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Planning Desirable Dietary Patterns for Future

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Although Pakistan has a comparatively comfortable food availability, yet malnutrition is widespread among the vulnerable groups. 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 percentage of total calories derived from cereals, roots, tubers and sugars, net dietary protein calorie percent of total energy derived from protein, carbohydrates and fat and protein energy ratio. 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 still a need to develop simple, approximate and probably empirical 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 New Zealand have already made recommendations for developing dietary patterns in terms of food groups.

According to some research workers, 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 the standpoint 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. 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 kcal/caput/day as average for the trienniums 1974-76 and 1984-86, compared with desir-

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able 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 percent 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. Cereal grains are deficient in lysine but are a good source of sulphur containing amino acid. 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. An optimum nutritional combination is provided by a diet composed of 70 percent cereals and 30 percent pulses. However, in Pakistan, the ratio of cereal to pulses consumed is 22:1. 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.

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. 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.

Oils and Fats

The nutritional importance

Table 1. Availability of dietary energy from various food groups

Food groups	Available calories/head/day		
	1974-76	1984-86	Desirable level
Total cereals	1439	1349	924
Pulses	73	53	139
Vegetables and fruits	71	69	231
Total animal products	203	178	462
Added fats and oils	194	306	231
Sugar and honey	263	276	185
Others	12	14	69
Total calories	2255	2245	
Average requirement	2310	2310	
Calories% requirement	97.6	97.2	

Source: FAO(1989)

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, over the period respectively.

Total Sweeteners

These 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 decay and degenerative diseases but also affects the utilization of dietary protein. 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. However, a level of 5-8 percent of the total calories from sugar, in a balanced diet, has been recommended.

Total Dietary Energy

The level of total dietary energy intake is the most important determinant 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, 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 percent of total energy is usually derived from protein, 55-70 percent from carbohydrates and 20-30 percent from fat. It is clear from Table 2 that diet during 1974-76 had high contents (74.4 percent) of carbohydrates and low level (16.6 percent) of fat. However, the diet during 1984-86 met all the requirements of a balanced diet. Protein scores based on FAO scoring pattern indicated

Table 2. Nutritional quality of diets available during 1974-76 and 1984-86

	Average of trienniums	
	1974-76	1984-86
Percent calories from		
Protein	11.0	10.5
Carbohydrates	74.4	68.2
Fats	16.6	21.3
Protein score	74.0	73.0
Limiting amino acid	Lysine	lysine
Dietary score	76.0	71.0

that lysine was the first limiting amino acid in both the national diets. Dietary scores were calculated from desirable dietary pattern. 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 less than 20 g in adults and less than 5 g of fat in children markedly reduced carotenoid utilization in the body. To meet the requirement of essential fatty acids, a level of 11 percent of the total calories from fat has been reported. In a balanced diet, energy derived from fat should not exceed 15 percent of the total calories.

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. 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 dependence on edible oil import. As a result of the objectives and strategies, the growth rate of the major crops is expected to be 4.0 percent, that of the major crops 5.5 percent, livestock 5.3 percent and fisheries 4.9 percent, thus resulting in an overall growth rate of 4.7 percent per annum for the agricultural sector.

The perspective plan aims at maintaining self-sufficiency in foodgrains, 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 be given due priority and thus, in turn, will improve the present imbalance between the contributions to calories by foodgrains, fats and oils. The Perspective Plan, if implemented, can lead to an average growth of 5.0 percent 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 percent, 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 Kcals 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 diet provided 158 and

Table 3. Per capita availability targets of dietary energy from various food groups

Food group	Available calories per head per day				
	1987-88 Benchmark	1992-93	1997-98 Target	2002-03	Desirable level
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 Perspective Plan 1988-2003

128 percent of the desirable level of calories from total cereals and fat, respectively, whereas the availability of calories from pulses, vegetables and fruits, total animal products and sugar were 49, 27, 72 and 90 percent, respectively, of the desirable levels during this year.

The target diets appear to be imbalanced in respect of available calories and have been planned to provide as percentage of the desirable level, 210, 213 and 219 percent from total cereals, 142, 158 and 174 percent from total fats and oils and 107, 122 and 137 percent from sugar, 29, 34 and 39 percent from vegetables and fruits, 77, 86 and 94 percent from total animal products during 1992-93, 1997-98 and 2002-03, respectively. The pulses supply 49 percent of the desirable level of calories throughout the Plan period.

It is evident (Table 3) that target national diets contained high contents of cereals, fat and sugar and low level of pulses, animal products and vegetables and fruits. Such planning may not achieve the objectives of the plans of exporting cereals and reducing dependence 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 ranges 9.9-10.2, 64.4-68.8 and 21.1-23.4 percent, respectively. The protein score of the national diet available during 1987-88 was 79 and it ranged between 70 and 72 during the target periods. Lysine was the first limiting amino acid in all the diets. 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 Seventh Five-Year Plan and the perspective Plan in the light of desirable dietary patterns proposed by FAO.

Table 4. Nutritional quality of diets available (1987-88 and 2002-03)

Calorie source	1987-88 Benchmark	1992-93	1997-98 Target	2002-03
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	79.0	70.0	71.0	72.0
Limiting amino acid	Lysinel	Lysine	Lysine	Lysine
Dietary score	85.0	80.0	82.0	83.0

DESIRABLE DIETARY PATTERN

The pattern, based on FAO desirable levels of various food groups, at national calorie requirement of 2100 Kcal (RDA) have been worked out (Tables 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.

Table 5. Desirable dietary pattern (per caput requirement) at national level

Food Groups	Physiological level kg/annum	Retail level kg/annum	Production level 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	
	Desireable dietary pattern	Desireable (FAO 1989)	Desireable 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	0
Total	100	100	80.0	100

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The per caput requirement of foodstuffs is one of the important considerations from the practical point of view in estimating the national food supplies. Employing the desirable levels for balanced diet, the per caput requirement of various food groups are calculated as under:

(i) To convert the per caput allowance at the physiological level to that at retail level, an allowance of 10 percent is made for kitchen wastage (WHO, 1974; ICMR, 1984).

(ii) To estimate production to meet the requirement of population an additional allowances of 12.5 percent

is made for seeds, feeds and wastage during transport and storage (ICMR, 1984).

The average national food basket per person per year at production level be composed of 155 kg of cereals, 9 kg of pulses, 74 kg of vegetables and fruits, 24 kg of roots and tubers, 84 kg of animal products, 11 kg of fats and oils, 1.6 kg of nuts and oilseeds, 19 kg of sweeteners, 63 kg of beverages etc. to achieve the dietary requirement at physiological/consumption level.

It must be pointed out that the estimated production of foods (Table 5) can adequately meet the requirements at national level provided distribution of food is done according to requirements and constraints of purchasing power do not limit consumption.

The desirable dietary pattern provides 2100, 2310 and 2600 Kcals/person/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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Reduction of Storage Losses in Foodgrains

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Foodgrains are produced on large scale in Pakistan and many other countries of the world. Their production is continuously increasing each year to meet the requirement of burgeoning world population. Pakistan produced 14.41 million tonnes of wheat during 1988-89 wheat season. It is the staple food of people of Pakistan. Paddy and maize are other important grains. In the storage, these grains succumb to the onslaughts of insects, mites, moulds, birds, rodents (biological factors) and moisture, temperature, relative humidity (physical factors). Of all these, insects are the major loss contributing factor.

About 39 species of insects have been reported to infest different stored grains in Pakistan. Of these, weevil, *Sitophilus oryzae* L., lesser grain borer, *Rhyzopertha dominica* F., red flour beetle, *Tribolium castaneum* Herbst; khapra, *Trogoderma granarium* Everts; and angoumois moth, *Sitotroga cerealella* Oliv. are important. Some of these pests (weevil and grain moth) feed internally and others (red flour beetle) externally on the grains. Insects have widely diversified habits and diets. Within a few months, sufficient progeny can develop from a single pair to seriously infest the grains. Primary pests are those which attack the undamaged grains (weevil and lesser grain borer). Secondary pests are restricted to those grains which have already been damaged.

LOSSES CAUSED BY INSECT PESTS

Annual losses by insect pests to wheat has been estimated to be 4 percent in the Punjab at farm level during the whole storage period. Similarly, loss has been reported to be around 4 percent in the public sector for storage period of about six months in Pakistan. Similar magnitude of losses have been reported for maize and paddy. This is weight loss. In addition, losses also occur in the quality and nutritional value. Huge expenditure is also incurred on the control measures. Insect infestations may originate from the field as the grain in the field may also get infested. However, main source of infestations are the storage structures itself or the nearby stores. Insects harbour the old foodgrain sweepings and grain dropped in crevices on the floor or walls of stores. The insects are capable of migrating to new storage sites.

At harvest, in many parts of Pakistan, moisture content of wheat is below 12 percent. This moisture content level is quite safe for storage of wheat for a storage season. If, at some places, it exceeds this limit, then wheat should be dried. The conventional methods of wheat harvest ensure the drying of wheat in the field through various steps as the commodity remain in the field and in the sun for a considerable time. However, when it is rainy season, then it becomes wet and troublesome grain. By the use of combine harvester, the moisture content can become higher because sub-drying is not possible as wheat is directly carried from the field to the farm storage or procurement centres, setup by various foodgrains handling

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