around the coasts of both East and West Pakistan has hardly been tapped.

An illustration of the position is to be found in the size of fish catches in relation to national nutrition. There is a great deal of confusion about the amount of fish landed and used in Pakistan. FAO statistics for landings in Pakistan, West and East, for 1954-5, were given as 271 thousand metric tons compared with 4721 thousand in Japan, 1099 thousand in the U.K., 1867 thousand in Norway, 2498 thousand in Russia, 839 thousand in India (FAO, 1956). The Director of Fisheries of East Pakistan, however, has mentioned the figure of about 435 lakh maunds of fish landings for East Pakistan alone (private communication). This is equivalent to 1600 thousand tons, about six times the amount reported by FAO (1956). Presumably these figures refer to sea fish. The task of assessing the amount of fresh fish taken from the fish tanks and rivers in East Pakistan is immense. Nevertheless this source of supply must be regarded as the major one for the poorer population, particularly in districts remote from the sea coast. It is almost certain that no such investigation has been carried out. In my opinion the figure of 1600 thousand tons is more likely to be correct than the smaller figure quoted by FAO.

Similarly, there are few reliable data on the amount of fish consumed by the population in East Pakistan. The Director of Fisheries in Karachi, (Qureshi, 1951) stated several years ago that the average annual consumption per head in East Pakistan was 7 lb compared with 1.2 lb in West Pakistan, 40 lb in the U.K., 18.2 lb in West Germany, 15 lb in the U.S.A., 3.4 lb in India (Qureshi, 1951). In spite of the lack of really reliable data existing on the spot, it is suggested that the reported consumption in East Pakistan, of only 7 lb/head, is very much less than the real figure. Thus, a suggested catch in East Bengal of 1600 thousand tons, is equivalent to an average annual consumption of 85 lb/head. This amount is more in keeping with the general opinion of the level of fish consumption in East Bengal, which was stated to approach that of Japan, the greatest consumer (FAO, 1954). In pre-partition days, consumption for the whole of Bengal was given as 50 lb of fresh fish and 60 lb of dry fish per head (Government of Bengal: Nutrition Committee, 1940).

Consideration of the meagre evidence available leads to the conclusion that the average annual consumption is at least 50-70 lb/head. This figure cannot be confirmed, however, until a careful survey of East Pakistan fisheries and of fish consumption has been made. Moreover, this average figure conceals the considerable variation in consumption by various classes of the community. This kind of information can be obtained only by a properly organized food-consumption survey. The question of fish consumption is tremendously important in determining the extent of malnutrition. An average consumption per head of 50 lb annually represents 9 g of fish protein daily, and when this amount of protein is added to that obtained from rice, pulses and other foods, it appears that much of the malnutrition in East Pakistan is due, not to gross lack of protein, but rather to the shortage of other essential nutrients such as vitamins and minerals. In any event, the above considerations point to the urgent necessity in Pakistan, and probably in other countries, of careful food-consumption and nutrition surveys and the collection of accurate agricultural and sea-fishery statistics. The United Nations, through FAO, UNICEF and WHO have

expert teams to help in carrying out surveys of this nature. These teams, however, cannot operate in any country unless, and until, they are invited to do so.

Role of the food scientist and technologist

Campaigns against malnutrition can be both short- and long-term. In recent years Western nations have supplied undernourished communities with foods and food supplements. The emphasis has necessarily been on the short-term campaign because of the incidence of disease and mortality from undernourishment.

Though these short-term efforts are being made, and no doubt will continue to be made, it must be recognized that the supply of supplementary foods cannot go on for ever, and it is essential that the undernourished and underdeveloped communities should also receive long-term aid, designed to make them increasingly self-sufficient and self-reliant. This long-term aid, or the long-term solution to the problem of underdeveloped countries, can be provided by schemes which have the following objectives:

(1) Food policies should be adopted which result in the maximum production of those foods necessary to maintain health. This objective, similar to the British wartime agricultural policy, is being tackled by measures which include irrigation, the fight against soil erosion, feeding the soil with fertilizers and humus, plant breeding and animal research. Further, much of the poverty of the soil is due to the use of animal dung for fuel purposes instead of for soil feeding. In this objective, the emphasis is on agriculture, and food technology plays a relatively minor, but not a negligible, part.

(2) Steps which involve development of the national food industry should be taken to ensure adequate means of preservation and distribution of the foods harvested, including agricultural produce and products of the sea and rivers.

(3) Endeavours should be made to use unwanted surpluses of food for export and thus help to pay for imported essentials and to capitalize industry. This aspect is, from the economic angle, of fundamental importance and must be recognized as a major activity of any struggling nation that wishes to raise its standards of living. It is again dependent on the expansion of a national food industry. Indeed the expansion of industry in general has a direct effect on nutritional standards by building up an economy in which the workers gain purchasing power.

Food scientists must play a major role in the implementation of the second and third objectives. Not only must they control the various processes by which food is preserved by the recognized methods such as drying, heat and freezing, but they must also help the manufacturing industries to produce goods for the home market to ensure even distribution of food, and for the export market to give the country purchasing power abroad.

Supply of trained personnel

In this country during recent years it has been asserted that we are somewhat short of well-trained industrial scientists in general and of industrial food scientists,

or technologists, in particular. Compared with the underdeveloped countries, however, we are well supplied. The advances that have been made in Europe and America in the preservation of food, particularly by freezing, canning and dehydration, would not have been possible without well-trained personnel. In Pakistan, which in many aspects is underdeveloped, although by no means the most seriously underdeveloped country in the East, the number of trained food scientists is alarmingly small. This is one basic factor which retards development in all industries, and in particular in the food industry. The shortage of trained food scientists and technologists is recognized by the aid organizations and accounts for thousands of students from underdeveloped countries who are at present overseas for training in the U.K. and other European countries, in U.S.A., Canada and Australasia. In the underdeveloped countries, facilities for advanced training do not exist and, indeed, the need for them is not always fully realized. Even in this country over-attention to our domestic scientific food problems sometimes obscures the international importance of giving adequate training to overseas students. Difficulty is often experienced in placing such students, and it is important to foreign and Commonwealth relations that any such difficulties should be resolved. It could be done by a combined effort on the part of academic institutions and research associations linked with the food industries, to draw up a scheme to meet the requirements of overseas students.

In the meantime it is essential to expand the food industries of underdeveloped countries, and nations more advanced industrially should help not only to guide operations but also to train scientific operatives. Thus, in Pakistan where aid organizations are providing fish harbours, deep-sea trawlers, cold-storage installations and the like, it is desirable that until such time as nationals can be trained technologists from abroad should be made available in order to manage such installations, to supervise adequate methods of preservation and to ensure satisfactory distribution. Ultimately, establishments for training top-grade scientists for the food industry should be provided in the countries concerned. Until then it will be necessary to continue to send students overseas for training.

Sufficient may have been said to indicate the directions in which efforts should be made to ensure better nutrition. No apology is needed for stressing the importance of industrial development as a prerequisite of a stable economy. It is sometimes forgotten that in some countries the very poor people can only afford to purchase the very cheapest foods. Until it is made possible for them to earn money, it is futile to think about them buying adequate food. In the meantime it is necessary for the more fortunate nations to supply nutritious food for the underfed populations, but as stated it would be helpful as an economy, if it were known what particular foods were needed to supplement the local diet.

Summary

(1) A brief general review is given of the attempts to increase food production in Pakistan,

- (2) The urgent necessity of the production of food statistics and nutritional data, and the carrying out of national food consumption surveys is stressed.
- (3) Special reference is made to the great importance of developing the fishery industries in Pakistan.
- (4) The importance of industrial food scientists to establish food manufacturing industries to increase the efficiency of food preservation and distribution nationally, and to foster export trade, is indicated.
- (5) The shortage of trained food scientists is a serious retarding factor in the development of food research and industry, and the urgent need of facilities for overseas training of a large body of potential food scientists and technologists is stressed.

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Nutritional change: some comments from social research

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This Symposium has raised in my mind a number of questions and comments touching on areas of interest to those concerned with research in the social sciences. It will be convenient to group my remarks under three headings: first, comments on some points raised during the Symposium; second, a brief and familiar outline of the ideal situation for development of nutritional work; and, thirdly, comments on some persistent difficulties which arise.

Comments on some points raised

In his opening remarks the Chairman (Aykroyd, 1961) emphasized the similarities as well as the differences in problems of fostering nutritional change in different regional and communal settings. Both are important when we come to consider the practical problems of implementing nutritional programmes; but it is in applying