Introduction

Although Pakistan has a comparatively comfortable food availability, yet malnutrition is widespread among the vulnerable groups (Khan 1988, 1989). Several interrelated socio-economic factors including dietary imbalance are responsible for the problem. Behind any national policy for linking food production with nutrition is not only the welfare objective giving people the food requirements for good health but also the economic objective of maximizing their working efficiency. A balanced diet at the lowest possible cost, at the national level and dietary indicators to measure its nutritive value are desirable to achieve this objective.

Various dietary indicators have been recommended to reflect different aspects of nutritive value of national diets, in terms of total calories, total proteins and animal proteins at the retail level and percent of total calories derived from cereals, roots, tubers and sugars (FAO/WHO, 1962), net dietary protein calorie percent (FAO, 1965), percent of total energy derived from protein, carbohydrates and fat (Davidson et al. 1975) and protein energy ratio (FAO/WHO/UNU, 1985).

Although the nutritional value of diets cannot be fully expressed in terms of a single indicator, and although certain indicators might be quite adequate for one pattern of diet but inadequate for another, there is a still need to develop simple, approximate and probably emperical indicators. Recently, FAO (1989) developed a scoring system (dietary score) based on the proportion of the total calories derived from food groups to measure the nutritional quality of the dietary patterns at national level. Some countries such as Australia, Japan, India and Newzeland have already made recommendations for developing dietary patterns in terms of food groups (FAO, 1989).

According to Khan and Eggum (1978) the average Pakistani diet contributed 13 percent of total calories from protein, 61 percent from carbohydrates and 11 percent from fat and was adequate to meet the dietary requirements of most groups of the population, as indicated by net dietary protein calorie percent values of the diet. The precise proportions of various food groups to be included in a diet to make it wholesome, nutritional and palatable have not been defined and dietary guidelines to formulate a balanced diet at national level do not exist in Pakistan.

There is a need to develop a desirable dietary patterns in terms of food groups, to meet the nutritional requirements not only from the point of view of nutrients but also from stand point of bulk and palatability at national level. Such dietary patterns can guide the food and agriculture planners in diversifying food crops and deciding policies of food import and export (Qureshi, 1988). The present paper deals with food availability situation and development of desirable dietary patterns for Pakistan.

Food availability situation

Food availability from various food groups in terms of kilocalories per caput per day as average for the trienniums 1974-76 and 1984-86, compared with desirable levels (FAO, 1989) are shown in table 1.

Cereals

The diets were predominantly rich in cereals and provided 64 percent of the total available calories over the period. The cereal consumptions were 155 and 146 percent of the desirable level during 1974-76 and 1984-86 respectively. The content of calories from cereals in total dietary energy decreased by 6% over the period.

Pulses

Pulses play an important role in improving the nutritive value of the diets rich in cereals. The calories from pulses were 53 and 38 percent of the desirable level during 1974-76 and 1984-86 and have been decreasing considerably over the period. Nutritionally cereals and pulses are complementary (Khan, 1987). Cereal grains are deficient in lysine but are a good source of sulphur containing amino acid (Khan, 1981). Pulses, on the other hand, contain twice as much protein as the cereal grains and are a rich source of lysine, although relatively low in total sulphur containing amino acids (Khan et al. 1979). An optimum nutritional combination is provided by a diet composed of 70 percent cereals and 30 percent pulses (Khan et al. 1979). However, in Pakistan, the ratio of cereal to pulses consumed is 22:1 (Khan, 1988). In a mixed diet, the ratio of cereal protein to pulse protein should be between 4:1 and 5:1 as recommended by Indian Council of Medical Research (ICMR, 1984).

Vegetables and Fruits

These are nutritionally desirable. They not only contain vitamins and minerals but also provide fibre needed in the diet. The availability of vegetables and fruits did not

change and provided calories at 30 percent of the desirable level over the period. The contribution of calories per head per day from roots and tubers were 12 and 9 calories respectively. These foods in comparison with cereals yield more calories per unit of land and nutritionally are desirable supplements to the cereal based diets (Khan and Hamid, 1986; Khan et al.1988). There is a need to encourage the production of potatoes and sweet potatoes to ease the pressure on the consumption of cereals.

Total Animal Products

The availability of calories from total animal products and its components such as meat and offals, milk, eggs and fish declined and were 44 and 39 percent respectively of the desirable level over the period. The addition of animal products improves the caloric density, quality of protein and palatability of the diets. Among animal products, fish provides more nutrients per unit area and can be classed as the cheapest source for improving nutrition (Khan and Ullah, 1986).

Oils and Fats

The nutritional importance of oils and fats lies in providing calorie concentration in diets rich in cereals. They are also vehicles for fat soluble vitamins and supply essential fatty acids in the diet. The calories from these foods increased significantly from 194 in 1974-76 to 306 calories in 1984-86. The availability of fat calories as percentage of desirable levels were 84 and 132 percent respectively over the period.

Total Sweeteners

Total sweeteners include processed as well as unprocessed sugar, honey and sugarcane juice. Sugar is not an essential ingredient and provides empty calories, however, its inclusion in diets deficient in total energy is desirable to a certain extent. Excessive consumption of sugar is nutritionally undesirable and causes not only the incidence of dental caries and degenerative diseases (Yudkin, 1971) but also affects the utilization of dietary protein (Khan, 1975; Khan and Munira, 1978). It is evident (table 1) that the contribution of sugar to the dietary energy has been rising over the period and were 142 and 149 percent of the desirable level during 1974-76 and 1984-86 respectively.

The consumption of sugar in Pakistan has been reported to be higher than Japan (FAO, 1988). However a level of 5 percent of the total calories from sugar, in a balanced diet, has been recommended (ICMR, 1984).

Total Dietary Energy

The level of total dietary energy intake is the most important determinent of nutritional adequacy. The availability of total dietary energy as kilocalories for the period 1974-76 and 1984-86 has been compared with the national average per caput energy requirement. The availability expressed as percentage of the average requirement is also shown in table 1.

It is evident that the availability of total dietary energy declined and were 97.6 and 97.2 percent of that average requirement over the period. Similarly recent National Nutrition Survey (1988) has reported an average consumption of 2180 Kcals per head per day which is 94 percent of the national average requirement.

Nutritional quality of national diet

In a well balanced diet 10-15% of total energy is usually derived from protein, 55-70% from carbohydrates and 20-30% from fat. It is clear from Table 2 that diet during 1974-76 had high contents (74.4%) of carbohydrates and low level (16.6%) of fat. However the diet during 1984-86 met all the requirements of a balanced diet. Protein scores based on FAO scoring pattern (FAO, 1973) indicated that lysine was the first limiting amino acid in both the national diets. Dietary scores were calculated from desirable dietary pattern (FAO, 1989). The dietary score of the national diet decreased from 76 in 1974-76 to 71 in 1984-86. The deterioration in the nutritional quality was mainly due to reduction of animal products and pulses and increase of sugar and oil contents in the diet. Fat is not a dietary essential, however, level of < 20 g in adults and < 5 g of fat in children markedly reduced carotenoid utilization in the body (pereira and Begum 1969). In order to meet the requirement of essential fatty acids, a level of 11% of the total calories from fat has been reported (Khan and Eggum, 1978). In a balanced diet, energy derived from fat should not exceed 15 percent of the total calories (ICMR, 1984).

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It may be concluded that nutritionally, the quality of Pakistani diets was satisfactory but its benefit was limited due to the shortage of overall calories. In order to achieve nutritional adequacy, efforts should be made to bridge the caloric gap between dietary energy availability and the requirement and allow sufficient margin in the availability of offset disparities in distribution. To improve the nutritional quality of the national diet, a caloric balance between food groups to be achieved by increasing pulses and animal products and reducing sugar and oil contents in the diet is desirable.

Future Food Availability Targets

The specific objectives of the Seventh Five Year Plan 1988-93 and Perspective Plan 1988-2003, are to consolidate self-sufficiency in grains and to regain self-sufficiency in sugar production and reduce dependency on edible oil import (Government of Pakistan, 1988). As a result of the objectives and strategies, the growth rate of the major crops is expected to be 4.0%,that of the major crops 5.5%, livestock 5.3% and fisheries 4.9%, thus resulting in an overall growth rate of 4.7% per annum for the agricultural sector.

The Perspective Plan aims at maintaining self-sufficiency in food grains, oilseeds and sugar and in production of surplus grains for export. The need to reduce the import of edible oils and sugar will have to be balanced with the need to increase the export of fruits and vegetables. During the plan period not only the production of food crops, but the processing, preservation and packaging will also given due priorities and thus in turn will improve the present imbalance between the contributions to calories by food grains, fats and oils. the perspective plan if implemented, can lead to an average growth of 5.0% per annum in total agricultural production. The annual growth rates of fruits and vegetables, all other crops, livestock and fisheries are expected to be 7.0, 4.0, 5.7 and 2.8% respectively. In short, the plan will improve the incomes, nutritional adequacy and well-being of the population

The availability of dietary energy from food groups and total kilocalories per head per day over the plan period is given in Table 3.

In the base year 1987-88, the country attained the availability level (2385 Kcal/head/day) of 3 percent above the average requirement (2310 Kcal/head/day). The national

Such planning may not achieve the objectives of the plans of exporting cereals and reducing dependency on the import of sugar and edible oils.

Table 4 reveals the nutritional quality of the proposed diets to be available during the Seventh Five Year Plan and the Perspective Plan. The percentage of calories from protein, carbohydrates and fats ranged from 9.9-10.2, 64.4-68.8 and 21.1-23.4% respectively. The protein score of the national diet available during 1987-88 was 79 and it ranged between 70-72 during the target periods. Lysine was the first limiting amino acid in all diet. Dietary score of the national diet available in 1987-88 was 85 and it was reduced to 80, 82 and 83 during 1992-93, 1997-98 and 2002-03 respectively. The low dietary score values of target diets may be due to imbalance in the composition and may enhance incidence of malnutrition in the country. There is a need to revise projected targets of the 7th Five Year Plan and the Perspective Plan in the light of desirable dietary patterns proposed by FAO.

Desirable Dietary Pattern

The desirable dietary pattern, based on FAO desirable levels of various food groups, at national calorie requirement

of 2100 Kcal (RDA) have been worked out (Table 5 and 6). The levels of food groups have been expressed as Kg per person per year for ease in their practical use in food policy and agriculture planning. There are several computations and permutations of food groups to achieve the same dietary score according to the availability of food groups. Some other factors such as socio-economic, cultural and palatability and sufficient caloric density of the diet should also be considered in the selection of various food groups. The following consideration were kept in mind for developing the desirable dietary patterns:

- Energy derived from cereals to be not more than 57 percent of total requirements.
- Energy derived from pulses should be kept to 3 percent of the total calories.
- Energy from vegetables and fruits not to exceed 4 percent of the total calories.
- Energy derived from roots and tubers (Potatoes and sweet potatoes) has been kept 2 percent of the total calories.
- Energy derived from total animal products has been kept at 11 percent of the total energy requirements.
- Energy derived from added fats and oils not to exceed 10 percent of the total calories.
- Energy derived from sugar/sweeteners not to exceed 8 percent of the total calories.

The desirable dietary pattern provides 2100, 2310 and 2600 Kcals per person per day at physiological, retail and production levels respectively and meets 100 percent requirements of energy at national level. The dietary score of the desirable dietary pattern was 80 (Table 6). The dietary score can be increased by modifying the average national food basket through measures of food policy and agriculture planning.

In conclusion, dietary imbalance in terms of available calories from different food groups exists in the national diet. A desirable dietary pattern can be achieved by reducing cereals, sugar and edible oils and increasing pulses and tubers at the national level. There is also a need to measure the biological value of the desirable dietary pattern. The use of dietary scoring system developed by RAPA (FAO) in the national food and agriculture planning is highly desirable.

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Table 2

Nutritional quality of diets available during 1974-76 and 1984-86

	Average of Triennium 1974-76	Average of Triennium 1984-86
Percent Calories from		
Protein	11.0	10.5
Carbohydrates	74.4	68.2
Fats	16.6	21.3
Protein score	74	73
Limiting amino acid	Lysine	Lysine
Dietary score	76	71

Table 3

Per capita availability targets of dietary energy from various food groups

Food Groups	Available Calories per head per day				
	1987-88 Benchmark	1992-93	1997-98	2002-03	Desirable level
		Target			
Total Cereals	1461	1941	1972	2023	924
Pulses	68	68	68	68	139
Vegetables and Fruits	63	67	78	90	231
Animal Products	332	356	396	432	462
Added Fats and Oils	296	328	365	402	231
Sugar	166	198	225	253	185
Total Calories	2385	2957	3103	3269	
Average Requirement	2310	2310	2310	2310	
Calorie% Requirement	103	128	134	141	

Source: Seventh Five Year Plan 1988-93 and Prespective Plan 1988-2003

Table 4

Nutritional quality of diets available during 1987-88 and 2002-03

	1987-88 Benchmark	1992-93	1997-98	2002-03
		Target		
Percent Calories from				
Protein	10.2	10.2	10.0	9.9
Carbohydrates	64.4	68.8	67.9	67.3
Fats	23.4	21.1	22.1	22.8
Protein Score	79	70	71	72
Limiting amino acid	Lysine	Lysine	Lysine	Lysine
Dietary Score	85	80	82	83

Table 5

Desirable Dietary Pattern (Per Caput Requirement)
at the National Level

Food Groups	Physiological Level	Retail Level	Production Level
	Kg/Annum	Kg/Annum	Kg/Annum
Cereals	125	138	155
Pulses	7	8	9
Vegetables and Fruits	60	66	74
Roots and Tubers	20	22	24
Total Animal Products	68	75	84
Milk	51	56	63
Meat	17	19	21
Added Fats	8.5	9.0	11
Nuts and Oilseeds	1.3	1.4	1.6
Sweeteners	15	17	19
Others (Beverages etc.)	51	56	63
Total Food	356	393	440
Total Calories/head/day	2100	2310	2600

Table 6

Dietary score of desirable dietary pattern

Food item	Kilocalories (%)		Dietary score	
	Desirable Dietary Pattern	Desirable (FAO 1989)	Desirable Dietary Pattern	Desirable (FAO 1989)
Cereals	57	40	28.5	20(45)
Pulses	3	6	6.0	12(20)
Vegetables and Fruits	4	5	8.0	10
Roots and Tubers	2	5	1.0	2.5(20)
Total Animal Products	11	20	22.0	40(50)
Added Fats and Oils	10	10	10.0	10
Nuts and Oilseeds	1	3	0.5	1.5
Sugar/Sweetener	8	8	4.0	4(5)
Other(Beverages etc.)	4	3	0	0
Total	100	100	80	100