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FOOD SUPPLY, DISTRIBUTION, CONSUMPTION AND NUTRITIONAL STATUS IN BANGLADESH

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ABSTRACT

This paper examines the level and composition of food availability, the role of public food distribution system (PFDS) in modifying the availability and consumption, and assesses the adequacy of overall consumption in relation to nutritional requirement. The PFDS appears to be increasingly assisting some special categories who are either urban or urban-like rural residents. While average per capita food and calorie intakes are declining. the existing level of per capita consumption seems to be consistent with defined calorie intake norm. However, distribution of food and calorie intake reveals widespread undernutrition in the vast segment of the population. Policies aiming to alleviate undernutrition should be commodity and target group specific and would have to be based on proper understanding of the food preference patterns of the classes of people.

I. INTRODUCTION

The overall food consumption and the consequent nutritional status in Bangladesh is determined by the interplay of a number of factors namely domestic production, import and public food distribution on the one hand and prices, incomes and consumers' preference on the other. Although aggregate food availability is determined by domestic production and imports, public food distribution is considered to play an important role in modifying the availability to different sections of the population. Measures of the impacts of public food distribution on food availability and consumption of different economic and social classes of people are of considerable interest from policy making point of view. On the other hand, given the level and composition of food consumed,

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whether or not, or to what extent nutritional requirements are fulfilled is a pertinent question about which not enough is known. A number of sources provide contradictory evidence on the levels and trends of food consumption, nutritional intakes and requirements (BBS 1980, 1986b; Chen 1975; Ahmad and Hassan eds. 1983).

In this paper aggregate food availability is examined in terms of the component sources namely domestic production, import and public distribution of food. Given the levels and compositions of food consumed, nutritional adequacy is assessed and implications are drawn for policies relating to production, pricing and distribution of staple foods. In section II aggregate supply and distribution of food i; examined. The pattern of food consumption and nutritional adequacy is assessed in section III and some conclusions are drawn in the final section of the paper.

II. AGGREGATE SUPPLY AND DISTRIBUTION OF FOOD

Net Availability of Food

Net availability of food in Bangladesh is generally determined by net domestic production and import. The overall annual availability, however, is modified by the Public Food Distribution System (PFDS) which controls the distribution of all imported and domestically procured grains, with some degree of stock adjustments [1]. In view of the overwhelming importance of cereal in the diet of of the people, food availability or food self-sufficiency in Bangladesh is often identified with availability of or self-sufficiency in cereal or foodgrains consisting mostly of rice and wheat. This section, therefore, deals mainly with availability of foodgrains.

Although aggregate domestic production of foodgrains more than doubled during the last three decades, population growth outstripped the rate of growth of food production and as a result per capita production and hence availability of foodgrains from domestic source declined over the past years. Per capita production of other food crops also declined over the past years, except for wheat and potato (Hossain 1984, Boyce 1987, Alauddin and Tisdell 1987, 1988). In the face of decline in the per capita availability of foodgrain from domestic source, imports had to play an increasing role in maintaining relative stability in

the overall availability. Total as well as per capita import of food increased manifolds during the last three or four decades. Import as a percent of total foodgrain consumption increased from less than 2 percent in the early 1950s to more than 10 percent during the last decade. Per capita import increased from 3.3 kg in early 1950s to more than 18 kg in the early 1980s (Alauddin and Tisdell 1987).

Aggregate as well as per capita net availability of foodgrain and proportion of import in the net availability for the decade ending 1984-85 is presented in Table 1. Per capita availability has remained more or less stable during the period. Although import as proportion of avilability fluctuated over the period, overall pattern shows an increasing trend reaching from about 7 percent in 1976-77 to 14 percent in 1984-85. Another important feature is the change in compo-

Table 1. Net Availability and Proportion of Import in the Net Availability of Foodgrains in Bangladesh (1975-76 to 1984-85)

Year	Net availability ('000 long tons)			Wheat as % of total availability	Import as % of net availability			Per capita availability (ounce/day)
	Rice	Wheat	Total		Rice	Wheat	Total	
1975-76	11471	1345	12816	10.5	3.5	78.0	11.3	16.9
1976-77	11101	757	11858	6.4	1.7	79.6	6.7	15.3
1977-78	11517	1698	13215	12.8	2.6	77.1	12.2	16.7
1978-79	11642	1607	13249	12.2	0.5	68.8	8.7	16.3
1979-80	11833	2316	14149	16.4	7.6	83.0	19.9	17.0
1980-81	11952	1809	13761	13.2	0.7	54.1	7.7	16.2
1981-82	12549	2121	14670	14.5	1.2	51.0	8.4	16.9
1982-83	12915	2364	15279	15.5	2.5	64.5	12.0	17 2
1983-84	13231	2541	15772	16.1	1.2	76.2	13.3	17.3
1984-85	14309	3324	17633	18 9	5.1	54.3	14.3	17.5

Note : Net Availability = Net Production − Internal Procurement + Ration Off−take.

Source : BBS 1982, 1986a.

sition of grains in total foodgrain availability. The share of wheat in total foodgrain increased from 10.5 percent in 1975-76 to as high as 19 percent in 1984-85. Chowdhury (1986), covering a longer time period, estimated change in proportion of wheat in total foodgrain availability from 2.4 percent in 1960/61-1962/63 to about 19 percent in 1982/83—1984/85. Both domestic production and imports contributed to increased availability of wheat and its increased share in total foodgrain availability.

Structure and Composition of Imports

Food import has some structural and compositional aspects which dave important policy imlications. As is well known, total import consists of a variety of arragements under which foodgrains are procured. Although grains are purchased for cash, short and long term credit including PL-480, the most dominant mode is the receipt of grains through grant and aid. Total import classified by type of grains and proportion of grant in the total import is presented in Table 2.

Table 2. Import of Foodgrains by Type of Grains and Basis of Procurement

Year	Import ('000 long tons)			Grant as % of total import			Wheat as % of total import
	Rice	Wheat	Total	Rice	Wheat	Total	
1975-76	396	1049	1445	16.9	34.0	29.3	72.6
1976-77	192	603	795	56.8	91.5	83.1	75.8
1977-78	300	1309	1609	34.3	92.7	81.9	81.3
1978-79	56	1106	1162	92.8	96.0	95.2	95 2
1979-80	903	1923	2826	26.0	63.4	51.5	68.0
1980-81	83	978	1061	22 9	73.7	69.7	92.2
1981-82	144	1082	1226	22.2	100.0	90.8	88.3
1982-83	316	1525	1841	42.4	56.0	53.6	82.8
1983-84	162	1938	2100	62.3	71.9	71.0	92.3
1984-85	792	1805	2534	23.7	60.9	50.2	71.2

Source : BBS 1986a and unpublished data from the Ministry of Food, Bangladesh.

Obviously wheat constituted the major proportion of import for all the years. Its share in total import ranged from the lowest of 68 percent in 1979-80 to as high as 95 percent in 1978-79 Grant as proportion of total import ranged from 29 percent in 1975-76 to 95 percent in 1978-79 and except for 1975-76 grant constituted at least 50 percent of total import of foodgrains. Such grant dominated imports reflect the vulnerability of food security aspect of the country.

Public Food Distribution and Net Availability

The Public Food Distribution System (PFDS) is considered to play an important role in determining the total foodgrain availability in the country. The share of ration off-take in the total availability and the relative proportion of rice and wheat in the total off-take is presented in Tabla 3. Ration off-take as proportion of total availability of foodgrain ranged from 11 percent to 17 percent during the decade under review. As regards relative proportions of rice and wheat in the total ration off-take, it can be seen also from Table 3 that except for 1976-77 when both domestic production and import of wheat were very low, wheat accounted for more than two-third of total off-take, and over the

Table 3. Share of Ration Off-take in Total Availability and Total Off-take Klassified by Type of Grains.

Year	Ration Off-take as % of availability			Percent of Off-take		
	Rice	Wheat	Total	Rice	Wheat	Total
1975-76	4.0	9.1	13.1	30.5	69.5	100.0
1976-77	6.5	5.7	12.2	53.3	46.7	100.0
1977-78	4.5	10.6	15.1	29.9	70.1	100 0
1978-79	4.2	9.2	13.4	31.4	68.6	100.0
1979-80	4.9	12.1	17.0	28.7	71.3	100.0
1980-81	3.7	7.4	11.1	33.2	66.8	100.0
1981-82	5.2	8.7	13.9	37.3	62.7	100.0
1282-83	3.2	9.3	12.5	25.6	74 4	100 0
1983-84	3.3	10.1	13.4	24.5	75.5	100.0
1984-85	2.3	12.2	14.5	15.8	84.4	100.0

period, while proportion of rice in the total off-take has decreased, that of wheat has shown an increasing trend. This reflects the increasing importance of wheat in the overall food system management in the country.

Structure of Public Food Distribution System

The PFDS in Bangladesh consists of as many as twelve channels of distribution. The major distribution operations are done by the Ministry of Food through its country-wide network of establishment although the Ministries of Relief and Rehabilitation, Local Government and other affiliated bodies perform some of the operations. The distribution channels are [2] :

1. Statutory Rationing (SR)
2. Modified Rationing (MR)
3. Essential Priorities (EP).
4. Other Priorities (OP)
5. Employees of Large Industrial Establishments (ELE)
6. Flour Mills (FM)
7. Food for Works Program (FWP)
8. Marketing Operations (MO)
9. Open Market Sales (OMS)
10. Vulnerable Group Feeding Program (VGP)
11. Canal Digging (CD)
12. Gratuitous Relief (GR)

The relative shares of different channels in the distribution of foodgrain is presented in Table 4. The table also shows overtime changes in the relative shares of different channels. The most noticeable changes occurred for distribution through MR and FWP. The MR accounted for 30 percent of foodgrain distribution in 1975-76. This share declined to 18 percent in 1984-85. Clay (1981) and Chowdhury (1986) also reported rapid declines in the share of MR. It should be mentioned that many of the channels listed above were non-existent before 1971, the pre-independence period. The OP and ELE include persons employed in government, autonomous and private establishments. These people were under MR category and have been taken out from there in the face of organized pressure exerted by them during mid seventies.

Table 4. Shares of Different Channels in the Distribution of Foodgrains

Year	Per cent of distribution through channels									
	SR	MR	EP	OP	ELE	FM	FWP	GR	Others (a)	Total
1975-76	21	30	6	14	5	10	6	7	1	100
1976-77	26	20	7	15	4	11	11	2	4	100
1977-78	24	19	7	18	5	12	14	1	—	100
1978-79	23	17	5	22	4	10	12	3	4	100
1979-80	20	16	3	23	5	7	18	2	6	100
1980-81	23	12	6	24	2	8	22	2	1	100
1981-82	15	25	5	18	3	6	18	2	9	100
1982-83	16	19	5	18	4	7	21	1	9	100
1983-84	14	20	5	17	3	6	22	1	12	100
1984-85	14	18	4	15	3	6	22	4	14	100

Notes : (a) Includes MO, OMS, CD and VGP. The relatively larger percentage for latter years appearing in the "Others" column is attributable to the increasing role assumed by the VGP which accounted for 5 and 7 percents of total foodgrain distribution in 1983-84 and 1984-85 respectively.

Source : Data were obtained from the Food Planning and Monitoring Unit (FPMU), Ministry of Food.

The decline in the share of MR has implications for distribution of grains to rural people. Rural people get monetized distribution of grains mostly through the MR channel. Thus a decline in the share of the channel means relatively lesser availability of grains to rural people. Of course, the increasing share of FWP implies some improvement of rural share in the public distribution of foodgrains. The FWP accounted for 22 percent of total public foodgrain distribution in 1984-85 compared to only 6 percent in 1975-76. However, the question of overall distribution of food between rural and urban people and the alleged disparity surrounding it is a long standing issue and needs more detailed examination to which we turn next.

Distribution of Food to Rural and Urban People

The operation of PFDS has been alleged to be biased historically towards the urban people. Although the share of urban people in the publicly distributed grain seems to be declining as can be seen through the declining share of SR channel (Table 4), the issue of overall distribution between rural and urban people needs to be examined in terms of more broad based and some structural indicators.

Chowdhury (1986) estimated rural and urban beneficiary ratios of PFDS with a number of restrictive assumptions about the operation of the system. He showed that while urban beneficiary ratio declined from 108 percent [3] in 197475 to about 50 percent in 1981-82, the rural beneficiary ratio improved slightly from 6.7 percent in 1974-75 to about 8 percent in 1981-82. However, as is apparent from the above figures, even after the change, the difference between the urban and rural beneficiary ratios remained sky high.

Some estimates of rural share in the total distributed grain for the year 198485 is presented in Table 5, The estimates covered only the major channels of distribution namely SR. MR. EP, OP, ELE and FWP. These channels accounted for more than 75 percent of public foodgrain diaribution in that year. It appears that rural share constituted 57 percent of total foodgrain distribution in the country. According to 1981 population census, 85 percent of the country's population live in rural areas. If distribution through FWP, which is the non-monetized channel and is seasonal in nature, is excluded then rural share comes to only 39 percent of total foodgrain distribution. Again, as is evident from Table 5, rural share in EP, OP and ELE have been assumed to be 40, 40- and 25 percents respectively. These shares go to the employees of government, semi-government and large private establishments. These people are rather the special categories who, althongh live in rural areas, are urban¯like in their profession and economic behaviour. If benefits accruing to these people are not considered as rural share or at least the assumed proportions of rural shares in the channels are discounted to some extent to account for such reality, then the overall benefits of PFDS accruing to rural people would be reduced further,

Distribution of Food by Income Classes

Within the rural urban dichotcmy an important aspect is the distribution of foodgrain among economic classes of people. Empirical evidence on this aspect

Table 5. Rural Share in Total Distributed Foodgrains, 1984-85

Channels of distribution	Total quantity distributed ('000 m. ton)	Rural share (a) %	Total rural quantity ('000 m. ton)
SR	358	nil	nil
MR	464	70	325
EP	112	40	45
OP	388	40	155
ELE	63	25	16
Sub-total	1385	39	541
FWP	571	100	571
All Channels	1956	57	1112

Note : (a) While rural share for individual channels are the given proportions from which actual rural quantities for individual and hence all channels have been derived, that for all channels have been calculated as the ratio of the derived total rural quantity to total quantity of foodgrains from all channels.

Source : Total quantity figures were obtained from FPMU, Ministry of Food; rural share figures (for individual channels) were obtained from Chowdhury (1986).

is very scanty. Ahmed (1979) made an indirect estimate of ration foodgrains as proportion of total foodgrain consumed by different income classes of rural and urban people. He obtained the total foodgrain consumption figures from the nation wide Household Expenditure Survey of 1973-74 and arrived at the ration foodgrain figures from the allotted ration quotas to cardholders by assuming that under the prevailing circumstances people withdrew full amounts of the ration quotas. Thus the estimates did not represent actual receipt of foodgrains by the cardholders.

The Bangladesh Household Expenditure Survey of 1981-82 included provision of recording data on consumption of ration foodgrains by the respondent households. Although detailed information were not available, some classified data on consumption of total and ration foodgrains by selected income classes

of rural and urban households were obtained from the Bangladesh Bureau of Statistics (BBS) These data facilitated calculation of the figures presented in Table 6. It appears from the table that both rice and wheat, and all foodgrains together from ration constituted very negligible proportion of per capita consumption of the grains of all income classes of rural people. For urban people, ration rice constituted less than 10 per cent of total rice consumption of all income classes. Also, ration foodgrain (rice and wheat) accounted for less than 15 per cent of total foodgrain consumption of all urban people. The only notable proportion of ration in the total consumption was for wheat among the major income classes of urban population. The pattern of distribution reveals that major proportion of benefits were obtained by the medium and high-income classes. It is apparent that for rice, wheat and foodgrain as a whole, ration constituted the lowest proportion of total consumption of the lowest urban income group

Apart from the issue of distribution, results of Table 6 appears to be in apparent conflict with those of Table 3 where, using aggregate time series data, it was observed that ration off-take contributed substantially to the total foodgrain availability in the country. Such conflict between overall supply based availability and demand based consumption was also encountered by Chen (1975). If it is assumed that the aggregate off-take figures provided by the time series data are correct, then lower estimates of rationed grain consumption revealed by the survey data may be attributed to either leakage through the distribution channels or omission of recording in the survey or both [4] Although estimates of actual leakage are hard to get, complaints are widespread that major proportions of foodgrains allotted especially through MR and FWP channels are sold for personal gains. Of course, the level of accuracy and hence reliability of the aggregate national time series data also need not be out of question [5].

III. PATTERN OF FOOD CONSUMPTION AND NUTRITIONAL STATUS

The preceding section was concerned with assessing the aggregate availability of food (mostly foodgrain) and the role that the public food distribution plays in influencing the distribution of food among classes of people. This section takes account of the overall diet patterns and the consequent nutritional status of the people. The evidence presented are mostly from cross section data unlike the findings of the previous section most of which were based on time series data.

Table 6. Consumption of Total and Ration Foodgrain by Rural and Urban Income Classes, 1981-82.

(kg per capita per month)

Household income groups (Tk./month)	Rural			Urban		
	Total consumption	Ration received	Ration as % of total	Total consumption	Ration received	Ration as % of total
			Rice			
Below 500	8.69	.06	.69	9.05	.34	3.76
500-749	10.32	.04	.39	9.74	.65	6.67
750-999	11.72	.08	.68	10.22	.70	6.85
1000-1499	13.00	.06	.46	10.81	.89	8.23
1500-2999	14.12	.02	.14	11.43	1.08	9.45
3000 or more	15.17	.02	.13	12.30	1.16	9.43
All groups	12.29	.05	.41	11.03	.96	8.70
			Wheat			
Below 500	2.05	.01	.49	2.48	.28	11.30
500-749	1.85	.01	.54	2.71	.64	23.62
750-999	1.74	.03	1.72	2.62	.77	29.30
1000-1499	1.47	.03	2.04	2.60	.92	35.38
1500-2999	1.66	.05	3.01	2.62	.96	36.64
3000 or more	1.04	.04	3.85	2.60	.97	37.31
All groups	1.68	.03	1.80	2.59	.87	33.60
			Foodgrains (Rice and Wheat)			
Below 500	10.73	.07	.65	11.53	.62	5.38
500-749	12.27	.05	.42	12.46	1.29	10.35
750-999	13.43	.11	.82	12.85	1.47	11.44
1000-1499	14.44	.09	.62	13.38	1.80	13.45
1500-2999	15.73	.07	.45	14.03	2.03	14.47
3000 or more	16.15	.05	.31	15.10	2.12	14.04
All groups	13.94	.08	.57	13.61	1.82	13.37

Source : Classified data of the 1981-82 Household Expenditure Survey provided by the BBS

Pattern of Food Consumption

Some details of average per capita per day intake of different food items by the rural and urban people are presented in Table 7. As is expected, rice constituted the single major item for both rural and urban people followed by vegeta-

Table 7. Average Per Capita Intake of Selected Food Items in Rural and Urban Areas of Bangladesh, 1981-82.

Food Items	Rural		Urban	
	Quantity in grams per day	% of total	Quantity in grams per day	% of total
Rice	403.8	54.6	362.5	44.0
Wheat	54.4	7.5	85.2	10.3
Potato	22.2	3.0	33.8	4.1
Pulses (a)	12.0	1.6	18.7	2.3
Vegetables	122.0	16.4	135.0	16.3
Onion	7.7	1.0	14.1	1.7
Milk	16.2	2.3	25.5	3 2
Edible oil (b)	5.1	0 7	18.6	2.3
Mutton	0.4	0.1	3.2	0.4
Beef	1.5	0.2	5.9	0.7
Chicken	2.0	0.3	3.9	0.4
Eggs	1.0	0.1	1.8	0.2
Fish	27.0	3.5	35.0	4.3
Sugar (c)	8.9	1.2	14.6	1.8
Fruit	9.9	1.4	13.6	1.6
Miscellaneous	46.0	6.2	53.0	6.4
Total	704.1	100.0	824.4	100.0

Notes : (a) Consists of masur, mashkalai and other pulses
(b) Consists of mustard oil and soybean oil
(c) Includes molases or gur

Source : BBS 1986b.

bles. Although vegetables constituted the second major item, it is in fact a food group consisting of some roots and tubers (excluding potato) and the whole range of leafy and other vegetables. Other than vegetables, wheat constituted the next major item for both rural and urban people.

A profile of changes in average per capita food consumption over time as revealed by a series of Nutrition Survey (NS) and Household Expenditure Survey (HES) is presented in Table 8. It needs to be mentioned that NS covered only the rural areas and as such only the rural component of the HES results have been compared with the NS results. It is important to note that both sources presented almost similar evidence in respect of total per capita intake of all foods in 1981-82, with results of NS being slightly higher than those of HES. However, while total food intake according to NS estimate declined, HES results indicate that total food intake of the average rural people increased over the periods. Most direct and indirect evidence, however, tend to support the NS estimates. Recent time series evidence presented by Alauddin and Tisdell (1988) shows that while per capita availability of cereals have remained more or less constant, that of other foods namely pulses, vegetables, fruits and spices have declined substantially. If it is assumed that the estimates of NS and HES for 1981-82 represent more or less the actual level of consumption and if the overall availability and hence consumption-decline is accepted as the true phenomenon, then the HES estimates of earlier years reflect some degree of underestimation [6].

Table 8. Changes in Aggregate Per Capita Food Consumption of Rural People Overtime.

Source of evidence	Per capita intake (grams per day)					Percent change in 1981-82 compared to			
	1962-64	1973-74	1975-76	1976-77	1981-82	1962-64	1973-74	1975-76	1976-77
Nutrition Survey :	885.9	—	807.3	—	764.5	-13.7	—	-5.3	—
Household Exp. Survey :	—	678.5	—	623.6	740.1	—	+9.1	—	+18.6

Source : Ahmad and Hassan (eds) 1983, BBS 1986b.

Nutritional Status

Although nutritional status is largely determined by the level and composition' of food consumed, the relationship between food consumption and nutritional status is not a very straightforward one. The physiological requirements of human body are protein, energy, fat, vitamins and minerals. Within the broad categories of nutrients there are varying numbers and types of constituent elements which, through their complex interactions determine the overall nutritional' status. It is almost impossible to determine an ideal or optimal nutritional status incorporating all the essential and micronutrients because not only nutritional requirements vary according to age, sex, body weight, climate and level of activity, they also interact in complex manners. Most nutritional, especially poverty related nutritional literature, therefore, emphasizes the importance of calorie and protein as the determinants of overall nutritional status, In relation to calorie - and protein needs, the other nutritional requirements for body are not so prominent and on a world scale, deficiencies in them are not so severe (Tarrant 1980: 195).

However, within the confinement of protein and calorie requirements, there has existed a lot of controversy regarding relative priority between the two. The balance of the arguments suggest that the primary requirement of body is energy. When energy derived from carbohydrates and fats fall short of requirement, the available protein is oxidized and used as energy. Thus even with adequate gross intake of protein, a body can be rendered protein deficient in net term (Miller and Payne 1961, Gopalan 1968, Sukhatme 1970, 1977, Osmani 1982). Sukhatme (1970) argued that in cereal based diets, protein needs are concomitantly fulfilled if the energy needs are met [7]. He also provided empirical evidence using dietary survey data from India that in only about 10 percent cases protein deficiency was found to occur without calorie deficiency. In the vast majority of cases protein deficiency was the result of inadequate intake of total energy (Sukhatme 1970 :477). Joy (1973) also strongly argued that protein deficiency without calorie deficiency is rare and that most protein deficient people actually eat enough protein but due to their calorie deficiency some proteins are converted and used as energy such that they become protein deficient in net term.

Available evidence from Bangladesh also strongly support the view. The Nutrition Surveys of 1975-76 and 1981-82 showed that the average per capita

intakes of protein of the rural people were more than the prescribed requirements by 29 and 7 per cents respectively (Ahmad and Hassan 1983). However, the study also revealed that the majority of the survey households had actual protein deficiency. It was interesting to note that of the 60 and 77 percent households which were protein deficient in 1975-76 and 1981-82 respectively, only 1 percent in both the years had protein deficiency without colorie deficiency. For all the other protein deficient households calorie intakes were inadequate with or with-out inadequate protein intakes. Thus, without undermining the importance of other nutrients for attaining optimal nutritional balance, it can be said that calorie holds the key to the nutritional status in Bangladesh. Therefore, assessment of the level and adequacy of calorie intake among the masses as well as different classes of people is a pertinent issue to which we turn next.

Calorie Consumption by Sources

An assessment of calorie intakes of the rural and urban people according to sources is presented in Table 9. As is expected, rice constituted the single -major source accounting for about 72 percent of the total calorie intakes of the average people of Bangladesh. Cereals, which consist of rice, wheat and other minor grains represents about 84 percent of total calorie intakes. Contribution of cereal to total calorie intake is somewhat higher for rural than for urban people. This directly follows from the higher average intakes of cereals by the rural people. Wheat is the second major source of calorie accounting for 14 percent of total calorie intake for urban compared to about 10 percent of calorie intakes for the rural people. The relatively higher contribution of wheat to total calorie of the urban people follows from their higher consumption of wheat which is -attributable to greater incidence of public distribution of wheat in the urban areas.

The distribution of food and calorie intakes of rural households according to per capita income is presented in Table 10. As is expected per capita food and hence calorie consumption consistently increased with increase in per capita income. However, distribution of intakes indicates that 37 per cent of the households with per capita income less than Taka 100 had per capita intakes of both food and calorie below the average intakes of the rural people.

Table 9. Per Capita Calorie Intake According to Sources, 1981-82.

Food items/groups	Kcals per capita per day			Contribution of individual items (percent)		
	Bangla-desh	Urban	Rural	Bangla-desh	Urban	Rural
Cereal	1614.0	1605.4	1616.0	83.8	78.4	84.8
Rice	1383.4	1259.9	1403.4	71.9	61.5	73.7
Wheat	200.8	291 5	186.1	10 4	14 2	9.8
Others	29.8	54.0	26.6	1.6	2.6	1.4
Potato (a)	29.5	31.9	29.1	1.5	1.6	1.5
Pulses (b)	46.2	65.9	43.0	2.4	3.2	2.3
Milk (c)	13.2	25.4	11.2	0.7	1.2	0.6
Edible oil (d)	389	90.3	30.6	2.0	4.4	1.6
Meat (e) eggs	7.8	18.0	6.1	0.4	0.9	0.3
Fish	35.0	43.3	33.6	1.8	2.1	1.8
Vegetables	43.5	41.0	43.9	2.3	2.0	2.3
Spices (f)	22.5	26.7	21.8	1.2	1.3	1.2
Fruits	16.7	19.6	15.6	0.9	0.9	0.8
Sugar (g)	40.9	63.1	37.3	2.1	3.1	1.9
Miscellaneous	17.1	16.9	17.1	0.9	0.9	0.9
Total	1925.2	2047.5	1905.4	100.0	100 0	100.0

Notes : (a) Includes sweet potato
(b) Consists of masur, mashkalai, kheshari and others
(c) Includes milk products
(d) Consists of mustard, soybean and other oils
(e) Consists of mutton, beef, chicken and ducks
(f) Consists of onion, chillies and others
(g) includes gur.

Source : BBS 1986b.

Table 10. Food and Calorie Intakes of Rural Households by Monthly Per Capita Income, 1981-82

Per capita monthly income (Taka)	Percent of households	Per capita food intake (grams/day)	Per capita calorie intake (kcals/day)
Below 50	2.4	577	1493
50—74	11.7	714	1769
75—99	22.9	728	1824
100—149	33.0	791	1974
150 and more	30.0	824	2086
All groups	100.0	765	1943

Source : Compiled from Ahmad and Hassan (eds.) 1983.

Consumption in Relation to Requirement

The adequacy of energy intake has to be assessed with respect to some yardstick of requirement. However, determination of energy requirement of human body is one of the most complex and controversial issues in the nutritional literature. Energy requirements not only vary according to age, sex, body weiget, activity levels and climatic conditions; there are also complexities involving inter-and intra-individual variations in requirement. Most of the current vi ws are directed against the notion of fixed requirement as a cut-off point (Sukhatme 1977, 1986; Sukhatme and Margen 1982; Srinivasan 1983). However, in order to asses the quantitative magnitude of undernutrition and poverty, some cut-off point would be necessary and in absence of more sophisticated measures of requirement, one has to rely on the available estimates keeping their limitations in mind.

In the specific context of Bangladesh, several sources estimated per capita calorie requirement following the FAO/WHO (1973) guidelines. The Institute of Nutrition and Food Science (INFS) in its nutrition survey report (Ahmad and Hassan 1983) estimated per capita calorie requirement of 2273 kcals per day for all age, sex and activity levels apparently for the rural people of Bangladesh. Knudsen and Scandizzo (1982), on the other hand, estimated per

capita per day calorie requirement of 2020 kcals for the average people of Bangladesh Chen (1975), however, using fairly rigorous methodology to account for climate, activity level, pregnancy and lactation allowances, calculated energy requirement of only 1589 kcals per capita per day. The Bangladesh Bureau of Statistics in its HES report (BBS 1986b) constructed three poverty lines corresponding to three levels of calorie intake-1600 kcals, 1800 kcals and 2200 kcals per capita per day. The report also argued that the second level of calorie intake (1800 kcals) would provide a realistic measure of the extent of poverty adding that 'persons consuming 1800 and more calorie can lead a healthy active life" (BBS 1986b : 43). Thus the estimates provided by the above sources are quite contradictory.

One of the important uses of calorie intake norm is to determine national food requirement and to set the target of food self-sufficiency consistent with nutritional norms. In view of the overwhelming importance of foodgrains in the overall diet, national food requirement in Bangladesh is conventionally identified with total foodgrain requirement. With a given per capita calorie requirement, corresponding per capita and hence national foodgrain requirement can be determined by deriving total foodgrain calories from total calorie intake and then converting the derived foodgrain calories into foodgrain quantities (rice and wheat, accounting for due proportions of each in the total foodgrain calories). A series of per capita foodgrain requirements corresponding to the varying estimates of calorie requirements as cited above is presented in Table 11.

Table 11. Per Capita Foodgrain Requirement Corresponding to Alternative Measures of Calorie Requirement in Bangladesh.

Sources of calorie estimate	Per capita calorie requirement (kcals/day)	Per capita foodgrain requirement (ounces/day)
Ahmad and Hassan (1983)	2273	19.7 (a)
Knudsen and Scandizzo (1982)	2020	17.6 (a)
BBS (1986)	1800	15.7 (a)
Chen (1975)	1589	13.2 (b)

Note : (a) Our estimates. (b) Chen's own estimate. The difference between our and Chen's method in deriving foodgrains from total calorie is explained in the Appendix B.

As is evident from Table 11, the estimates of foodgrain requirement corresponding to calorie requirements set by Chen, and Ahmad and Hassan are at the two extremes and one would have reasons to be skeptical in accepting either. Foodgrain requirement of 15.7 ounces corresponding to 1800 calories advocated by the BBS roughly coincides with the existing usage of per capita (foodgrain) requirement in determining total national foodgrain requirement. On the other hand, 17.6 ounces of foodgrain corresponding to 2020 kcals used by Knudsen and Scandizzo falls within the vicinity of historical levels of foodgrain availability (and implied consumption) in Bangladesh (Table 1). Also, calorie intake of 2020 kcals compares fairly well with calorie intake norms of other developing countries namely India, Pakistan, Indonesia and Sri Lanka (see Knudsen and Scandizzo 1982).

If per capita calorie requirement is set at 1800 or 2020 kcals or somewhere between the two and foodgrain requirement corresponding to each are taken as the requirement or consumption consistent with nutritional norm, then the available evidence on both per capita calorie intake (Table 9), and foodgrain availability and hence consumption (Table 1) suggest that, on the average, current level of consumption in Bangladesh is consistent with nutritional norm. Thus domestic production of the existing level of consumption of foodgrain can be taken as the self-sufficiency target of foodgrain production from nutritional point of view. However, the above picture of average consumption can not be taker} as the realistic index of consumption and nutritional status in that even a com3 mon sense observation would suggest that a vast segment of population of the country live in abysmal poverty and pervasive undernutrition. Distribution of food and calorie intake among economic classes of people shows that substantial proportion of the population are undernourished (Table 10). According to the HES estimate of BBS. 45 percent of people in Bangladesh fall below calorie consumption level of 1800 kcals per capita per day, corresponding to monthly per capita income of Taka 153.00.

Thus in designing policies and programs for pricing and distribution of food in Bangladesh, efforts need to be directed to identify the appropriate target groups of people. In order that efforts to alleviate undernutrition will succeed t_o, any desirable extent, policies and programs will have to be sufficiently targeted both by commodities and the classes of beneficiaries. Since nutritional intake is determined by the level and composition of foods, policies and programs must

take due cognizance of the food preference patterns of the people. The success of policies aiming to alter the level and composition of foods will depend on the relevant food and nutrient consumption parameters reflecting food preference patterns of the classes of people.

IV. CONCLUSIONS

The available evidence indicate that average per capita consumption of food and hence calorie are declining in Bangladesh. Given the existing level of food availability and average per capita consumption, nutritional deficiency does not seem to exist when compared with reasonable level of calorie requirement. However, distribution of food and calorie intake reveals widespread undernutrition among vast segment of the population. This situation calls for sufficient redistributive measures both with existing and additional supply of food.

Formulation of policies must address the issue of level as well as composition of foods. The existing consumption pattern is dominated by cereal which, in general, is not inconsistent with nutritional wellbeing. However, cereal production increased in the country at the expense of other crops namely pulses which are important sources of protein. Thus too much substitution away from pulses (in production and consumption) will jeopardize the protein-calorie balance in the diet. On the other hand, consumption of cereal is dominated by rice which is relatively expensive source of calorie compared to other grains namely wheat and 'sorghum' (Table A-1, and Karim and Levinson 1979). However, increasing domestic production of wheat and other minor grains is constrained by physical and climatic factors. Again, without proper knowledge of peoples' preference pattern and their level of motivation, consumption of these grains can not be augmented beyond certain limit even with moderate price and income measures [8].

The success of policies aiming to improve nutritional status by altering the level as well as composition of foods will depend on the relevant food and nutrient consumption parameters of the classes of people. Some limited estimates of such parameters are due to Ahmed (1979, 81) and Pitt (1983). While analyses and formulation of policies should make proper uses of these estimates, efforts should be directed to generate mote of such parameter values for continuous evaluation and formulation of food policies consistent with efficient nutritional outcomes.

NOTES

[1] For details of controversy and some resolutions on the definition of availability, see Chen (1975).

] 2] Detailed description of the channels can be seen in World Bank 1977, 1979 and Chowdhury 1986.

[3] Beneficiary ratio greater than 100 per cent implying more off-take than can be accounted for by the total urban population is attributable to the use of false ration cards for lifting ration goods.

[4] Data provided by the BBS did not make any specific mention as to whether ration grains included grains received by people through non-monetized channels such as 'Relief' and 'Food' for Works Programme. In comparing the off-take figures with ration grains received by consumers, it has been assumed that ration included grains distributed through such channels. If, however, such assumption is not true, any statement relating to the discrepancies between off-take and consumption of ration grains should be interpreted with caution.

On the question of omission of ration receipt during the survey, it may be mentioned that the HES survey recorded data on consumption for past one week. In case the week of survey did not coincide with the week of ration receipt, such omission might have occured.

[5] For sceptical views on the use of official statistics in Bangladesh, see Chen (1975), Pray (1980), Boyce (1985) and Clay (1986).

[6] The consumption figures proxided by the nutrition survey are also not free from dispute. Chen (1975) provided some cogent explanations how the per capita consumption figures of the 1962-64 nutrition survey (particularly of foodgrains) were inflated by substantial magnitudes. However, his revised estimates would not change the order of magnitudes of the consumption figures of Table 8.

[7] For arguments against the view that protein needs can be met by simply consuming enough of a normal diet containing sufficient calories, see Scrimshaw (1978).

[8] Shah (1980) observed in the Indian cantext that for a given percentage increase in the per capita expenditure of even the lowest-income households,

percentage increase in the calories derived from more expensive sources were higher than the percentage increase in calories derived from relatively less expensive sources.

If peoples' preference deviate from preference for objective characteristics (calorie, for example) of a product, and if such deviations are based on ignorance or faulty information, they can be altered through promotional measures. Thus if the objective of a food program is to promote consumption of cheap and calorie intensive foods, the program should embody provision of information concerning economic and nutritional aspects of the foods being considered for promotion.

Appendix A

Table A-1. Price Paid for Calories from Selected Food Items by Income Classes of Rural and Urban Households.

Income groups (Tk /month)	Price (in Taka) per 1000 kcals					
	Rice	Wheat (a)	Potato (b)	Pulses (c)	Fish (d)	Edible oil (e)
Rural						
Below 500	1.50	1.12	2.16	2.99	8.29	3.06
500- 749	1.49	1.11	2.33	2.89	9.23	3.07
750- 999	1.51	1.14	2.62	3.03	9.59	3.18
1000-1499	1.53	1.14	2.63	3.05	10.29	3.15
1500-2999	1.55	1.16	2.90	3.13	11.17	3.21
3000 or more	1.57	1.16	3.20	3.08	12.06	3.20
All Rural	1.52	1.14	2.63	3.03	10 04	3.14
Urban						
Below 500	1 56	1.16	3.97	3.89	12.36	2.98
500- 749	1.58	1.15	3.89	3.65	12.05	3.11
750- 999	1.61	1.25	4.14	3.55	13.10	3.04
1000-1499	1 59	1.19	4.11	3.63	13.05	2.97
1500-2999	1.65	1.16	4.18	3.64	14.45	3.05
3000 or more	1.74	1.20	4.29	3.80	16.06	3.08
All Urban	1 63	1.19	4.10	3 68	13 55	3.06
All Households	1.56	1.16	3.24	2.30	11.51	3.10

Notes : (a) Includes wheat flour.
(b) Includes sweet potato.
(c) Consists of masur, Mashkalai and kheshari.
(d) Calorie from 'rohu' applied to fish of all kinds.
(e) Consists of mustard and soybean oil.

Source : Household Expenditure Survey (1981-82) data provided by the BBS.

Appendix B

In deriving per capita foodgrain requirement from per capita total calorie requirement, the proportions of foodgrain calorie in total calorie intake has been the same (84 percents) in both Chen's and our estimates. However, due to changes in the relative shares of rice and wheat within foodgrain and some other factors, our method may be considered to have differed from Chen's in respect of the following :

First, our estimates are based on the INFS (1977) recommended calorie conversion factors while Chen used different source for calorie conversion. Second, in Chen's estimate, relative shares of rice and wheat in total foodgrain calorie were 94 and 6 percents respectively reflecting (presumably) the consumption pattern prior to 1971, the reference period of his study. As is apparently manifested, share of wheat in total foodgrain and hence (foodgrain) calorie has increased over the past years, and our estimates are based on the consumption pattern revealed by the 1981-82 Household expenditure Survey (BBS 1986 b) in which shares of rice and wheat (including minor grains) in total foodgrain calorie were found to be 86 and 14 percents respectively. Third, in deriving calorie from wheat, Chen apparently considered whole wheat only. Since in actual purchase or in reporting consumption, people refer to both wheat and wheat flour and since calorie content of wheat and wheat flour differs to a considerable extent, a reasonable approach would be to consider both in calorie conversion. Our approach is based on the assumption that people used wheat and wheat flour in equal proportions in reference to wheat consumption and therefore calorie from a unit quantity of wheat represented the simple average of calorie from whole wheat and wheat flour.

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