DIMENSIONS OF INTRA-HOUSEHOLD FOOD AND NUTRIENT ALLOCATION: A STUDY OF A BANGLADESHI VILLAGE

by

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Dedicated to the memory of my mother.

ABSTRACT

This thesis describes and discusses a study conducted in a central-west Bangladesh village, between March 1981 and January 1982, with a view to testing the hypothesis that intra-household allocation of food discriminates against women and children and that the discrimination puts the vulnerable members of the household at extra risks during periods when food and financial resources of households are scarcest.

Intra-household allocation of food was studied by weighing the individual food intakes of household members for three consecutive days, at four different seasons covering periods of normal food availability, relative shortage and abundance of food. Nutritional status was assessed by consecutive measurement of weight (monthly) and height (quarterly). Information was collected on socio-economic status of households, people's perception of food needs (physiological) of individuals, household decision making and strategies in coping with shortage by structured and unstructured interviews and through personal observations. The sample consisted of 320 individuals in 53 households.

Analysis of the study revealed lack of marked and consistent socio-economic differentials in intake and outcome, but that highly significant seasonal differences did exist. The most important finding of the study is that although the intake of women and girls over 5 years was lower than that of men and boys over 5 years, the male-female differential did not generally exceed the differential between the two sexes that might be expected on the basis of body size and activity. Only in the 1-4 year age group was there a significant difference between energy intakes of males and females when corrected for body size. Furthermore, contrary to what has been generally postulated in the literature, (often based on qualitative information), women and children were not discriminated against during periods of food shortage, but were rather generally given preferential

treatment in the allocation of available food.

It is believed that the study adds to our understanding as to how seasonal fluctu. ations affect the food intake of 'poor' people in rural Bangladesh and how people cope with predictable cyclical periods of food shortage.

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rapport with the study households. She has always provided moral support and encouragement.

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BACKGROUND AND PLAN OF THE STUDY

In this chapter, the main themes underlying the study are discussed first, followed by an account of the study plan and of the country and place of the study.

1.1 SOCIO-ECONOMIC DIFFERENTIALS AND NUTRITIONAL STATUS

Malnutrition is a condition that is basically socio-economic in origin. It arises as a result of the interaction between a complex set of socio-economic and environmental factors and is primarily a manifestation of poverty. The poor, among whom malnutrition is concentrated, are not only economically disadvantaged but also poorly educated. They live under poor environmental conditions and they have very limited access to resources. On the other hand, those who are economically advantaged do enjoy a higher social status and a higher living standard, better health and better nutrition.

Except for certain micro-nutrients, energy and nutrient intakes have been shown to correlate positively with socio-economic characteristics of population groups in Bangladesh (US-DHEW, 1966; INFS, 1977) and elsewhere (Franco, 1971; ICMR, 1980; Poleman and Perera, 1971; Rao and Satyanarayana, 1976). Of singular importance in Bangladesh is access to crop-land, which determines the quality and quantity of nutrient intake among rural agricultural communities. The national nutrition survey of rural Bangladesh: 1975-76 has revealed that big land holders enjoy better nutrition than the small and deficit farmers. The following table shows the energy and protein intake by land holding in Bangladesh.

Table 1.1

Energy and protein intake by land holding

Land holding (acres)	Intake/person/day	
	Energy (kcals)	Protein (Gm)
Below 0.50	1925	53
0.50 - 0.99	2035	58
1.00 - 2.99	2193	63
3.00 +	2375	68

(Source: Institute of Nutrition and Food Science, 1977)

For the landless rural labourer, the intake of energy and nutrients can be perceived as a function of staple food price and wage rate. In Bangladesh it has been shown that the nutritional status of children from landless households is worst when the price of staple food was highest and employment opportunities and wage rates were low (Abdullah, 1981 INFS, 1980).

There is also some variation in intake and nutritional status within various occupational groups. However, occupational groups correlate with income. Environmental conditions determine the rate of infections which in turn affect the intake and utilisation of nutrients.

1.2 SEASONAL DIFFERENTIALS

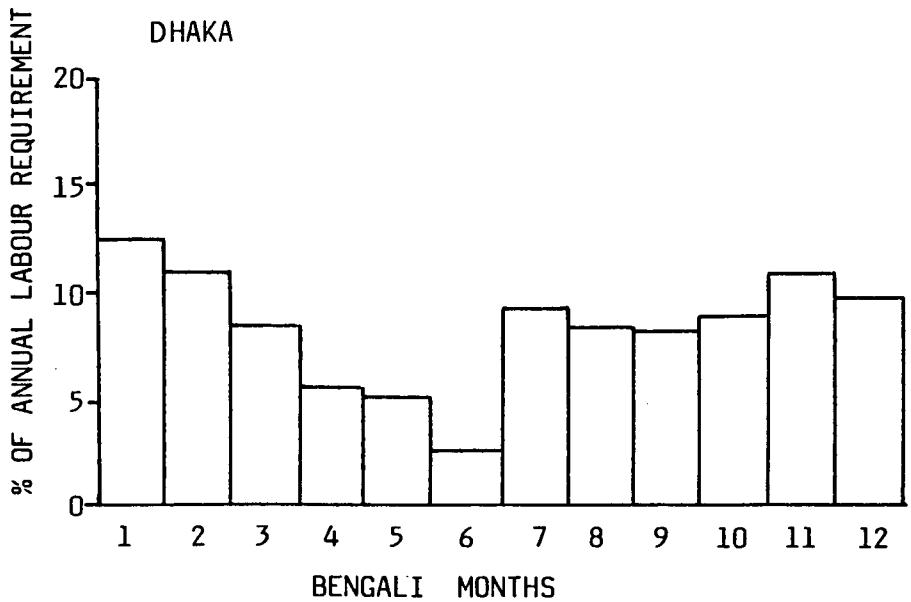
Seasonal differences in the availability and intake of food and, for that matter, in the nutritional status of people in rural areas of developing countries have received considerable research attention in recent years. Conclusive evidence is available on seasonal variations in the nutritional status of people in different regions of the world

(Fox, 1953; Collis, 1962; Choudhury *et al.*, 1981; Chimwaza, 1982).

In some parts of the world, seasonal food shortages coincide with peak agricultural activities. Fox (1953) showed that in the Gambia, energy expenditure far exceeded the intake when agricultural activities were intense and food availability low. Collis found in Nigeria (Collis, 1962) that energy intakes were inadequate when farm activities were at their most intense. Seasonal food shortages may well be characterised by diminished agricultural activities in certain regions. For instance, in Bangladesh in areas where the main rice crop is the broadcast *aman,* there is virtually no farm activity during the second half of monsoon (mid-August to the end of September). Figure 1.1 shows the seasonal crop labour demand in the study area.

Figure 1.1

Seasonal crop labour demand in the study area (Dhaka district)



Source: Clay (1981)

Marked seasonal differences in the intake of energy and nutrients and in the nutritional status of people have been documented in Bangladesh (INFS, 1977; US-DHEW, 1966). Modernisation of agriculture leads to self-sufficiency and/or surplus in food grains proudction. It also generates year-round employment opportunities for the rural landless: and this, associated with intensified agricultural activities, tends to smooth out seasonal differences. Again in Bangladesh, it has been shown that seasonal differences are less pronounced in the areas where agriculture has undergone modernisation than in those areas where agriculture is still traditional (Table 1.2), which are still in the majority. Only 8% of the total acreage is under modernised irrigated cultivation (BBS, 1981).

Table 1.2

Energy and Protein Intake (per person/per day) among modernised and traditional agricultural communities in different seasons in Bangladesh

Season	May-July		Aug-Sept		Oct-Nov		Feb-April	
Area	Energy kcal	Protein Gm	Energy kcal	Protein Gm	Energy kcal	Protein Gm	Energy kcal	Protein Gm
Agriculture modernised	2766	68.0	2664	67.4	2586	64.3	2754	67.2
Agriculture traditional								
Area - 1	1757	50.4	2014	57.6	1731	49.5	2129	55.8
Area - 2	1584	45.4	2012	53.3	1766	48.9	2064	55.9

(Source: Institute of Nutrition and Food Science, 1977)

Where agriculture is unmodernised, however, seasonal factors are very important to nutrition. Employment opportunities for the landless agricultural labourer decrease drastically during the season of slack agricultural activity. He finds only casual work and is forced to sell his labour at low rates. His purchasing power is seriously affected which in turn affects his dietary intake. The deficit farmer is also affected, because his food stocks are exhausted or fall very low while the next food crop is yet to be harvested. It seems obvious that where seasonal food shortages are characterised by diminished agricultural activity, both the deficit farmer and the landless labourer will be equally affected. In contrast, when seasonal food shortages coincide with peak agricultural activity, as in Africa, the deficit farmer will be affected more than any other group. Due to increased labour demand, the landless agricultural labourer will have enough wage earning capacity to buy his food from the market. But the deficit farmer would be working on his own land and at times may even be required to hire in wage labour.

1.3 INTRA-HOUSEHOLD DIFFERENTIALS

It is widely held that maldistribution of food within the family, particularly when the food is in short supply, is a major cause of malnutrition among the vulnerable children and women. A recent World Bank Report (1980) states:

> **"A variety of evidence indicates that in most developing countries adult women receive a lower proportion of their food requirements than adult**

> men; girls are likewise generally less well-fed than boys. As between adults and children, the picture is less clear: in many countries children under five (and particularly up to the age of three, when they are less able to take food themselves) do much worse than adults; in some countries, though, this is not the case."

Recently, Wheeler (1982) identified three complementary views of differential food allocation within the family. They are: cultural, resource control and functional. From the cultural point of view the status of an individual will be reflected in the kind and amount of food eaten, and intra-household allocation of food tends to favour the high ranking individuals of the family (Atkinson, 1979; Douglas, 1982). The resource control view holds whoever has the control of household resources, and/or food budget will receive priority in food allocation (Whitehead, 1981). The functional view of food allocation, on the other hand, would be that survival of the household as a unit and its capacity to reproduce itself all-important, so that food allocation would favour the most productive members of the unit (Cantor Associates, 1979).

Although there is ample evidence about seasonal fluctuations in the availability of food and the nutritional status of people, data on intra-household variations are extremely limited and data on intra-household differences between seasons are almost non-existent. After a thorough search of literature, Schofield (1974) found limited evidence on intra-household distribution of nutrients and concluded:

> "The data suggest that adult males tend to receive an unfair share of total family food (even allowing for their greater work needs), while the pregnant and lactating women and preschool children suffer."

There is still very little evidence, however, on whether the intra-household allocation of nutrients is more skewed towards adult

males at certain times of the year than at others. One might expect that when seasonal food shortages coincide with intensive farm activities, the distribution of limited family food would tend to favour working adults. This seems obvious in view of the fact that the working capacity of male adults must be sustained. Non-productive members of the household, e.g. women and children, will then have to absorb the effect of the food shortage. Even when periods of food shortage are characterised by diminished agricultural activity, as in Bangladesh, productive members will tend to receive relatively large shares of whatever family food is available, because the working capacity of the productive members must be maintained until the next harvest.

Longhurst and Payne (1979) reviewed cross-country data on seasonal intakes of nutrients but found no evidence for or against the suggestion that intra-household allocation of nutrients varies with seasons or between groups. The nutrition survey of rural Bangladesh obtained data on intra-household distribution of nutrients in a sub-sample. It was shown that on average, adult males received a disproportionately large share of family food (INFS, 1977). Chen *et al.* (1981), claimed a sex-bias in health and nutrition-related behaviour in a rural area in Bangladesh. He showed that per capita male food intake consistently exceeded that of females in all age groups. When, however, he made certain arbitrary adjustments for body size and activity, women's intakes approached those of men's. More recently in Malawi, Chimwaza (1982) showed that although the men-women differential in the intake of energy increases at certain times of the year, the overall intake of women was rather higher than a strictly "functional" view would suggest.

1.4 STUDY HYPOTHESIS

It is evident from the foregoing discussion that there is some conflict, in the literature, as to whether intra-household differentials

in food allocation do occur, beyond what can be accounted for by differences in body size and activity. Clearly the question "Do such differentials occur" is a very general one and it is more useful to ask "In situations where there is a risk of food deficits and malnutrition, does differential allocation put certain members at extra risk?" The goal of this study is to address the precise question "Is it in the poorer families, at times when food is in short supply, that differential food allocation occurs and has harmful effects?" In order to relate this question to various socio-economic variables, the situation is hypothesised as follows:

> **Under conditions of stress, where there is an overall deficit in family food, the allocation of family food among different members of the family is not done according to individual physiological needs, but family members who are perceived as "productive" receive a relatively large share. Under conditions of food sufficiency on the other hand the inequality in the intra-family distribution is reduced or smoothed out.**

There are two basic assumptions underlying this hypothesis. The first is that there will be inter-socio-economic group differentials so that the distribution pattern will differ between "food deficit" and "surplus" groups; and the second is that within the same socio-economic group there will be seasonal changes in the resource status of certain households, i.e. some households will move from food sufficiency to food deficiency and vice versa. The assumptions call for a detailed examination of intra-household allocation of food in the same households at different times of the year and in households of different socio-economic status.

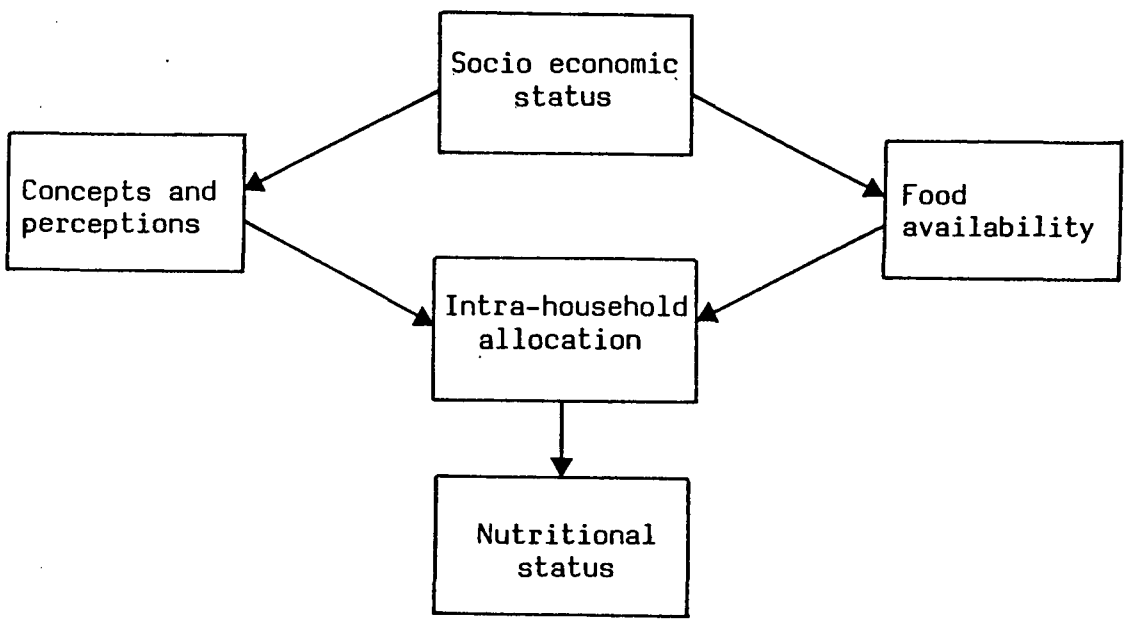
1.5 STUDY DESIGN

Individual food intake was measured in 53 households at 4 seasons of the year in a Bangladesh village, giving a total sample of 2596 person-day-intakes. Indivuduals' nutritional status was obtained by anthropometric measurements. In addition, information was collected on household food stores. Household heads were interviewed about their management of food and other resources. The households studied included 'poor', 'better-off' and 'rich' (as detailed in Chapter 2). By these means, the variation in intra-household food allocation could be examined between seasons and between socio-economic classes.

The conceptual framework of the study is depicted in Figure 1.2 below. The data and information obtained within this framework are discussed in detail in Chapter 2: Methodology.

Figure 1.2

Simplified framework of intra-household food allocation and nutritional status



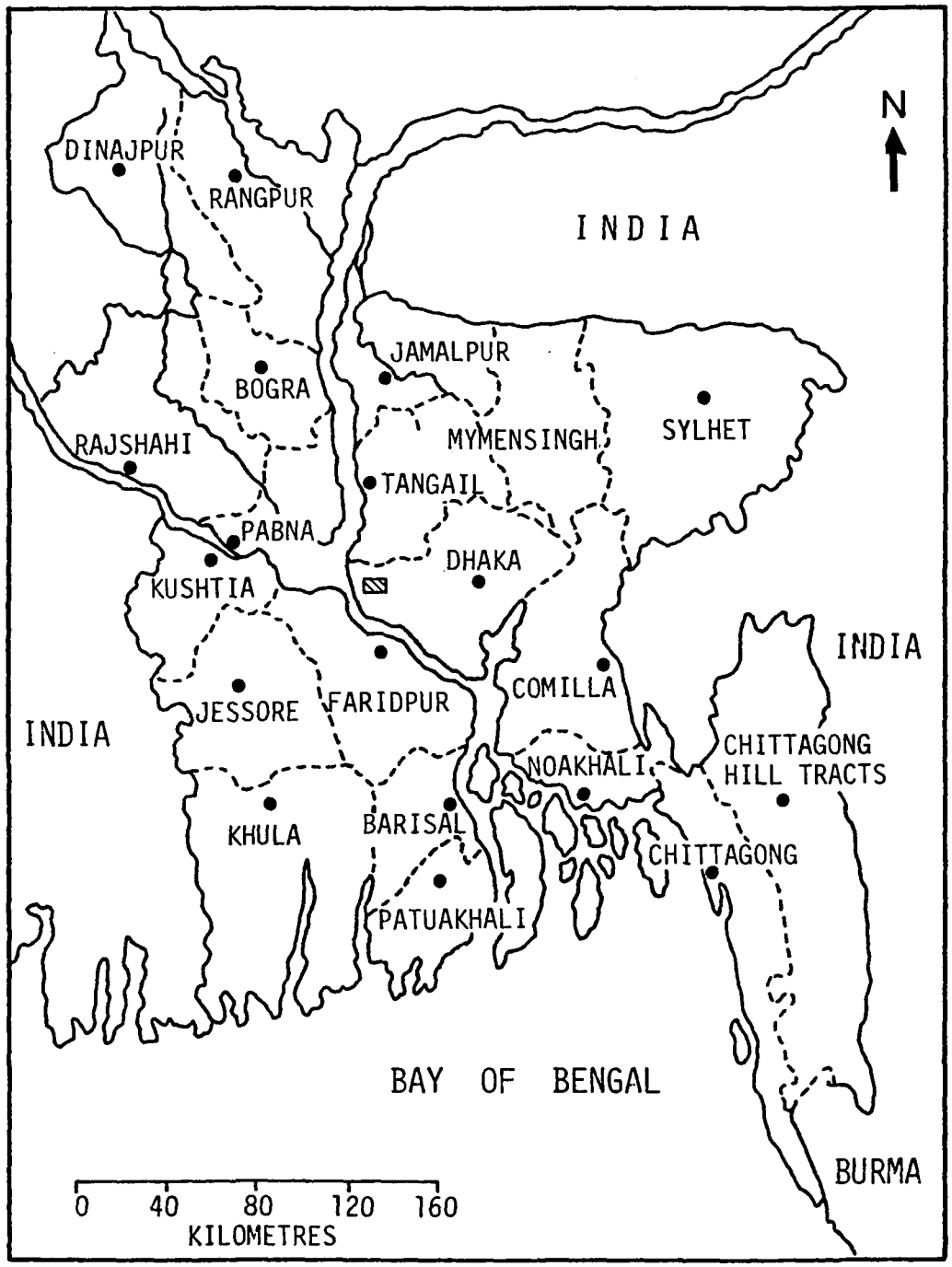
1.6 STUDY LOCALE: BANGLADESH

The themes underlying the study are: the seasonal variation in food supply and the occurrence of malnutrition, and the supposed existence of inequalities in the within-household distribution of food. Rural Bangladeshi society (discussed later in this chapter under "village social and cultural norms") provides a framework within which it is at least possible (a) that women and children receive relatively less food than men in proportion to their needs, (b) that unequal distribution is seen most clearly at times of food shortage, in the poorest families.

1.6.1 Geography and Climate

Bangladesh is a small country of 144 thousand square kilometers (55.6 thousand square miles), located between 27.75^{o} and 25.75^{o} north latitude and between 88.30^{o} and 92.75^{o} east longitude. It is bordered on the west, north and north-east by India and on the south-east by Burma. The Bay of Bengal washes its southern shore. Figure 1.3 presents a map of Bangladesh. The country lies within the delta of three of Asia's largest rivers, the Ganges, the Brahmaputra (Jumna) and the Meghna (Padma). Nine tenths of the country is low-lying and delta plain. There are considerable seasonal variations in the climate. The summer months from April to June, characterised by high temperatures and uncomfortably high humidity, are followed by heavy monsoon rains from late June to September. The total annual rainfall varies from 1500 mm in the west to 3000 mm in the north-east and south-east, with appropriately 2000 mm in the central region. Ninety per cent of the total rainfall falls during the monsoon months. The period from November to March is relatively cool and dry.

Fig. 1.3
Map of Bangladesh



Study Area

1.6.2 Economy, Agriculture and Population

Agriculture is the largest sector of Bangladesh's economy contributing approximately 50% to its GDP and employing 70% of its labour force (BBS, 1981). The contribution of industrial sector to GDP is barely 7.7%. Farming in Bangladesh is largely at subsistence level, and only 8% of the total acreage is modernised (BBS, 1981). Food crops dominate the agriculture and rice is the principal food crop. Three types of rice crops can be distinguished and are referred to as *aus, aman* and *boro* paddy. The most important rice crop is *aman* constituting 60% of total rice production. *Boro* and *aus* constitute 14 and 26 per cent respectively. Other important food crops are wheat, legumes, potatoes, various kinds of vegetables and oilseeds. The important cash crops are jute, sugar cane and tobacco. In certain regions onions and chillies are produced as cash crops. The crop calendar at Figure 1.4 shows the crops grown in the study area in different seasons of the year.

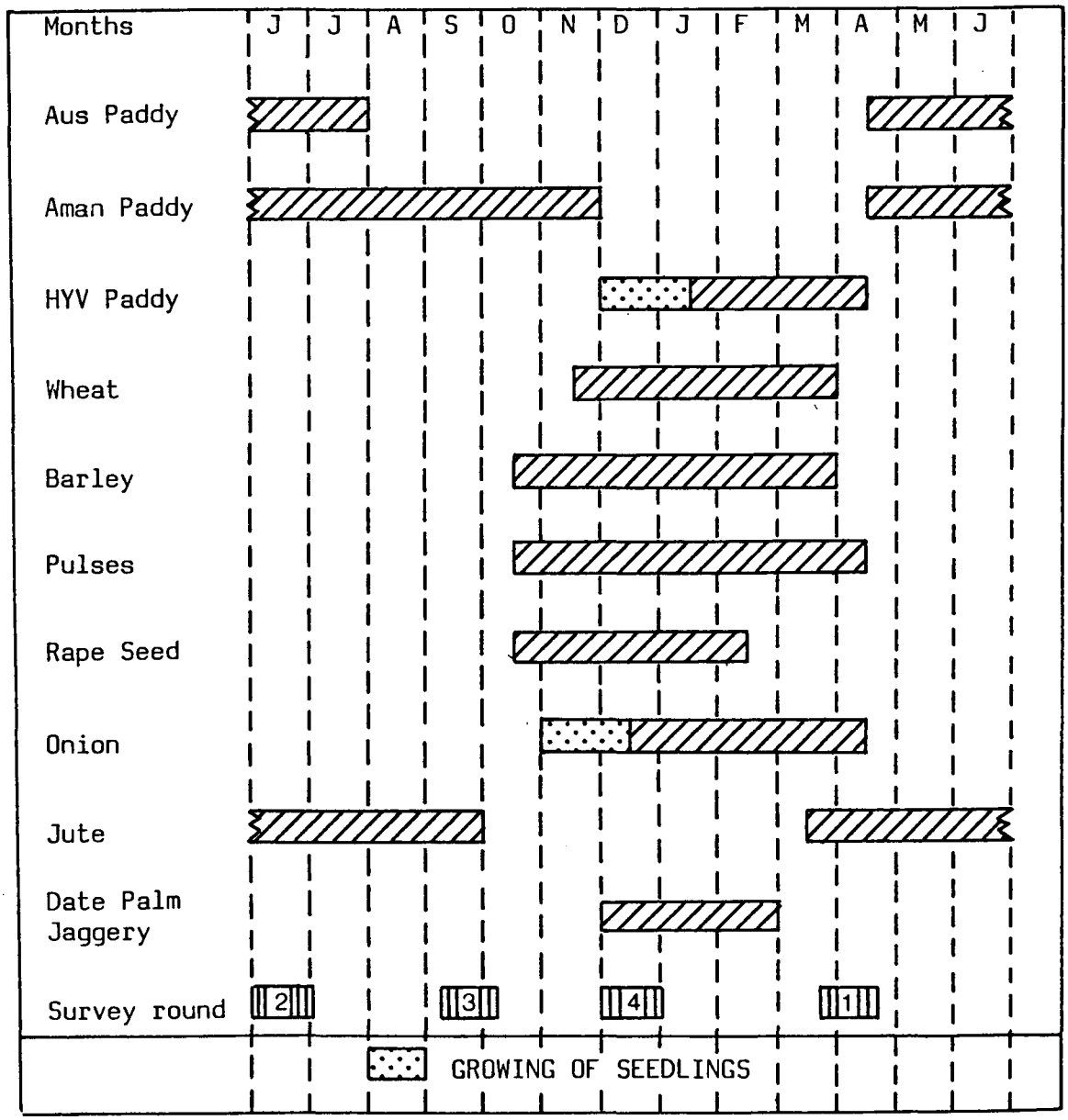
Bangladesh is one of the most densely populated countries in the world with a population density of 625 persons per square kilometer (1618 per square mile). It is the eighth most populous country of the world. Between 1961 and 1981 the population of Bangladesh increased by 65%: from 54.53 million in 1961 to 89.94 million in 1981 (BBS, 1981) during which period food production failed to keep pace with population growth.

1.6.3 Villages in Bangladesh

Bangladesh is essentially a rural country. Over 90% of its

Fig. 1.4

Crop calender



90 million people live in some 68 thousand villages. The study was conducted in one of those villages. For readers unfamiliar with Bangladesh it seems desirable to make a brief presentation of what a Bangladesh "village" means. A village in Bangladesh may be defined as an agglomeration of unevenly distributed homesteads or clusters of homesteads. The pattern of homesteads is basically effected by ecological factors such as the lie of the land and the siting of water supplies. Within homesteads are households consisting primarily of patrilineal kin groups. Households or groups of households have courtyards of varying size. The territorial boundaries of a village are not discernible to the casual observer. Often homesteads or clusters of homesteads in close proximity, apparently belonging to the same village, may in fact belong to different villages. The villagers themselves however can readily identify the confines of their respective villages, which they perceive as consisting of certain groupings of households.

About Bangladesh villages, Bertocci (1970) observed:

> **"The village as a discrete and observable entity is seemingly invisible.... They do not correspond to natural social groupings which are called villages in a sociologically significant sense.... The arrangement of dwellings does not correspond to some externally derived cultural ideal (as in the case of Mesoamerican villages)."**

Thus a village in Bangladesh does not represent one community distinct from another. It is more or less a kind of politico-administrative unit in the continuum of rural areas. Inter-village social and economic transactions are as common as intra-village ones.

1.6.4 Village Social and Cultural Norms

Although there are Hindu villages in Bangladesh, all the communities studied here are Moslem. Islam encourages the seclusion of women, but the *purdah* system is not strictly observed in the village. Only women of child-bearing age generally observe seclusion from strangers. There is sexual division of labour, and the duties and responsibilities of men and women are clearly defined. Men undertake farm work and all outdoor activities requiring physical mobility. Processing of harvested food crops is women's job, which includes winnowing, boiling, drying and husking of paddy. Increasingly, however, husking is being done mechanically. The other responsibilities of women are housekeeping, cooking, washing and child care. Since all the main productive activities (in the sense of income generation) take place outside the homestead, men are the primary producers of income. Women's activities, however arduous they might be, are not considered productive in the sense of income generation.

The basic unit of production and consumption is the household which may consist of a nuclear or an extended family. Within the household men rank higher than women. The hierarchical position of man entitles him to preferential treatment in the allocation of household resources including food. He is usually served first, and certain portions of food may be reserved for him. Man controls the resources, which implies that his likes and dislikes are to be given due attention. His position in the household is also seen to be prestigious, which presupposes that certain prestigious foods and/or portions must be served to him first.

In a nuclear family the hierarchical pattern is clear - the rank of the wife is next to the husband. In extended families the ranking is somewhat blurred. If the father is too old to work he may still be regarded as retaining the highest rank, but some of his responsibilities including resource handling may be passed on to his grown son(s). The eldest son usually has to shoulder most of the responsibilities of the father. The rank of the grown sons would be determined by the extent of their control on household resources. Allocation of family food would tend to follow the new hierarchical pattern, the father still being regarded as holding the most prestigious position in the family. In the land-holding class, the post-productive fathers, with a view to retaining their ranks, would not like to part with their titles to land. In an extended family of more than one brother, their wives and children, the hierarchy is determined by the extent of control of resources by each. Wives' ranks would correspond to their husbands'. Even in nuclear households, earning sons enjoy higher status over the non-earning ones.

The existence of household hierarchy suggests that there will be differential allocation of food in favour of individuals enjoying higher status. In general, males in all age groups receive preference over females in corresponding age groups. Chen *et al.* (1981) speculated that sex-biased health and nutrition behaviour may be related to the inferior status, role and work

opportunities of women in Bangladesh. But does work preference mean female/child deprivation? or do all get equivalent shares even though men are served first and get first choice?

2

METHODOLOGY

Before going into the details of methodology to which this chapter is devoted, a brief discussion may be useful on the overall approach to field work in this study.

That malnutrition is social and economic in origin is beyond question. Food and nutrition-related behaviours come out of the econo-socio-cultural background of people. In dietary studies, therefore, information on various socio-cultural characteristics are as important as the hard data on intake and outcome. Conventional, structured, cross-sectional field survey techniques are not perhaps the best means of getting reliable information on this very important aspect of integrated nutrition studies. At one point in the early planning stage it was conceived that an anthropologist's approach would be the best one. But then I had to look at my capabilities, and I realised that it would be inappropriate to encroach on a discipline in which I had neither formal training nor any experience whatsoever. After all, I was not going to study culture or kinship. Nonetheless, I was fascinated by the anthropologist's tool of field work, participant observation, and keenly wanted to supplemnt my own study with that. Eventually, the study plan incorporated both quantitative and qualitative elements, with structured as well as unstructured data collection.

What follows now is the discussion of the techniques used in the study, which includes selection of study community and samples, methods of data collection, analysis and interpretation.

2 .1 SELECTION OF THE STUDY VILLAGE AND HOUSEHOLDS

It was necessary to choose a village for the study which should be reasonably accessible but not strongly associated with urban culture. It should consist mainly of subsistence households and not be near a road or township. The chosen village is located in the central-west region of Bangladesh at a distance of 85 kilometers from the capital city of Dhaka. To reach the village one has to walk 5.6 km from a highway. During the dry months (January to March) it can be reached by jeep, by an unmetalled zigzag road which increases the distance to 7.2 km. During two of the wet months (mid-August to mid-October) one can also reach the village by country boats. No modernisation programmes have affected the farmers, and there is no significant agricultural extension work.

There is no qualified doctor nor any clinic in and around the village. The nearest Government Health Centre is 11 km. away. There is also a charitable dispensary at a distance of 6 km. Both the health installations are on the highway and none of them is effectively utilised by the study population. Two quack doctors (i.e. unqualified sellers of Western type medicines) are available in two different neighbouring villages roughly 3 km away. There are, however, a number of traditional healers within the village. Although there is no school in the village, there are three primary and one secondary school within 2 km. On the whole, although this village is not an isolated one, it can be regarded as traditional, one not so much influenced by modernisation efforts. Figure 2.1 shows a partial view in the study village.

After selection of the village, a preliminary census of households was done and then all the households having one or more children under 5 years of age were selected for the study. This included both 'poor' (landless and small landholding) and 'better-off' (medium landholding) families as well as a few 'rich' ones. During field work two households were found to be non-cooperative and have been excluded. Until its completion 31 'poor', 17 'better-off' and 5 'rich' households participated in the study. The spatial distribution of households is shown in Figure 2.2. Table 2.1 presents the distribution of samples by age, sex and socio-economic class.

2.2 SELECTION OF VILLAGE ASSISTANTS

It was essential to employ women assistants for the collection of weighed food intake data. Trained female investigators available at the Institute of Nutrition and Food Science might have been used, but after selection of a village which was more than 85 km away from the Institute, it could no longer be considered logistically or economically feasible. The alternative was to recruit local assistants.

There were 9 literate (Grade 5-10) women in the village and I needed a team of 5 assistants. It was anticipated that selection of 5 assistants out of the 9 might create personal problems. In order to deal with this a selection committee composed of the chairman of a

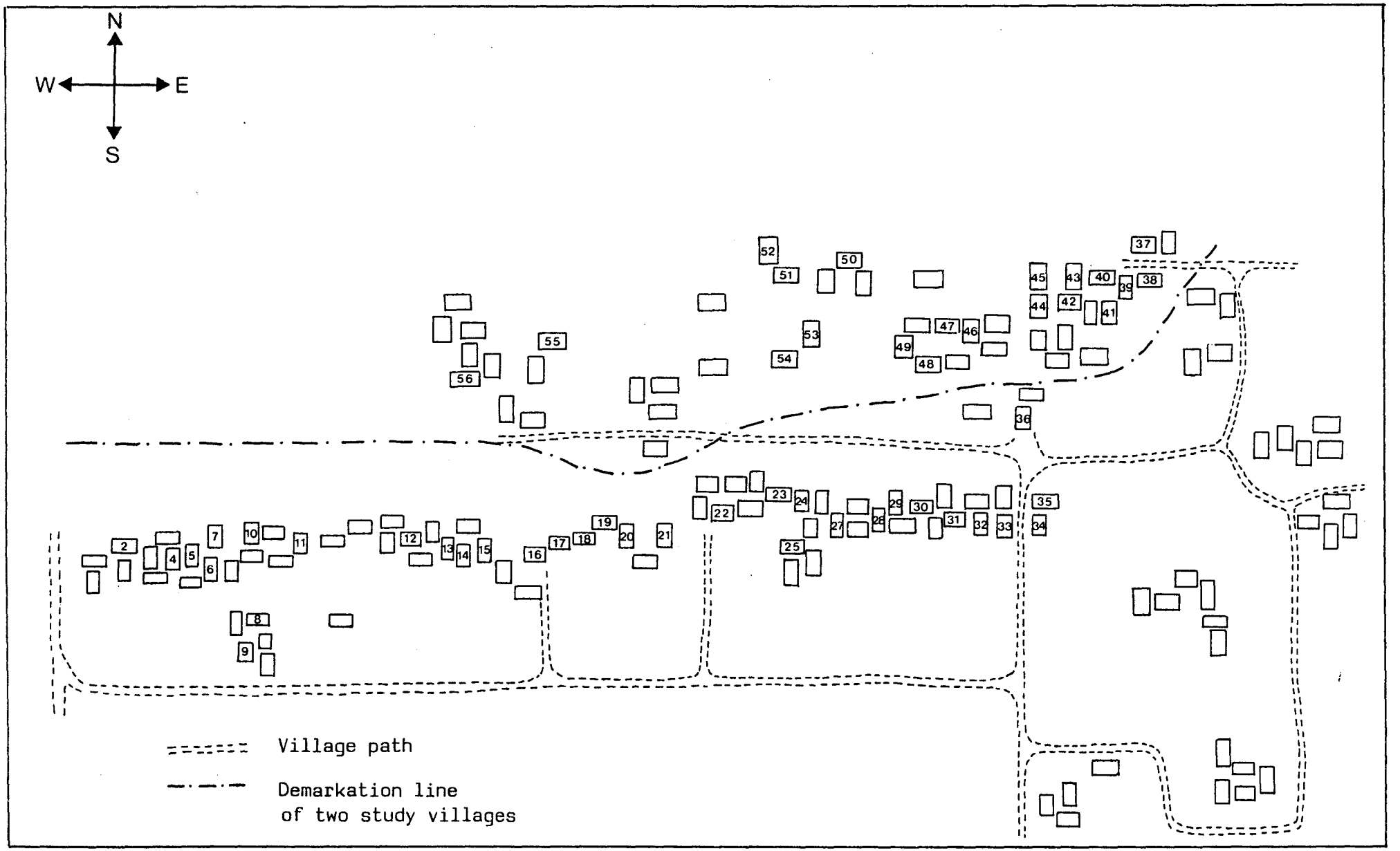
Figure 2.1. A partial view in the study village - also shows the investigator along with a village assistant walking from one sector to the other for anthropometric measurements.

Table 2.1

Distribution of sample by age, sex and socio-economic groups

Socio-economic class	No. of house-holds	Age and sex									
		Under 1 yr.		1-4 yrs		5-14 yrs		15-45 yrs		45+ yrs	
		M	F	M	F	M	F	M	F	M	F
Poor	31	9	7	22	11	24	29	25	34	9	4
Better-off	17	1	6	18	5	13	13	22	23	12	2
Rich	5	1	1	4	1	3	4	10	6	1	-
Total	53	11	14	44	17	40	46	57	63	22	6

Fig. 2.2 Village map showing spatial distribution of study households



neighbouring *Union Parishad* (well known and respected in the village), a local college teacher and a university colleague, was constituted. The committee met on an appointed date and selected 3 women out of the 9 after a written test and interview. A 16-year old girl, who did comparatively well in the test was kept on the waiting list.

In spite of these precautions, problems arose as anticipated. The father of the young girl on the waiting list happened to be a village leader. He became very hostile and asked why, if his daughter was to be rejected because of her age, was she interviewed in the first place? He categorically pointed out that it would be difficult for me to work in the village without having his daughter appointed as a village assistant. He wouldn't listen to any explanation. However, since I needed two more assistants I decided to recruit this young girl. But no-one else in the village was found to be suitable for the fifth assistant. Having failed to recruit the fifth assistant from the village a Hindu woman from the neighbouring village was taken according to the advice of village elders. The team was completed with the recruitment of a male supervisor whose main responsibilities were to keep the survey equipment and stationery in safe custody, escort the women assistants to and from the study households and motivate people to cooperate. During my absence from the village the women assistants were made responsible to him. Intensive training was imparted to the village assistants in dietary survey technique and correctly recording survey data.

2.3 DIETARY INTAKE

Measurement of food intake of individual household members has serious limitations. The required accuracy can hardly be acquired without disrupting the household way of life (Casley and Lury, 1981). Four methods, namely (1) weighed food intake, (2) replicate diet analysis,

(3) dietary recall, and (4) maintenance of diary have been used by various workers for measurement of household and individual food intakes. Conventionally either weighing or recall or both are widely used in dietary surveys. Both the methods have merits and demerits (Marr, 1971). None is one hundred per cent accurate. There are considerable technical and other problems in measuring individual's food intake. Apart from the problem of interference in the usual way of household life, there are errors related to some foods not being weighed or recorded. A further set of errors is introduced by the use of food composition tables for conversion of foods into nutrients. Stock and Wheeler (1972) found a consistent and significant tendency for calculated values of fat and energy to be higher than analysed: the variation was of the order of $\pm$ 20%. Bransby *et al.* (1948) showed that the use of food tables over-estimated energy, fat, carbohydrate and calcium while under-estimating protein and iron values. Acheson (1980) reported calculated energy values to be consistently lower than analysed. On the other hand, Widdowson and McCance (1943) observed that analysed and calculated values of mixed diets were sufficiently close to justify use of food tables.

The day to day variations in the intake of individuals are also considerable. As such, a limited period of survey cannot be claimed to estimate mean habitual intake of any individual over long periods of time. Some workers observe that a period of 7 days should be the minimum duration of a dietary survey (Thomson, 1958) and others are of the opinion that one week would be insufficient because of inter-week variations (Walker, 1965; Yudkin, 1951). Some workers argue that a 3-day period is good enough (Fidanza and Alberti, 1967; Hussain and Sarker, 1971; Visweswara Rao, 1976). The minimum period of any dietary survey for an acceptable degree of reliability will however depend on the region, country and the particular community to be investigated.

Earlier surveys in Bangladesh revealed that the average rural diet

is extremely monotonous. Cereals alone contribute over 80% of energy and protein intake (US-DHEW, 1966; INFS, 1977). In countries like Bangladesh, precision in the measurement of the staple cereal seems to be crucial. A comparative study was done on the method and duration of dietary survey in Bangladesh (Hussain *et al.*, 1980). The results of the study showed that one day's mean intake can estimate with reasonable accuracy the mean intake for 7 days either by weighing or recall method. Because of the slight variation in the diet a longer period of dietary survey, say for 7 days, seems wasteful. Since the primary goal of this study was to estimate intra-household allocation of food there was no option but to employ the weighing method. As to the duration, a 3-day period was considered to be necessary, in view of day-to-day intra-individual variations.

2.3.1 Method Used

A 3-day dietary survey was conducted at 4 different times: March-April, June, September-October and December (Figure 1.4). All foods that were going into the cooking pots were weighed using Salter Diet scales of 1 kg capacity. For estimation of individual intakes of cooked food it was initially thought that standardised bowls and cups could be used. Then a methodological test indicated considerable variation in the weight of cooked rice (the main staple) measured in the same bowl or cup: This resulted in the abandonment of the use of bowls and cups. Instead, each individual serving of cooked food was weighed using the Salter scales. Weighing the intakes of each individual member of the household was an extremely arduous job. The dietary workers were required to stay in the study household until every individual member had eaten his or her meal. Some individuals would be away at usual meal times, so the workers would wait for them to return and eat their meals. Sometimes the worker(s) would leave the household after weighing the

intakes of the majority of household members eating together, and then return to weigh the intakes of the remaining member(s). On certain occasions (although very few) when any of the household members was away for long and not expected to return soon the housewife would apportion his/her share of family food and get the same weighed and keep it separately. Figure 2.3 shows a dietary worker weighing individual servings while the family members are eating.

As has already been mentioned, this part of the study was the most difficult. It may be argued that the very presence of the dietary worker while a family was eating has introduced a bias in the distribution pattern. Nevertheless this was considered to be the method that would entail least possible errors, because the dietary workers were not strangers, they belonged to the same community and in some cases to the same kin group. Their presence at meal times would cause least embarrassment to the study household members. Frequently the investigator would sit by and observe the workers weighing individual servings. Signs of embarrassment on the part of any household member were seldom noticeable.

Any leftover food, or foods given to others, or to household pets were also weighed. Foods eaten in-between meals such as roasted chickpeas, peanuts, rolled rice, puffed rice, pancakes, etc. or snacks bought from pedlars, or fruits collected from trees or bushes were weighed whenever possible. Individuals were asked if they had eaten anything that had not been weighed. If reported, the item(s) was recorded in terms of local units of measure and then converted into weights by the investigator himself. Breast milk was not estimated.

2.3.2 Nutrient and Energy Needs

Dietary intake data do not, by themselves, reveal whether the intakes of an individual or a community are adequate or not. The adequacy or

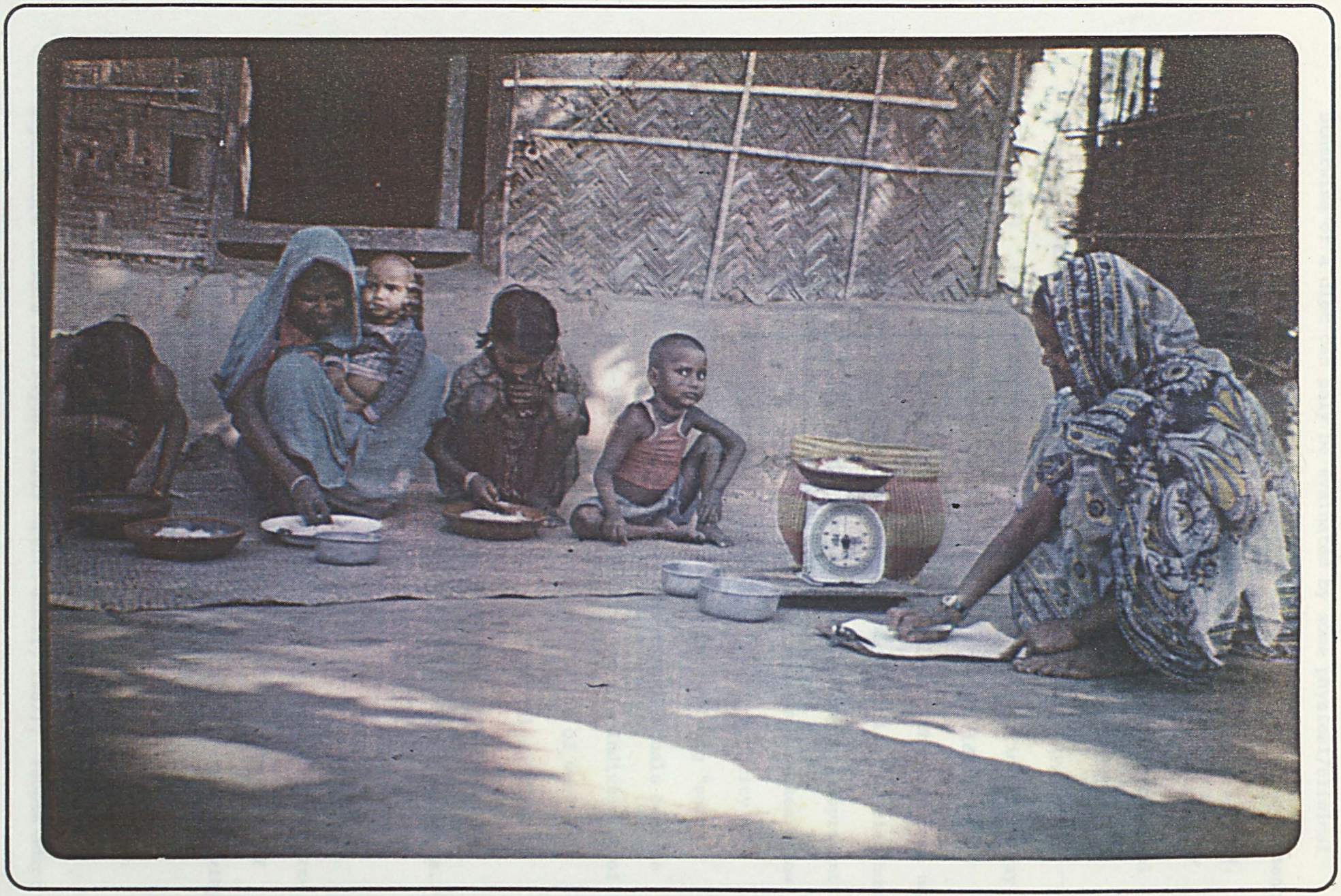


Figure 2.3 A dietary worker weighing individual food intakes while household members are eating.

otherwise of a diet can only be evaluated by some physical/clinical measures of nutritional status. Comparing intake data with requirements has serious problems because of the variance in both sets of figures.

Conventionally two standards have been employed to evaluate dietary intake data independent of physical assessment of nutritional status. One is to compare intake data with "Recommended Dietary Allowances" and the other to use "Safe Levels of Intake" (FAO, 1967, 1970, 1973). Figures for recommended allowances are set in such a way as to cover or exceed the needs of practically all individuals even though they may be living in a variety of situations. This approach has some usefulness in national planning of food and nutrition policies but cannot be applied to individuals. The "safe levels" usually represent the mean + 2 S.D. of minimum physiological requirements, intakes below which there is a risk of symptoms of deficiency in the majority of people. There are, however, practical problems of applying "safe level" figures to evaluate the dietary intakes of individuals because of a wide range of inter-individual variations. No two individuals of same age and sex and perhaps performing the same amount of work and experiencing the same environmental stress are identical in terms of nutrient requirments. Thus comparison of intake and requirement may be regarded as probability statements rather than absolute judgements.

(a) Energy needs

The computation of individual's energy needs from average requirement figures is at best an approximation in view of the wide range of inter- and intra-individual variations. Although body size and activity are the two major determinants of energy needs, yet it is almost impossible precisely to define a requirement because there is such an interaction between body stores, physical activity, intake and expenditure (Rivers and Payne, 1982; Ferro-Luzzi, 1982). People adapt

themselves to a wide range of intakes through a number of mechanisms. When intakes fall short of needs, the body stores are drawn upon resulting in a decline in body weight. A reduction in body weight in turn contributes to a reduction in the maintenance needs of energy (Longhurst and Payne, 1979). People voluntarily reduce physical acitivity in response to decreased intakes which itself leads to change in expenditure above BMR. Conversely, when energy intakes are in excess of needs, the body has a mechanism to store the excess energy.

Inter- and intra-individual differentials in the intake and expenditure of energy are so large that it does not seem sensible to prescribe any safe level(s) of energy requirements at individual level(s). Sukhatme (1977) has clearly shown the magnitude of inter-individual variations in the intake and expenditure of energy. Drawing from data of Edholm *et al.* (1970) he has shown that the coefficient of intra-individual variation in energy expenditure is of the order of 5-6% and the coefficient of variation in intake is twice as large. An individual may consume more than he spends for days and weeks together; equally he may consume less than his expenditure without any loss in body weight or reduction in activity unless the balance exceeds the critical lower limits of distribution of energy balance over time.

(b) Nutrient needs

The problem with regard to employing safe level figures of nutrients is that experimental measurments of physiological needs have sought to determine levels of intakes which will prevent the appearance of deficiency symptoms. Experimental subjects have been conventionally kept insulated from the external environment. We do not therefore know how individuals would respond to fluctuations in intake under real life situations. There are clear indications of adaptation to a variety of intake levels (Waterlow, 1981; Durkin *et al.*, 1981). We do not know the

mechanism as to how the body adapts itself to fluctuations in the intake of nutrients, but we do know that people can survive on varied levels of intake, at least for short periods, without any bodily disfunction. For the nutrients, the availability of which is seasonal, the body has evolved storage mechanisms to smooth out seasonal shortages. The requirements somehow change in response to changes in the intake without necessarily giving rise to any bodily disfunction. It is not possible to establish a single "safe level" of intake which can be applied to individuals of different socio-economic and environmental backgrounds (Nicol and Phillips, 1976).

It seems from what has been written about energy and nutrient needs that we know very little about the variation in individual requirements around the mean requirements for each age and sex group. Evaluating the dietary intake data in terms of percentage fulfillment of requirements alone, leads to many ambiguities and problems of interpretation. If, however, there is some objective measure of nutritional status as well as the dietary data, the latter can be used as a commentary on and explanation of the former. In this study the requirement figures have been used as guidelines to 'desirable' levels of intake, and the intake data themselves have been analysed by socio-economic group, and in the light of the anthropometric data.

2.4 ANTHROPOMETRY

Various anthropometric indices, e.g. weight-for-age, height-for-age, weight-for-height, arm circumference-for-age and/or height, skin-fold thickness, etc. have been extensively used for assessment of nutritional status of individuals and communities (Gomez *et al.*, 1956; Jelliffe, 1966; Keller and Maeyer, 1976). The most commonly used are weight-for-age/height and height-for-age. Weight is a very sensitive

indicator which responds to fluctuations in dietary intake even over short periods, particularly in the growing age (Jansen and Bailey, 1977; Wiersinga and van Rens, 1973). On the other hand, height is affected when malnutrition persists over long time during the periods of relatively rapid growth rates (Waterlow, 1978). When the dietary intakes of growing children fall short of their requirements they will gorw at a slower rate than normal. They may stop growing or even lose weight in severe food shortages or illness.

2.4.1 Weight and Height Measurements

The basic assumption of this study is that seasonal trends in the supply of food may result in an increase in the relative inequality of intra-household allocation. Under such a circumstance, weight (and perhaps height), would be affected. Weight and height were therefore considered to be two important measures in the study. Height and weight of all household members were measured at the outset. Then weight measurments of all individuals were done once every month and heights of growing children at three-monthly intervals. In all, ten sets of weight data and four sets of height data were obtained. Supine length of children under one year was not measured because of resistance from parents (see Chapter 3).

Weight was measured using a Salter bathroom scale graduated in 0.5 lb divisions. Weights were subsequently converted into kg and rounded off to one place of decimals. The accuracy of the scale was frequently checked using standard weights. Efforts were made to measure weight at the same time of day on all successive rounds, so as to minimise within-day intra-individual variations. The subjects wore light clothes only (Figure 2.4).

For height measurement, a 'height measuring scale' of standard design was used, constructed by the Institute of Nutrition and Food

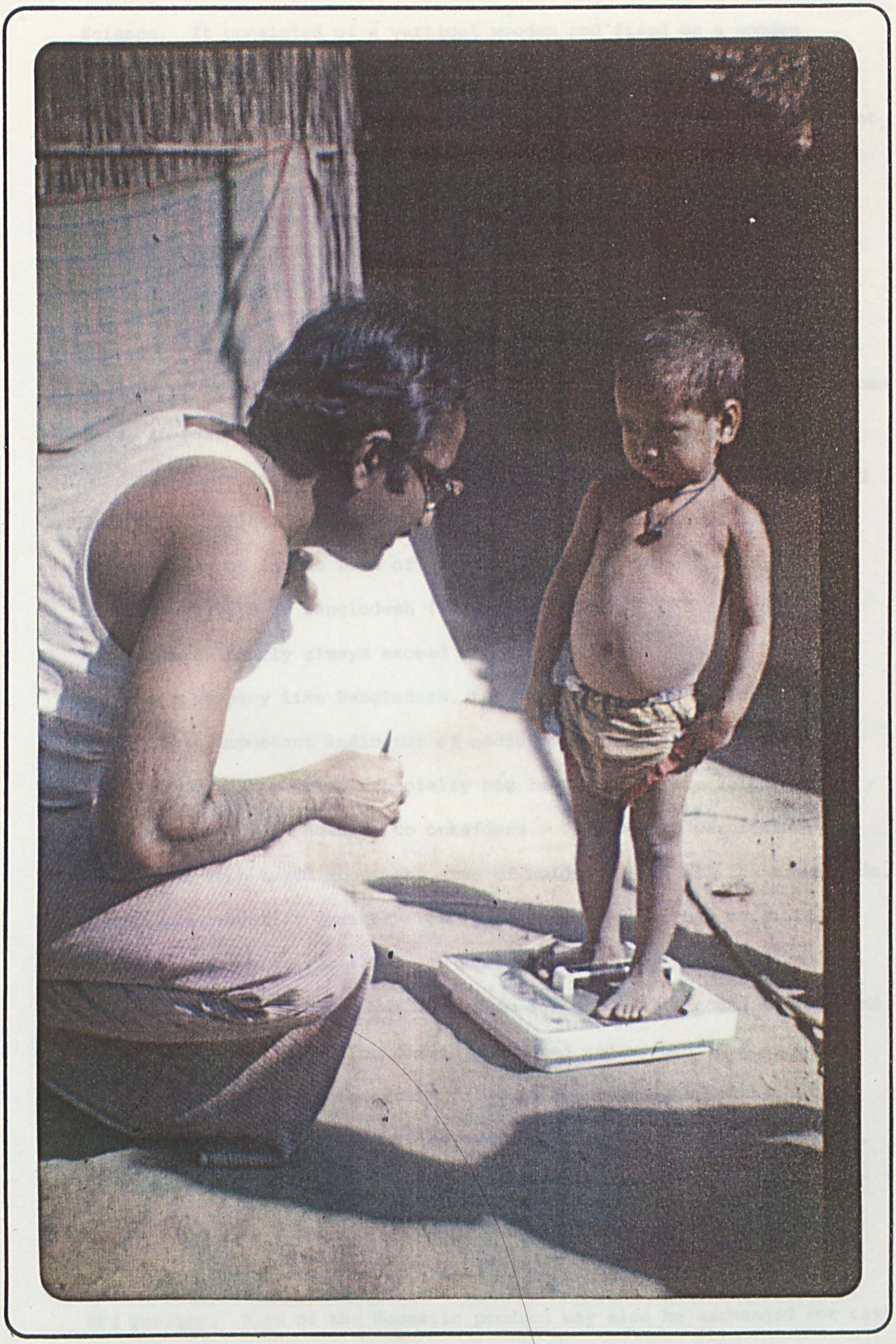


Figure 2.4. The investigator taking weight of a child who wore very light clothing.

Science. It consisted of a vertical wooden rod fixed on a wooden platform and fitted with a sliding head-piece. A steel tape graduated in cm was fixed to the vertical rod. Height was recorded to the nearest 0.5 cm.

2.5 SOCIO-ECONOMIC DATA

It is well recognised that reliable data on socio-economic conditions of people in any rural community are difficult to obtain. Income data, in particular, may mean little. People do not generally want to disclose their income and there is always a tendency of under-reporting income and inflating expenditure figures (Casley and Lury, 1981). "Income" may be in the form of crops and produce rather than in cash. Previous surveys in Bangladesh (INFS, 1977) showed that reported expenditures nearly always exceed reported income.

In a country like Bangladesh, the ownership of agricultural land is the most important indicator of socio-economic status for rural households. But people, especially big land owners, are reluctant to disclose their land holding to outsiders. They become particularly suspicious when asked about the size of holdings. In all the households, income was primarily derived from agriculture: either as agricultural produce or as wages for labour in agricultural activities. The reliability of income data derived from agricultural produce will depend on how well crop production can be estimated and valued (Casley and Lury, 1981). Attaching monetary value to subsistence crops is particularly difficult because of variations in their prices over time. Rural people, as opposed to urban, are never dependent on a single source of income. For instance, almost every rural household having some spare land around the homestead produces vegetables and/or fruits and poultry. Part of the domestic produce may also be exchanged for cash.

Domestic produce is extremely difficult to quantify and express in terms of monetary value. In addition, many rural households have subsidiary sources of income. A farmer may be a money lender or a part-time shopkeeper. He may do seasonal trading during periods of slack agricultural activity. Even a landless labourer may join in seasonal trading with someone who has cash. Petty traders and shopkeepers never do any book-keeping. Income data from such sources are not more than gross approximations, the reliability of which will depend on the honesty of the respondent and ingenuity of the investigator. A landless labourer's wife may be working in the house of a relatively well off farmer helping processing of harvested crops. She may not be paid any cash but may be receiving the wage in kind or just the food for herself and perhaps for her youngest child if accompanied. She may also take home the food so received and share it with other members of the family. These are almost impossible to quantify.

Realising the practical problems associated with the income and resources survey it was not started until the study was well established. By that time it was possible to make a fair amount of observation and establish good rapport with the households. At that point (July), a structured interview of households for wealth and income estimation was conducted. The interview questionnaire can be seen in Appendix 'A'. Indices of wealth were: land-holding (including mortgaged and share cropped land), housing, livestock, and prestige possessions. Assessments of agricultural produce were made after principal harvests. Costs of inputs other than family labour were estimated and deducted from the gross value of agricultural produce to derive the net income from agriculture. Approximations of domestic production of vegetables, fruits, poultry and date-palm jaggery (crude sugar) were also made. Cash incomes of wage labourers were derived from estimated number of days employed and the wage rates at different seasons. Incomes from shop-

keeping, petty trading and remittances (if any) are as reported by the respondents. Information on changes in assets, investments, debts and debt repayments were also obtained. Notes were also made regarding number of working members in the households, their principal and subsidiary occupations, household furnishings, etc.

For estimation of crops produced, interviews were conducted on three different occasions, so it was possible to cross check doubtful information. Personal observations throughout the study provided a basis for cross checking. Personal observations were also useful to bring out points that the respondent(s) did not volunteer to discuss during interviews. On the whole, income and wealth data could be claimed to be fairly reliable. The problem remains, however, as to how to rank and classify households in a way which really separates 'the rich', 'the middle' and 'the poor'.

2.6 HOUSEHOLD FOOD STOCKS

In a predominantly agrarian society, household stocks of staple foods may be expected to provide a useful indication of the total dietary intakes of the household. An attempt was therefore made to estimate the household stocks of cereal grains (providing on average 80% of energy in rural Bangladesh). Every week, on a particular day, a simple form asking how much of different cereals had been produced, purchased or sold during the previous week was filled in for each household by the village assistants. The accuracy of this household food stock data is questionable. It was sometimes observed that the landless households, depending for the whole of their foodgrains on purchases, had a tendency to report on what they would need for a week rather than what they actually purchased. Also it might have so happened that grains purchased towards the end of a week under report were again reported as purchases

during the following week. Every effor was made to obtain figures for actual purchases and to avoid double reporting. For landowning families double reporting of production figures was found. This could, however, be corrected using the total production figures.

2.7 PERCEPTIONS, CONCEPTS, AND STRATEGIES OF HOUSEHOLDS

Unstructured interviews were conducted to find out people's perceptions of the physiological needs of individuals for food, concepts of productiveness, and strategies, if any (explicit or implicit) underlying the observed pattern of intra-household food allocation. The interviews were conducted towards the end of field work, during November and December, by which time good rapport with the study households was already established. The villagers became very frank and friendly and I was not being treated like a stranger any more. There was therefore no difficulty in getting response. It was only a matter of finding a convenient time for the interview. In all 23 'poor', 12 'better-off' and all the 5 'rich' households were covered by the interview. In most cases men were interviewed but frequently women, especially in 'poor' households were also present and participated in the discussion. In 3 'poor' households the male heads were away and interviews were conducted with women. In these interviews particular attention was given to household decision-making. Different aspects of decision-making such as: who is the boss in the household? who has the control on household resources? who decides about purchases and sales of foodgrains? who decides about the treatment and care of the sick children? were generally discussed in these interviews. Attention was also given to householders' perception of their economic status and their economic strategies, if any. Although the unstructured interview was conducted once in each household, observations on almost all of these aspects were continually made

throughout the study. All bits and pieces of information noted at different times were integrated to construct a profile of each household.

2.8 DATA ANALYSIS

2.8.1 Classification of Households into Socio-Economic Categories

The practical problem associated with classifying households into socio-economic categories is well recognised. Particularly difficult is the identification of thresholds which divide them into 'poor', 'middle' or 'rich' groups. Neither income nor landholding nor any other single index nor a combination of various indices of socio-economic status can precisely divide households into homogeneous groups. Nevertheless a combination of various indices should be a more acceptable method of classification.

Socio-economic data were first transferred to a Diskette at the Bangladesh University of Engineering and Technology computer centre and subsequently analysed at the London University computer centre, so as to classify the study households into three categories e.g. 'poor', 'better-off' and 'rich'. Four selected measures of socio-economic status: land holding, land actually cultivated, annual income and the ratio of earning to dependent members in the household, were each assigned a score. The total score obtained by a particular household was then used to assign it to one of the three categories. The scoring was done as described in the next paragraph.

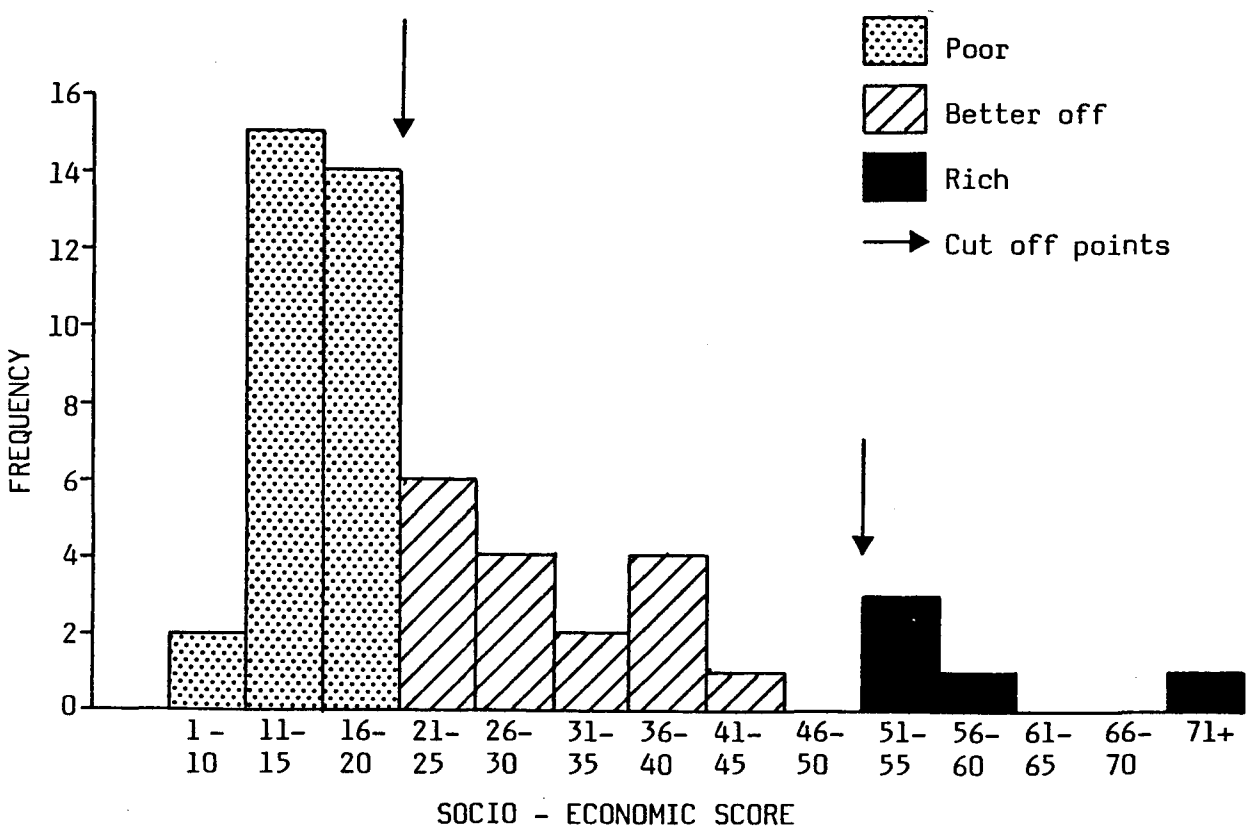
It has already been mentioned that access to cropland is the most important index of wealth in rural Bangladesh. Access to cropland might be either by ownership or by share-cropping. Land actually cultivated may be different from land owned. Owned land given to share-croppers vis-a-vis land taken in for share-cropping is worth half in terms of produce. A total of 30 points, divided into two halves, 15 each for

land owned and land cultivated, were used as 'land score'. Annual income, the other important measure of socio-economic status, was assigned a maximum of 40 points. Ten points were assigned to the fourth index, the ratio of earning to non-earning members of the household. Details of the scoring system are given in Appendix 'B'.

In order to divide the households into three categories of 'rich', 'better-off' and 'poor' threshold values of the socio-economic score were taken as 20 and 50. Figure 2.5 shows the distribution of households by socio-economic scores in the village and the way in which these values were distinguished in 3 groups.

Figure 2.5

Frequency distribution of households by socio-economic score



The lowest category 'poor' included 31 households out of the total of 53. This group included 18 out of 20 landless households and 10 very small landowning or near landless households, most of whom also sell their labour. In addition two medium landowners fell in this category, because the aggregate value of their produce was very low which rendered them economically disadvantaged. If land ownership alone would have been the criterion for classification, these two households would be classified as 'better-off'. The two landless households classified as 'better-off' had 3 and 2 earning members respectively, which in spite of their being landless placed them economically in a better position than the rest of the landless households.

The 'better-off' group included all the medium landowning households, most of whom produce food in amounts that meet their food needs for part of the year and are dependent on the market for the rest of the year. After harvests they often sell portions of their produce to meet the demand for cash even though they will be required to buy the same amount at higher prices afterwards. Total number of households in this group was 17.

The 'rich' group included only five households, very heterogeneous in character. Two of them are the highest landowning households, one is a shop-keeper-cum-medium landowner. The fourth is a primary school teacher belonging to the medium landowning group, but during the study year, he and his brothers procured a shallow irrigation tubewell on bank credit under a Government scheme. The tubewell was installed in the field. The farmers owning land around the tubewell cultivated HYV rice and paid back the cost of irrigation water in kind as one third of the rice produced. As a consequence of this the medium landowning primary school teacher was high up in the income ladder. The fifth household had a substantial amount of remittance from a brother working in the army which placed it into the 'rich' category.

2.8.2 Dietary

Dietary data were first transferred to code sheets, then to punch cards and finally to a magnetic tape. Individual intakes of the raw ingredients in cooked foods were worked out using a computer program at the Bangladesh University of Engineering and Technology (BUET) computer centre. Software facilities were provided by the Institute of Nutrition and Food Science at the University of Dhaka. For conversion of foods into energy and nutrients, Food Composition Tables for Indian Foods (ICMR, 1977), Nutritive Value of Local Foods (INFS, 1980) and Food Composition Tables for use in East Asia (US Dept. of HEW and FAO, 1972) were used. Food composition data were also transferred to a Diskette at the BUET. All the subsequent analyses were done at the London University Computer Centre, using some one-off programs, and SPSS: Statistical Package for Social Sciences. In computing per day intakes household members who had missed any of the family meals on any particular survey day(s) were excluded.

2.8.3 Anthropometric

As for socio-economic data, weight and height data also were transferred to a Diskette at the BUET Computer Centre and analyses were done at the London University Computer Centre using SPSS. Weight and height data were mainly analysed over time by age, sex and socio-economic categories. In addition weight/age of children between 1 and 4 years and height/age of 1-14 year old children are compared with NCHS standards (WHO, 1979).

2.8.4 Peoples' Perceptions, Concepts and Strategies

Qualitative information obtained with regard to peoples' perception of individual food needs and strategies to deal with food shortage, household decision-making process in general and decisions regarding sale

and purchase of food and care of the sick children in particular, as well as households' economic condition and economic strategies (if any) as perceived by themselves have been compiled and tabulated by socio-economic categories and presented in Chapter 6. An attempt has been made to identify socio-economic differentials which in turn have been referred to in the discussion and interpretation of quantitative dietary and anthropometric data.

2.8.5 Food Stocks

Data collected on weekly basis regarding production, sale and purchase of foodgrains have been converted into per capita monthly availability by socio-economic class.

2.8.6 Data Checking

The large volume of dietary data made it virtually impossible to check for errors in recording food weights. Some errors in food coding were checked by the computer. Very high energy and nutrient intakes were checked and in some cases rejected; but erroneously low intakes cannot be detected. In the anthropometric data, apparent loss of height could be detected as an error.

3

PROBLEMS IN THE CONDUCT OF FIELD WORK

Some problems and hazards associated with field studies are recognised and predictable. Unforeseen problems may also crop up at any stage during the conduct of field work and may eventually affect the study itself. The present study has not been an easy going one: some of the major difficulties and problems encountered are discussed below.

3.1 PROBLEM OF FOOD WEIGHING

The concept 'research' is unintelligible to the study community. It was therefore extremely difficult to make people understand the usefulness of the study. They do, however, understand 'survey', but a survey without the promise of any action to follow is inexplicable. The proposal to weigh their food intake made them suspect at once that the Government was planning to specify a national fixed ration scale. They thought that rural people, and especially the wage labourers, would not be able to work after eating such weighed rations, which, they suspected, would be less than their usual intake. It was hard to make them realise that it would be next to impossible to feed the entire nation on a fixed ration, even if the Government wanted to do so. The 'gruel kitchen' and 'modified rationing system', with which they are more or less familiar, can be taken to show that the Government infrastructure is not even capable of managing these programmes properly, not to speak of feeding the entire nation under any programme. But the problem of management is not comprehensible to the villagers and they were unable to understand why the Government machinery should be considered incapable of ration-feeding the people, even if it wanted to do so.

Whenever the question of weighing food intakes arose, the people

would immediately ask whether the Government would give them the food they needed. They would say:

> "You won't get much information by weighing our food because we can't manage to eat what we actually need. Sometimes we eat half of what we need, sometimes we eat only *roti* (unleavened bread made of whole wheat flour), and on occasions we just have to starve. If you want to weigh our food (food is synonymous with rice), first give us food and then measure our intake and then report to the Government to give us the food we need."

Contrary to the general notion that rural people are simple, some of them appeared to be very cunning and evasive. For instance, one Mahmud, a wage labourer said,

> "Everybody knows, and for that matter the Government knows, what the people eat. They eat rice or *roti* and when they fail to procure either they starve".

Another individual, a cattle-broker-cultivator, went further in argument and said:

> "We eat a very poor diet. At times we eat nothing but gruel. How can we disclose it to outsiders?"

I had the impression that he was lying. Later on, my long observation in the village supported my initial impression that the people of that area were in general not reluctant to disclose what they eat.

Another problem was encountered. During the training of village assistants in dietary survey techniques, bowls and cups of various sizes were used to estimate portions of cooked food distributed among household members. A strong rumour spread that the wage labourers would refuse to work in those households that had served them rice (synonymous with food) which had been measured out in bowls or cups. Certain indivi-

duals belonging to a particular social group were especially active in spreading the rumour. Reasons for this are discussed below under 'Village social groups'. It took long to overcome the problem.

3.2 PROBLEM OF ANTHROPOMETRY

There is a genral belief in rural Bangladesh that weighing is bad for health. Weighing is believed to result in the loss of body weight and to render people, particularly children, vulnerable to diseases. Even educated people in general are not immune to this. For instance, one of the village assistants was a woman educated to "HSC-passed" (equivalent to A-level). She had a twelve month old daughter, and she never agreed to weigh her child. This attitude is understandable when we realise that various infections are a common feature in rural Bangladesh, where younger children do frequently suffer from them. It is quite likely that a child might fall ill after being weighed. Under these circumstances people jump to the conclusion that the illness was caused by the weighing. For example:

Sher Ali is a young man of about 22 years. He had a 10-month old daughter and wouldn't get her weighed. After long persuasion he reluctantly agreed. Unfortunately the child fell ill afterwards and Sher Ali concluded it was due to weighing. As was expected, during the next round of the survey he vehemently refused to allow his daughter to be weighed.

Taizuddin's 15-year old son became ill with typhoid after the first weighing. For lack of proper treatment his condition became so precarious that at one point everybody gave up hope of his survival. A strong rumour spread that the boy had been forcibly weighed, which had made him fear-stricken, so that finally he fell ill. On my return to the village after a week or so I was shocked to hear about this. We went to the boy's home with the intention of consoling the parents and also

advising them for his proper treatment and care. On sight of us the mother of the boy started crying and said,

> **"I urged upon you not to weigh my only son. You didn't listen to me. He fell ill and now he is dying. How shall I live if my only son dies?"**

One can imagine what a sad and heart-touching occasion it was. I did not know how to console the mother. I could only say that it was God's will and God will help him recover. In the meantime a Medical Assistant was called for. He gave the boy some medicine. Fortunately the boy then started recovering and things eased.

Tara is 18 years old, the only son of a widow, who wouldn't allow him to be weighed. She pled:

> **"Spare my son, and take my own weight as many times as you wish".**

Similarly, Chandu's wife refused to get her children weighed. She said that a number of her children had died in infancy and childhood. She wouldn't therefore take the slightest risk which might harm the surviving ones. After long persuasion she agreed to get her daughters weighed, but not the only son.

Abul Hossain's 26 year old wife vehemently opposed to the taking of height/weight of her children. Both her first and second children had died in infancy. She is therefore very worried about the living ones and does not want to take any risk by getting them weighed. She asked

> **"Will you undertake the responsibility if any of my children diesafter weighing?"**

She admitted that any of her children could die even without having been weighed, but then that will be God's will. Even then, she argues, if

they died after having been weighed it will certainly strike her mind that perhaps weighing was the cause. On the other hand, if anybody dies without having been weighed, she will have nothing to blame herself for. After long persuasion she admitted that weighing of children might not be as harmful as she thought. But then, she asked

> **"Will you give us anything to feed the children? Any medicine or clothing? If you don't give us anything why should we allow you to weigh our children?"**

It was difficult to make her understand that my work was in no way associated with any kind of material assistance to people.

In the beginning children used to run away to avoid weighing. Sometimes the parents also would ask them to hide. Even when the study was well established, parents wouldn't generally allow weighing of sick children. I did not try to take supine length of infants and young children after observing a strong superstition with respect to laying them down on the wooden platform of the instrument. They used to say that only dead bodies are carried to the graveyard on such (indicating the length measuring instrument) a thing.

3.3 PROBLEMS OF VILLAGE SOCIAL GROUPS

Circumstances having no apparent connection with the research may sometimes have far-reaching consequences for village studies in countries like Bangladesh, as is seen from the following account.

After the recruitment of village assistants, a formal appeal was made to the villagers seeking their cooperation in the study. A mimeographed appeal was addressed to household heads, explaining the objectives of the study, information sought, method of data collection and its relevance to nutrition planning. It was at this point that inter-

social group rivalry prevailing in the village began to be important.

In rural Bangladesh the village social group is known as the *Samaj* which can be taken as the basic unit of social activities. There are certain social norms which the *Samaj* members are supposed to abide by. If anyone deviates from the norm, the *Samaj* has the authority to award punishment (Aziz, 1979). The *Samaj* also holds sittings to arbitrate in cases of small thefts, feuds among its members or any harm caused to any of its member(s) by any other(s). If anybody dares to defy the judgement of arbitration, the *Samaj* may award him the most severe punishment, excommunication. The head of the village social group is called the *Matbar* Besides the *Matbar*, there are other leaders, and together they constitute the village social group leadership.

Geographically, the study village is divided into two clusters, West Para and East Para (also known as Molla Para). Until 3 years ago, the entire village owed allegiance to a single *Samaj*, and the *Matbarship* was vested in a person from West Para; but the collective leadership included two leaders from East Para. However, there are now two different rival *Samaj* in the village and inter-*Samaj* rivalry had considerable effect on the present study.

My initial contact was with certain members of *Samaj* 1, without knowing that a second *Samaj* existed. My first job in the village was to prepare a list of all households and of literate girls. This was done with the help of a young man belonging to *Samaj* 1 and the survey revealed that all but one of the literate girls belonged to *Samaj* 1. Afterwards, it turned out that all the village assistants would have to be recruited from *Samaj* 1 because nobody in *Samaj* 2 was suitable. This became a stumbling block in carrying out the study in West Para.

Because of inter-group rivalry there was a general unwillingness in *Samaj* 2 to participate in the study. This was firstly because I

initially associated myself with *Samaj* 1, secondly because all the village assistants belonged to *Samaj* 1 and thirdly because *Samaj* 2 took this as an opportunity to oppose the other group out of their long standing rivalry. Realising the difficulty I approached the leader of *Samaj* 2. After several attempts it was eventually possible to persuade him to cooperate. However, there was a power struggle going on inside this *Samaj*, between the leader and a small sub-group which opposes his leadership. It was necessary to convince the sub-group leader as well; but several attempts to do so were in vain. Then a group meeting was arranged in the house of the opposing sub-group leader, which was attended, among others, by three leaders of *Samaj* 1. The sub-group leader was a very shrewd man. He argued that he was not the *Matbar* and that therefore he could not ask anybody to participate in the study. He continued, if the *Matbar* asked, everybody including himself would participate. He then sent somebody to call the *Matbar* to his house instead of proposing to shift the venue of the meeting to the latter's house, which would rather conform to the *Samaj* norms of behaviour. This seemed to be a deliberate challenge on the part of the sub-group leader, who was striving for *Samaj* leadership. As one would expect, the *Matbar* didn't come at his summons. Later, however, on my personal approach the *Matbar* came, but due to the evasive tactics of the sub-group leader the meeting failed to decide whether *Samaj* 2 would participate in the study or not. Several subsequent attempts, including a big sitting attended by almost all village elders and a few influential leaders from outside the village, failed in the same way.

From the economic point *Samaj* 2 regarded the study as a means of providing some financial benefit to the other *Samaj*, which they deeply resented. As a matter of fact, some of them proposed that if three of their men were given jobs then they would participate in the study. Since there were no jobs for them I couldn't do that. Moreover,

by that time some of the leaders of *Samaj* 1 were completely against any compromise with the other group.

In the meantime several months have already passed and it became clear that *Samaj* 2 was more or less united to foil the study. There seemed to be two reasons why *Samaj* 2 wanted to stop the study. If they were successful, they would view this as a defeat for the other group. Secondly, they would thereby succeed in depriving the latter of any financial benefit derived from the study, however trivial that benefit might be.

Having failed to include *Samaj* 2, the study was extended to the adjacent village. This is a very small one and similar to the former for all practical purposes. Geographically it is contiguous and most of its houses are even nearer than most of the houses of the opposing group of the former village. Figure 2.2 shows the distribution of households in both the villages. It was surprising to discover that even in this second village of only 42 Moslem households there are two separate *Samaj*, one of which wouldn't join the other in the study. This smaller group, also geographically farthest away from the centre, was excluded from the study.

3.4 LONGITUDINAL VS CROSS-SECTIONAL STUDY: ADVANTAGES AND DISADVANTAGES

Longitudinal studies are by definition time-consuming and limited in coverage. On the other hand, a large scale cross-sectional sample survey can be carried out in a relatively short period. However, the information obtained in a cross-sectional study relates to a particular point in time and does not reflect variations over time. Furthermore, cross-sectional food survey data tend to be biased, because the respondents provide only the information that they think they should reveal to a strange investigator. Some people will provide true information under any circumstance, but others may distort or may even fabricate with the hope of any future benefit such as relief. Some people will withhold information with a view to evading certain perceived problems in future, e.g. taxation or levy, while some others will be inclined to make a more favourable image of themselves. A longitudinal study, on the other hand, allows time for people to feel at ease. Eventually when they become familiar with the investigator they do not generally try to withhold or distort information. They may correct false information which they gave at the outset. Even if they did want to deceive it becomes increasingly difficult for them to do so, when the information provided can be cross-checked at different times and from different angles.

Cooperation of study households and their willingness for continued participation are fundamental to any longitudinal study. Some people may withdraw from the study at any stage of its conduct thus rendering the already obtained information relatively less meaningful, if not useless. In the present study two households were found to be non-cooperative. They were eventually excluded from the study.

Another very important dimension of the problems of longitudinal study that came up to the surface has not been previously reported. That is, the way in which inter-social group rivalry affected the study.

The problem that cropped up owing primarily to inter-social group rivalry would not have come up to the surface in any cross-sectional survey. The inter-social group rivalry eventually resulted in the loss of information with respect to one group which, however, was compensated by inclusion of a similar group from a neighbouring village in the study. Had there not been a comparable group nearby, as might well be the case in many other longitudinal studies, the study would have been fragmented.

4

INTRA-HOUSEHOLD DISTRIBUTION OF ENERGY AND SELECTED NUTRIENTS

This chapter deals with the intra-household distribution of energy, protein, vitamin A and fat among different age and sex groups by socio-economic category of households at different points of time. The main emphasis has been placed on the analysis of energy distribution. Protein distribution follows precisely the same pattern as energy. Vitamin A malnutrition, particularly affecting pre-school children is a major nutritional problem in Bangladesh and has received considerable attention in recent years. An attempt has been made to analyse vitamin A distribution with particular reference to its highly fluctuating availability across seasons. Since the principal source of vitamin A in the diet is carotene, utilization of which is modified by dietary fat, the intake of fat has also been analysed in relation to carotene.

Dietary intake studies were conducted four times: March-April, June, September-October and December. Detailed description of the methodology has been presented in Chapter 2. For reasons already discussed in Chapter 3 the first round of dietary study came to a halt after surveying only 23 households. Dietary data with regard to the first round survey constitute only 43% of the households covered in subsequent rounds and may not be representative of the entire study community. Any comment on dietary intake data relating to the first round survey must, therefore, be considered as tentative.

For reasons already stated in Chapter 3, the sample size, of necessity, had to be kept small and because of their small size the samples have been grouped into four age categories e.g. 1-4 years, 5-14 years, 15-44 years and 45 years and above. Further disaggregation would render the number of subjects in each age/sex group too small to make

meaningful comment on the socio-economic and seasonal differentials hypothesised in Chapter 1. Grouping of samples into fewer categories has obviously introduced greater variability within each group. In order to reduce the within-group variability, energy and protein intake data have been expressed per kg of body weight. This rendered the groups more homogeneous for the purpose of comparison and reduced the effect of increasing age as the survey proceeded. Within each age group, sex and socio-economic class have been used as discriminating variables.

With regard to the 'rich' group little comment can be made because of extremely small numbers in each age and sex groups. Data are presented in all the tables but in the illustrations only adults between 15 and 44 years have been included.

The average intakes recommended by FAO/WHO (1973) are indicated in some of the tables. In some of the illustrations, the intakes of women and children have been expressed as a percentage of the household heads, as an indicator of within-household distribution. In these illustrations the FAO recommended intake for the relevant age and sex group is shown as a percentage of that for an 'active' 48.5 kg man.[1] Appendix Table C.1 presents details of computation of energy needs of different age and sex groups.

4.1 ENERGY AND PROTEIN INTAKE

4.1.1 Men and Women: 15-44 Years

Mean adult energy intakes are shown in Tables 4.1a (15-44 years) and 4.1b (15-59 years). These show that the absolute intakes of both men and women in the 'better-off' group were similar. During March-April 'poor' males had a slightly higher intake

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[1]The average weight of the adult males aged 20-39 yrs in the survey.

Table 4.1a

Mean Energy intake of 15-44 year old men and women by socio-economic class at different times (KCal/person/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept.-Oct.	December
Men	Poor	2943 ± 414 (8)	2618 ± 764 (19)	2238 ± 419 (21)	2425 ± 506 (20)
	Better off	2875 ± 616 (5)	3038 ± 542 (19)	2399 ± 448 (19)	2485 ± 606 (16)
	Rich	3096 ± 439 (8)	2916 ± 366 (7)	2553 ± 727 (8)	2387 ± 529 (8)
Women	Poor	2022 ± 686 (14)	2093 ± 536 (29)	1755 ± 450 (32)	1753 ± 408 (31)
	Better off	2472 ± 582 (10)	2133 ± 337 (19)	2002 ± 355 (21)	2010 ± 365 (20)
	Rich	2310 ± 287 (5)	2186 ± 200 (4)	1921 ± 226 (6)	1770 ± 217 (6)
*FAO recommended intake (Group mean)	Male	2558	2558	2186	2186
	Female	1719	1700	1707	1736

*Details of computation are given in Appendix Table C.1.

Table 4.1b

Mean energy intake of adults between 15 and 59 years

by socio-economic class at different times

(KCal/person/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept-Oct	December
Male	Poor	2958 ± 405 (11)	2580 ± 738 (22)	2201 ± 425 (27)	2369 ± 495 (26)
	Better-off	2883 ± 531 (7)	2978 ± 514 (25)	2424 ± 388 (28)	2497 ± 541 (23)
	Rich	3096 ± 439 (8)	2971 ± 373 (8)	2622 ± 710 (9)	2415 ± 501 (9)
Female	Poor	1998 ± 667 (15)	2088 ± 578 (32)	1733 ± 437 (36)	1753 ± 390 (35)
	Better-off	2428 ± 572 (11)	2120 ± 332 (22)	1981 ± 367 (24)	1974 ± 373 (22)
	Rich	2310 ± 287 (5)	2186 ± 200 (4)	1921 ± 226 (6)	1770 ± 217 (6)
FAO recommended intakes	Male:	2487	2487	2126	2126
	Female:	1704	1685	1691	1718

Figures in parenthesis are numbers of persons.

than the 'better-off' males. During that period large scale 'Food for work' projects were being executed around the study village, and the poor males, most of whom are landless wage labourers, were working in those projects. Thus they were earning a sufficient wage, and consuming more calories to compensate for the extra energy expenditure associated with earth-cutting in such projects. 'Better-off' males did not work on this project. Except in December, the 'rich' males had higher intakes than the 'poor' males. Compared to the 'better-off' group their intakes were sometimes slightly higher and at others slightly lower. 'Poor' males and 'better-off' females had their highest absolute intakes in March-April while the highest intakes of 'better-off' males and 'poor' females were recorded in June. The 'rich' women had always higher intakes than the 'poor', but generally lower than the 'better-off' women, except in June. Absolute intakes of all groups dropped sharply between June and September. The males' intake in the 'better-off' and 'poor' groups increased somewhat in December, but remained well below the June levels. The females' intake remained essentially the same. The intake of both men and women in the 'rich' group continuously declined to reach the lowest levels in December.

When expressed per kg of body weight the between-group differences in energy intake are considerably reduced, as may be seen in Figure 4.1. The difference in the female intake between the 'better-off' and 'poor' tends to be of the same order throughout the year, except in June, when the difference in the absolute intake also was minimum (less than 2%). The difference in the male intake between the 'rich' and the 'poor' group almost disappeared. Except in June, 'better-off' females had a 15-18% higher energy intake per kg. The intake of 'rich' women was the same as that of 'poor' except in March-April when the former had a 10% higher intake.

Superimposed on Figure 4.1 are protein intakes per kg body weight,

Fig. 4.1
Energy and protein Intake of men and women between 15 - 45 years

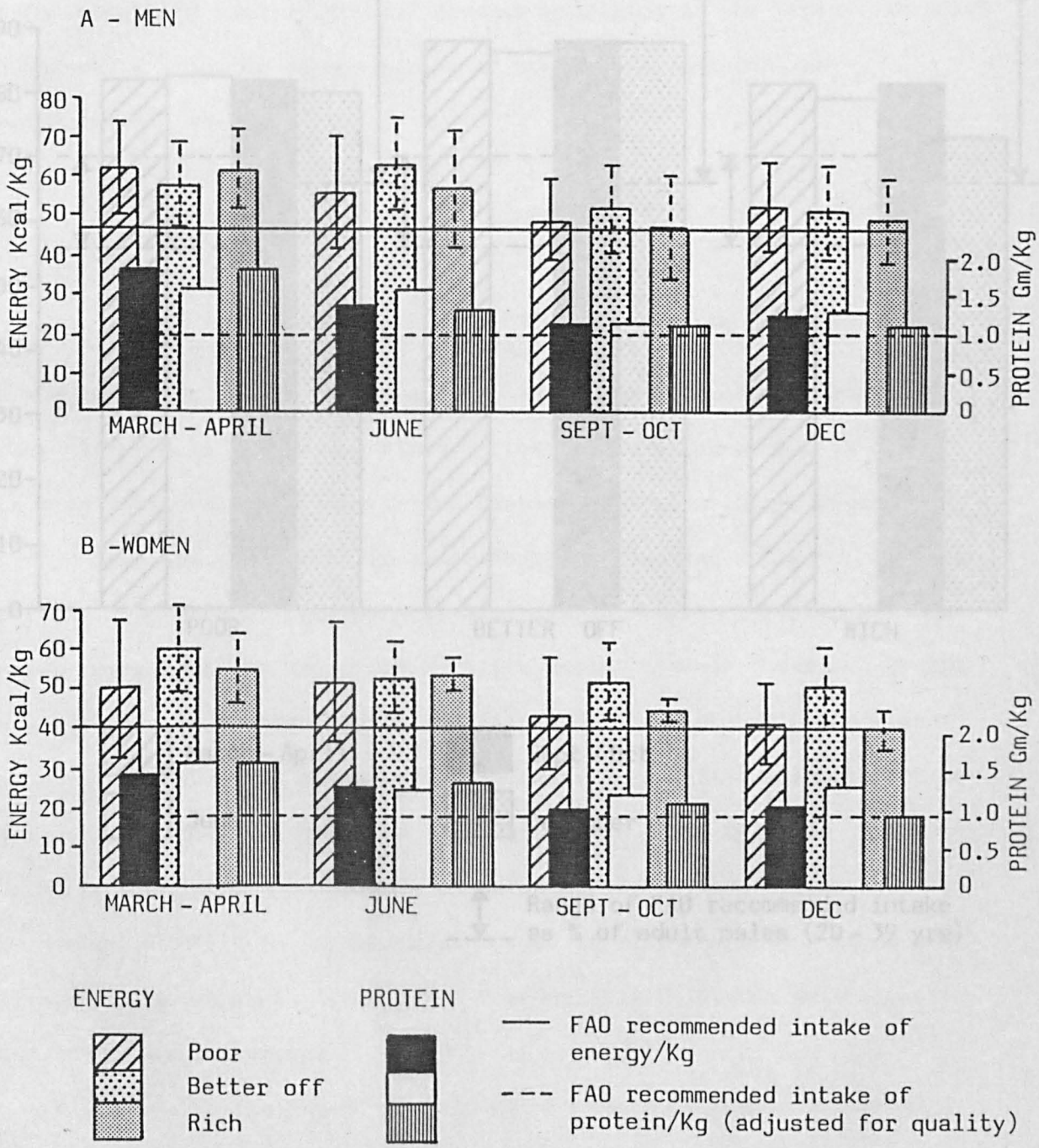
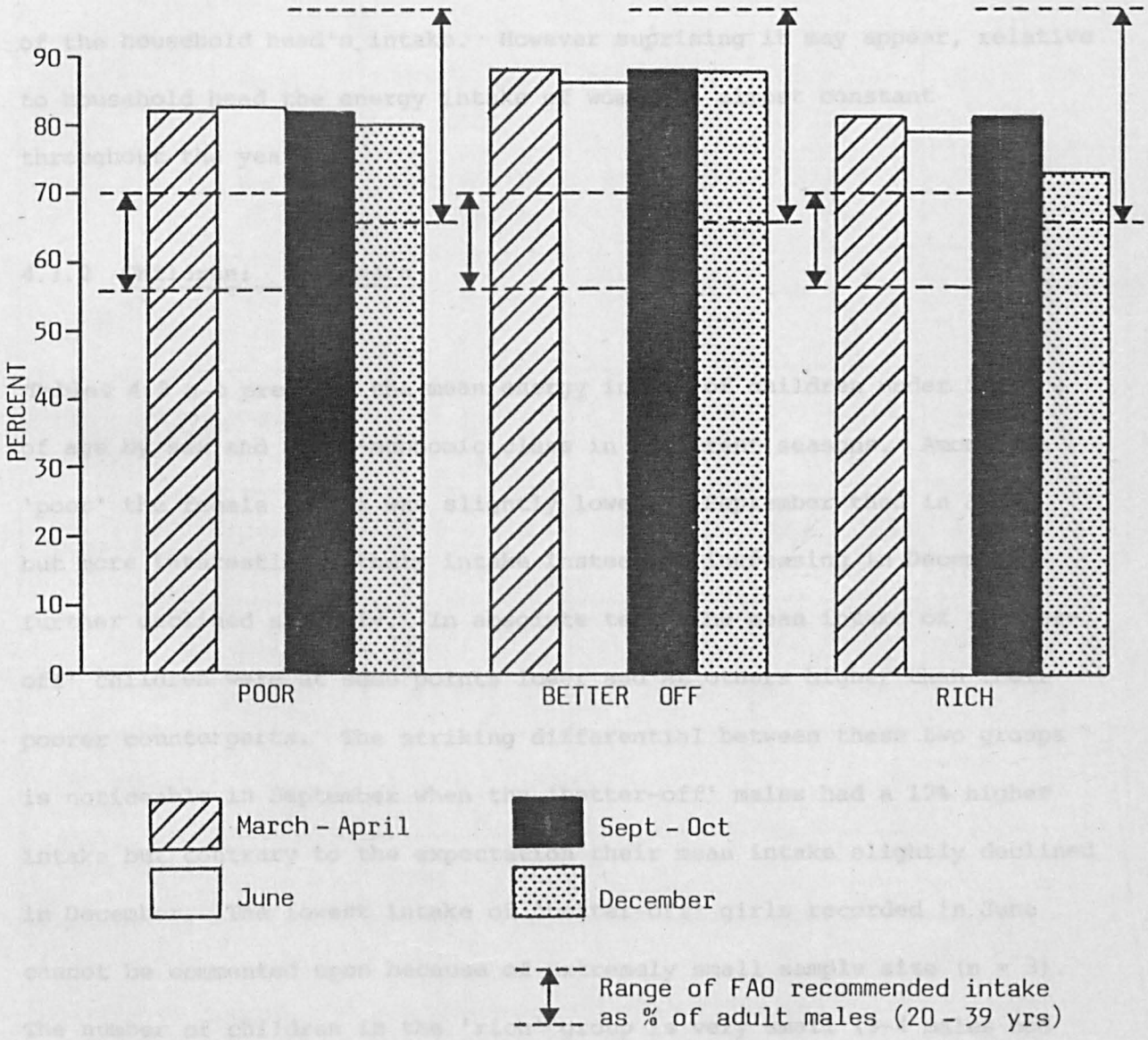


Fig. 4.2

Energy Intake of women aged 15 - 44 years as percent of Household Head's intake



which show that the intake pattern is almost the same as that of energy per kg. The only difference is noticeable in December when the 'better-off' males had a 3% lower energy intake but 3.7% higher protein intake than the 'poor'. There is no difference at all between the 'rich' and the 'poor' in terms of protein intake per kg of body weight. Protein intake data are presented in Appendix Table C-2. Figure 4.2 plots the energy intake of women between 15-44 years of age expressed as a percentage of the household head's intake. However suprising it may appear, relative to household head the energy intake of women is almost constant throughout the year.

4.1.2 Children: 1-4 Years

Tables 4.2 a-c present the mean energy intake of children under 5 years of age by sex and socio-economic class in different seasons. Among the 'poor' the female intake was slightly lower in September than in June, but more interestingly their intake instead of increasing in December further declined slightly. In absolute terms the mean intake of 'better-off' children were at some points lower and at others higher than their poorer counterparts. The striking differential between these two groups is noticeable in September when the 'better-off' males had a 12% higher intake but contrary to the expectation their mean intake slightly declined in December. The lowest intake of 'better-off' girls recorded in June cannot be commented upon because of extremely small sample size (n = 3). The number of children in the 'rich' group is very small (3-4 males and 1 female). Nonetheless, more often than not their intakes were higher than the other two groups.

A decline in the intake of both groups was expected in September-October before the main rice harvest and in fact the intake of 'poor' children did decline in absolute amounts; but that of 'better-off'

Table 4.2a

Mean Energy Intake of 1-4 year olds by sex and socio-economic class at different times (KCal/person/day ±S.D.)

Sex	Socio-economic class	March-April	June	Sept.-Oct.	December
Male	Poor	808 ± 391 (10)	984 ± 448 (16)	795 ± 337 (21)	820 ± 409 (21)
	Better-off	788 ± 416 (6)	822 ± 402 (14)	887 ± 301 (15)	792 ± 292 (16)
	Rich	895 ± 53 (3)	849 ± 322 (3)	956 ± 450 (4)	1039 ± 236 (4)
Female	Poor	651 ± 186 (4)	776 ± 419 (10)	731 ± 273 (10)	666 ± 214 (10)
	Better-off	764 ± 313 (2)	497 ± 177 (3)	737 ± 163 (5)	671 ± 166 (5)
	Rich	1196 ± 0 (1)	1182 ± 0 (1)	960 ± 0 (1)	418 ± 0 (1)
*FAO recommended intake (Group mean)	Male	1076			
	Female	994			

*Details of computation are given in Appendix Table C-1.

Table 4.2b

Mean energy intake of 1 and 2 year old children by socio-economic class at different times (KCal/person/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept-Oct	December
Male	Poor	433 ± 301 (4)	729 ± 308 (7)	591 ± 302 (10)	547 ± 288 (10)
	Better-off	570 ± 388 (3)	486 ± 155 (4)	663 ± 218 (5)	624 ± 238 (7)
	Rich	911 ± 64 (2)	701 ± 276 (2)	579 ± 57 (2)	872 ± 261 (2)
Female	Poor	535 ± 0 (1)	537 ± 342 (4)	590 ± 156 (4)	611 ± 261 (4)
	Better-off	-	476 ± 245 (2)	742 ± 193 (3)	693 ± 189 (3)
	Rich	-	-	-	-
FAO recommended intake	Male: 938				
	Female: 904				

Figures in parentheses are numbers of children. An unknown amount of breast milk was taken by this age group.

Table 4.2c

Mean energy intake of 3 and 4 year old children by socio-economic class at different times

(KCal/kg/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept-Oct	December
Male	Poor	1058 ± 181 (6)	1182 ± 452 (9)	981 ± 255 (11)	1069 ± 342 (11)
	Better-off	1005 ± 380 (3)	957 ± 393 (10)	999 ± 279 (10)	922 ± 271 (9)
	Rich	862 ± 0 (1)	1144 ± 0 (1)	1334 ± 189 (2)	1207 ± 172 (2)
Female	Poor	690 ± 207 (3)	935 ± 413 (6)	825 ± 305 (6)	703 ± 194 (6)
	Better-off	764 ± 313 (2)	541 ± 0 (1)	730 ± 179 (2)	638 ± 187 (2)
	Rich	1196 ± 0 (1)	1182 ± 0 (1)	960 ± 0 (1)	418 ± 0 (1)
FAO recommended intakes	Male: 1185				
	Female: 1076				

Figures in parentheses are numbers of children. In this age group, breastfeeding is very unusual.

Table 4.3

Frequency of Selected Food Items cooked per day in

different seasons - by socio-economic class

Food items / Season & socio-econ. class	March-April			June			Sept.-Oct.			December		
	Poor	Better off	Rich	Poor	Better off	Rich	Poor	Better off	Rich	Poor	Better off	Rich
Rice	1.35	2.00	2.00	1.15	1.71	1.83	2.02	2.29	2.20	1.54	1.67	1.83
Roti[1]	.43	.50	.64	1.31	.86	1.00	.30	.04	.07	.20	.04	.11
Khichuri[2] or Gruel	.32	.50	.18	.20	.43	.42	.31	.27	.20	.18	.27	.17
Rice products	.14	.39	.27	.05	.19	.33	.04	.27	.33	.21	.36	.67
Total cereals	2.24	3.39	3.09	2.71	3.19	3.58	2.67	2.87	2.80	2.13	2.34	2.78
Vegetables	.99	1.72	1.36	1.05	1.29	1.25	1.62	1.78	1.87	1.06	1.24	1.39
Pulses	.05	.19	.27	.05	.43	.67	.08	.24	.33	.06	.24	.17
Fish/meat	.08	.50	.09	.13	.14	.67	.16	.40	.20	.16	.31	.33
Milk	.08	.47	.36	.10	.10	.67	-	.09	.07	.03	.09	-

1. Unleavened bread made of wholemeal wheat

2. Thick porridge made of rice or broken wheat often with little pulse (sometimes without pulse) and spices like onions, chillis and turmeric.

children rather increased. A further decline in the intake of all groups except the 'poor' females was not expected in December after the main rice harvest. Although this was not statistically significant, the interesting point is that intakes did not rise during this period of relative abundance of food. The apparent anomaly cannot be explained by food availability alone. Factors other than food availability must be considered for a satisfactory explanation of the observation. One may speculate whether the shorter day length during winter months has any effect on the dietary intake of young children. A closer look into the meal patterns in different seasons might provide additional insight into the observed deviation from what was expected. During the winter months, two principal meals are eaten in most households instead of the usual three meals a day in other seasons. It is possible that a young child may not be able to eat the same amount of a cereal-based bulky diet in two meals which would otherwise have been distributed in three or more meals during longer days of the year. Data presented in Table 4.3 provide some indication of meal patterns in different seasons of the year. It will be seen from the table that the frequency of cereals eaten in December is less than at any other time of the year. In particular, the frequency of use of cereals in 'poor' households drops from 3/day to just over 2/day. This lower frequency of meal preparation is suggestive of less frequent eating and hence less in absolute amount. However, lack of enough empirical evidence makes it necessary to speculate rather than conclude.

Figure 4.3 illustrates the man energy intake of the under-fives expressed per kg body weight. Although the pattern is essentially the same as mean absolute intake the difference between the 'poor' and the 'better-off' groups is reduced. During March-April and June the 'poor' males had higher intakes than the 'better-off' males but during September-October and December they were practically the same. The female intakes

Fig. 4.3

Energy and protein Intake of children 1-4 years

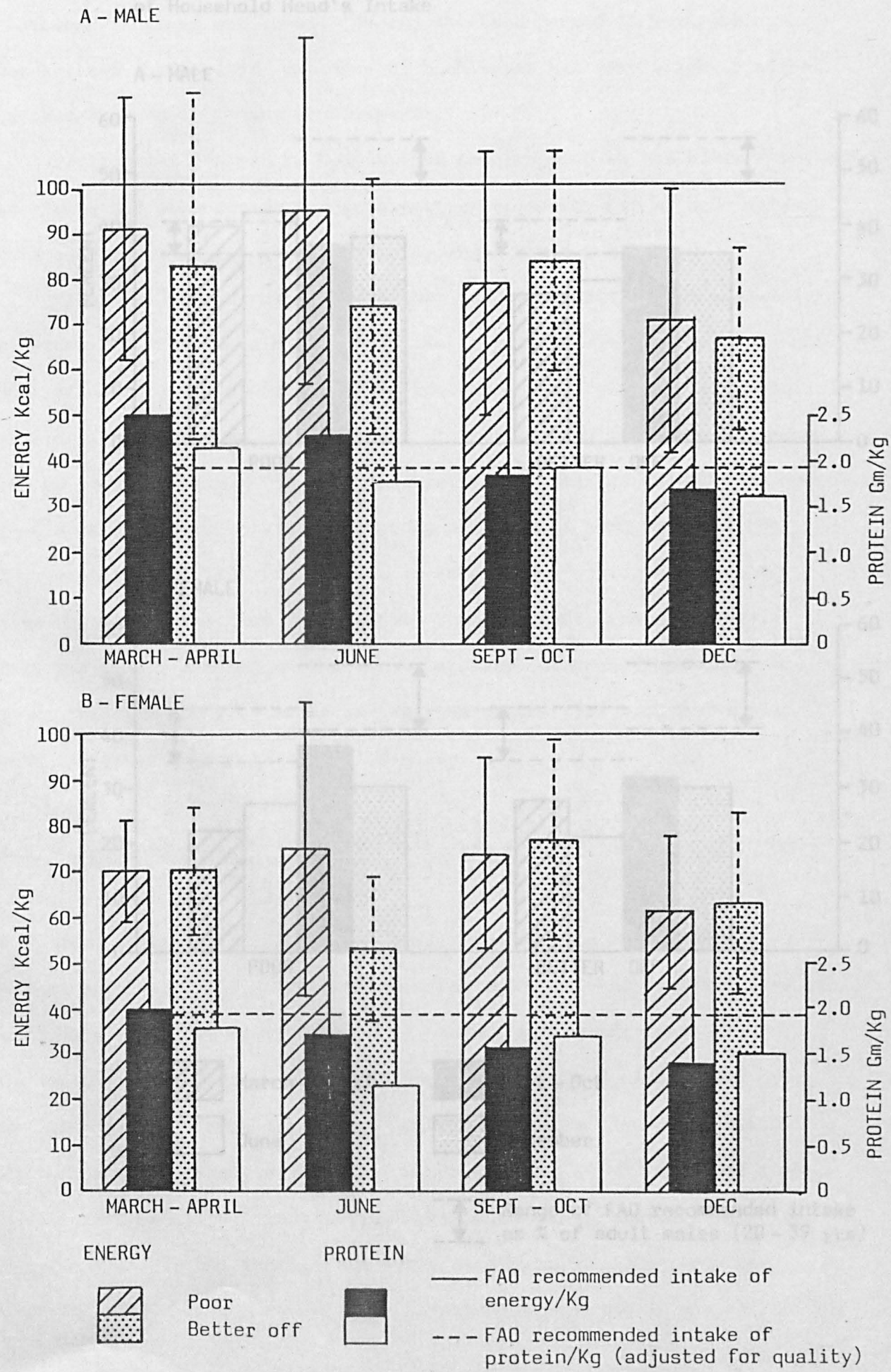
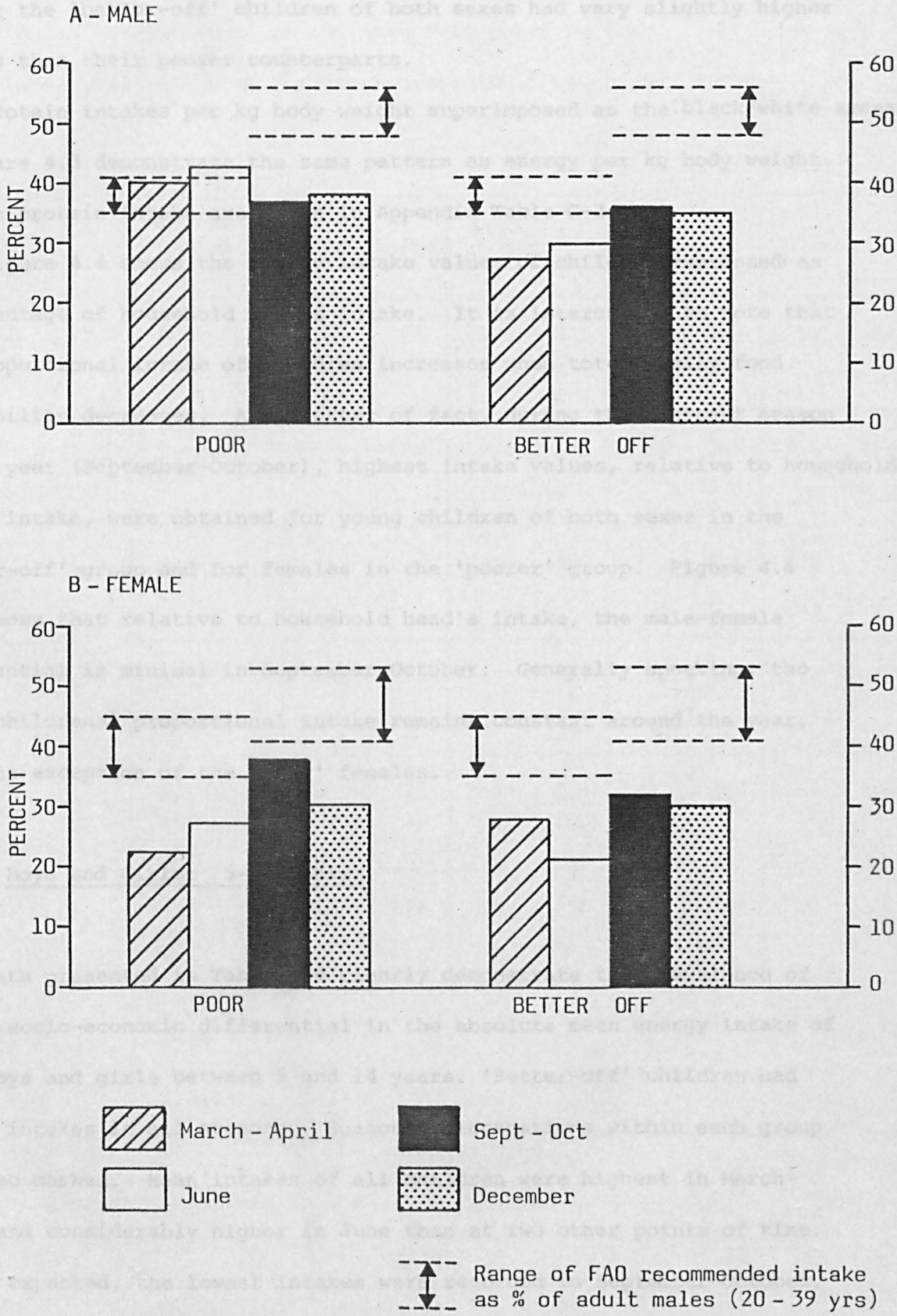


Fig. 4.4

Energy Intake of children 1 - 4 years as percent of Household Head's Intake



in both groups are the same except in June when the intake in the 'better-off' group was lower. During the lean period in September-October the 'better-off' children of both sexes had very slightly higher intakes than their poorer counterparts.

Protein intakes per kg body weight superimposed as the black/white areas in Figure 4.3 demonstrate the same pattern as energy per kg body weight. Data on protein intake are given in Appendix Table C-3.

Figure 4.4 shows the energy intake values of children expressed as a percentage of household head's intake. It is interesting to note that the proportional intake of children increases when total family food availability decreases. As a matter of fact, during the scarcest season of the year (September-October), highest intake values, relative to household head's intake, were obtained for young children of both sexes in the 'better-off' group and for females in the 'poorer' group. Figure 4.4 also shows that relative to household head's intake, the male-female differential is minimal in September-October. Generally speaking, the young childrens' proportional intake remains constant around the year, with the exception of the 'poor' females.

4.1.3 Boys and Girls: 5-14 Years

Data presented in Table 4.4 clearly demonstrate the prevalence of marked socio-economic differential in the absolute mean energy intake of both boys and girls between 5 and 14 years. 'Better-off' children had higher intakes in all seasons. Seasonal fluctuations within each group are also marked. Mean intakes of all children were highest in March-April and considerably higher in June than at two other points of time. As was expected, the lowest intakes were recorded in September-October, but surprisingly the intakes did not rise substantially in December after the main rice harvest. The magnitude of decline in the intake

Table 4.4

Mean Energy Intake of children 5-14 years by sex and socio-economic class at different times (KCal/person/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept.-Oct.	December
Male	Poor	1430 ± 422 (14)	1395 ± 270 (14)	1225 ± 286 (21)	1258 ± 324 (21)
	Better-off	1829 ± 188 (3)	1594 ± 375 (11)	1311 ± 303 (13)	1464 ± 283 (11)
	Rich	1484 ± 472 (2)	1718 ± 490 (2)	1820 ± 1093 (3)	1796 ± 772 (3)
Female	Poor	1423 ± 474 (11)	1350 ± 384 (24)	1158 ± 179 (25)	1364 ± 437 (26)
	Better-off	1701 ± 332 (5)	1563 ± 271 (10)	1433 ± 305 (11)	1456 ± 251 (11)
	Rich	2103 ± 247 (2)	1425 ± 210 (3)	1856 ± 427 (4)	1709 ± 143 (4)
*FAO recommended intake	Male	1392			
	Female	1325			

*Details of computation are given in Appendix Table C-1.

Fig. 4.5

Energy and protein Intake of boys and girls 5 - 14 years

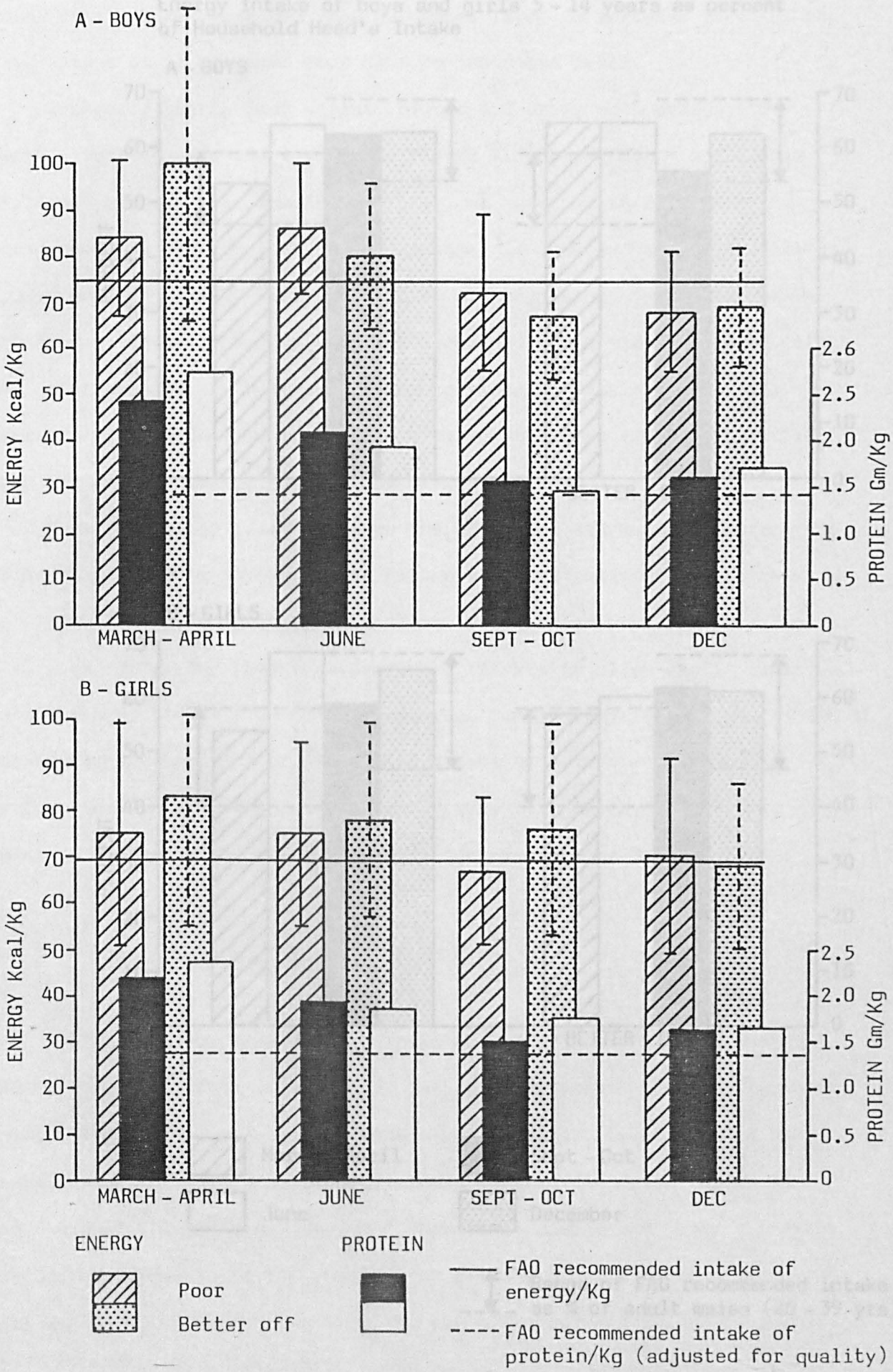
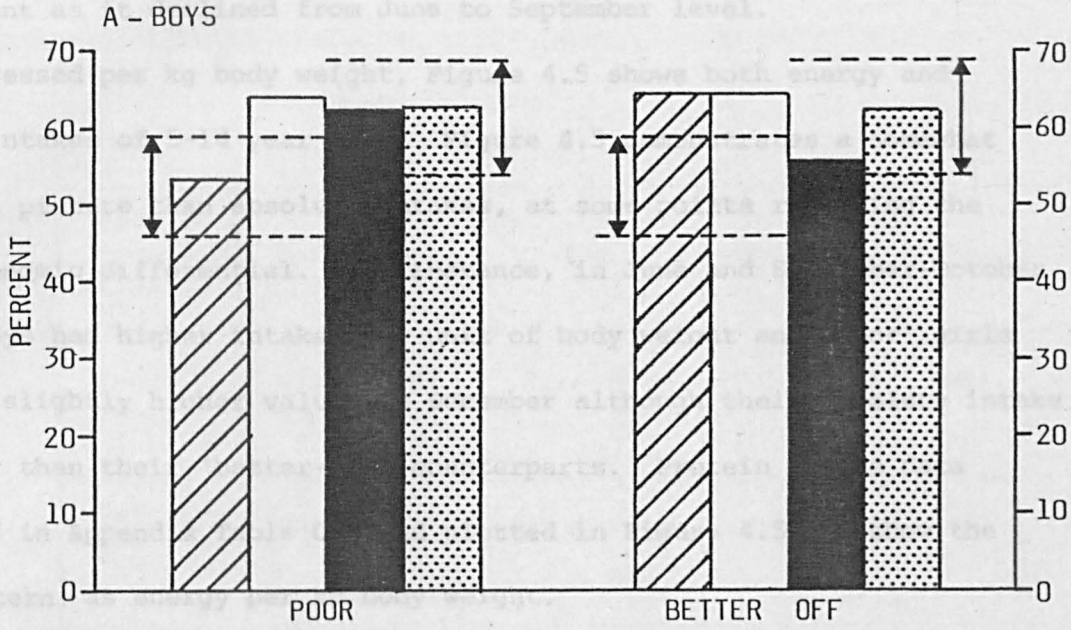
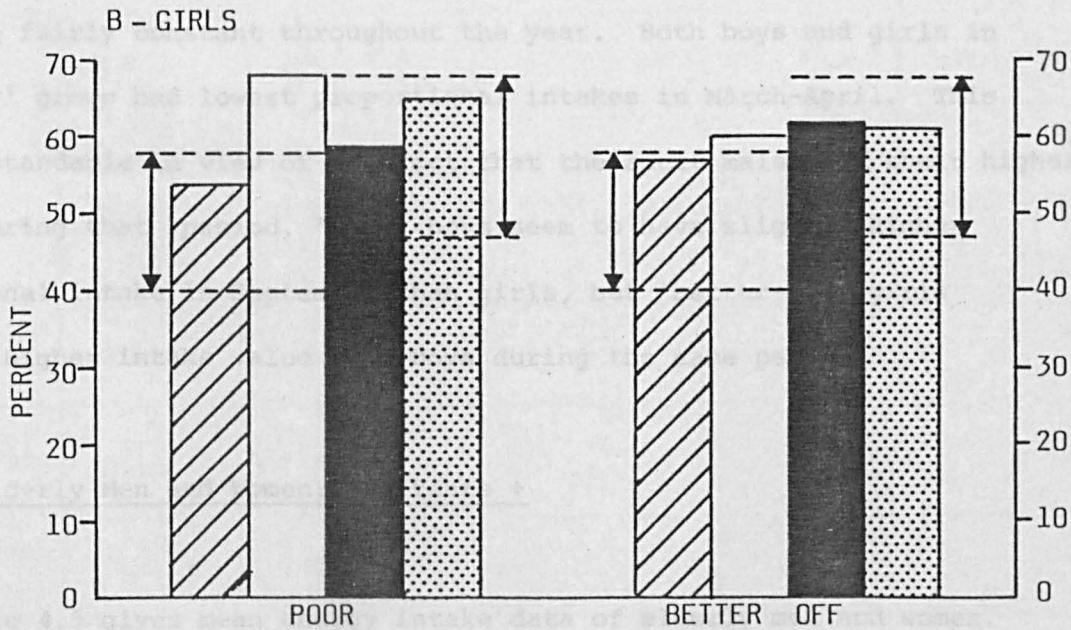


Fig. 4.6

Energy Intake of boys and girls 5 - 14 years as percent of Household Head's Intake





March - April

Sept - Oct

June

December

Range of FAO recommended intake as % of adult males (20 - 39 yrs)

from June to September was considerably higher than that of increase from September to December level. The only exceptions were 'poor' girls whose mean intake increased from September level to December level by the same extent as it declined from June to September level.

Expressed per kg body weight, Figure 4.5 shows both energy and protein intakes of 5-14 year olds. Figure 4.5 demonstrates a somewhat different picture than absolute intakes, at some points reversing the socio-economic differential. For instance, in June and September-October 'poor' boys had higher intakes per unit of body weight and 'poor' girls obtained slightly higher values in December although their absolute intake was lower than their 'better-off' counterparts. Protein intake data presented in Appendix Table C-4 and plotted in Figure 4.5 show the same pattern as energy per kg body weight.

When the energy intake of boys and girls are expressed as percentage of household head's intake, as in Figure 4.6, the relative intake seems to remain fairly constant throughout the year. Both boys and girls in the 'poor' group had lowest proportional intakes in March-April. This is understandable in view of the fact that the adult males had their highest intake during that period. 'Poor' boys seem to have slightly higher proportional intake in September than girls, but 'better-off' girls obtained higher intake value than boys during the same period.

4.1.4 Elderly Men and Women: 45 Years +

Table 4.5 gives mean energy intake data of elderly men and women. Elderly people of both sexes in the 'better-off' group had higher absolute intakes than the 'poor' except in December when 'poor' females had a 7% higher intake. There was only one elderly man in the 'rich' group who had a higher intake in all rounds. When their energy and protein intakes are expressed per kg of body weight the pattern appears to be more or less similar to that of adults in the age group between 15 and 44 years (see Appendix 'C': Table 5).

Table 4.5

Mean Energy Intake of elderly men and women (45 yrs +) by socio-economic class at different times (KCal/person/day ± S.D)

Sex	Socio-economic class	March-April	June	Sept.-Oct.	December
Men	Poor	2710 ± 687 (4)	2214 ± 519 (5)	1975 ± 494 (8)	2091 ± 509 (8)
	Better-off	2827 ± 321 (3)	2706 ± 346 (9)	2359 ± 299 (12)	2489 ± 374 (8)
	Rich	-	3356 ± 0 (1)	3169 ± 0 (1)	2636 ± 0 (1)
Women	Poor	1665 ± 0 (1)	1733 ± 1066 (4)	1474 ± 317 (5)	1591 ± 423 (5)
	Better-off	1982 ± 0 (1)	1884 ± 401 (5)	1827 ± 407 (4)	1489 ± 264 (4)
	Rich	-	-	-	-
*FAO recommended intake (group mean)	Male	1889			
	Female	1463			

*Details of computation are given in Appendix Table C-1.

Calculation of 'per caput' intakes. Thus far, the energy intakes have been expressed as mean values for age/sex/socio-economic class groups. To facilitate comparison with other data, the total set of energy intake data has been recalculated as 'per caput' intake. That is, total amount of energy consumed in the study population is divided by total number of individuals. It is in this way that national food supply data, and the results of large-scale household surveys, are expressed (e.g. FAO, 1977). Intakes calculated in this way are shown in Table 7.1; taking the entire year together, they amounted to 1750 kcalories/person/day.

4.2 STATISTICAL TREATMENT OF ENERGY INTAKE DATA

Analysis of variance (ANOVA) indicated the existence of seasonal as well as socio-economic differences in the overall energy intake. Comparisons were then made among different age and sex groups by ONEWAY analysis of variance followed by LSD (Least significant difference) and LSDMOD (Modified LSD). The results are presented in Tables 4.6(a) and 4.6(b) and referred to in the discussion and interpretation of results in Chapter 7.

4.3 VITAMIN A AND DIETARY FAT INTAKE

Table 4.7 shows the seasonal fluctuations in the intake of vitamin A. The highest intakes were recorded for all age/sex and socio-economic groups in June, except for 'rich' males who had their highest intake in September. The data clearly demonstrate very high inter-individual variations and the relatively small number of subjects in the 'rich' group who had relatively higher intake of leafy green vegetables in September-October may explain the deviation from the trend. By far the major source of the vitamin in the diet is carotene from leafy green and yellow vegetables and seasonal fruits like mangoes. Although very large amounts of carotene are ingested at certain times of the year, how much of the ingested carotene is available and actually absorbed and utilized is not known. Estimates on the availability of carotene from various sources are scanty. Only limited range of foods has been examined. It is therefore not possible to make an accurate prediction on the availability of carotene from these sources.

Certain minimum amount of fat is necessary for absorption and utilization of carotene, but the minimum level is not known. However, the beneficial effect of fat supplementation has been demonstrated in

Table 4.6 (a)

Analysis of Variance: Seasonal and socio-economic effect on energy intake of certain age/sex groups

Age/sex group	Source of variance	F Prob.	LSD	LSDMOD
5-14 yrs: Male				
Absolute E intake	SOC	< .0018	IP < (IB + IR)	IP < IR
Per kg E intake	SOC	No difference		
5-14 yrs:Female				
Absolute E intake	SOC	< .00001	1) IP < IB 2) IP < IR 3) IB < IR	IP < (IB + IR)
Per kg E intake	SOC	No difference		
15-44 yrs: Male				
Absolute E intake	SNL	< .00001	$(R_3 + R_4) < (R_2 + R_1)$	$(R_3 + R_4) < (R_2 + R_1)$
Per kg E intake	SNL	< .0001	$(R_3 + R_4) < (R_2 + R_1)$	$(R_3 + R_4) < (R_2 + R_1)$
15-44 yrs:Female				
Absolute E intake	SNL	< .0001	$(R_4 + R_3) < (R_2 + R_1)$	$(R_4 + R_3) < (R_2 + R_1)$
Per kg E intake	SNL	< .0007	$(R_4 + R_3) < (R_2 + R_1)$	$R_4 < (R_2 + R_1)$
Absolute E intake	SOC	< .007	IP < IB	IP < IB
Per kg E intake	SOC	< .001	IP < Ib	IP < IB
45 yrs+ : Male				
Absolute E intake	SNL	< .042	1) $R_3 < R_2$ 2) $R_4 < R_1$	No difference
Per kg E intake	SNL	< .0015	$(R_3 + R_4) < (R_2 + R_1)$	$(R_3 + R_4) < R_1$
Absolute E intake	SOC	< .0014	IP < (IB + IR)	IP < (IB + IR)
Per kg E intake	SOC	No difference		

E - Energy
SOC - socioeconomic
SNL - Seasonal

IP - Intake of poor group
IB - Intake of better-off group
IR - Intake of rich group

R_1 - March-April
R_2 - June
R_3 - Sept.-Oct.
R_4 - December

Table 4.6 (b)

Analysis of Variance: Effect of sex on energy intake/kg

Age group	Source of variance	F. Prob.	LSD	LSDMOD
1-4 yrs	Sex	.04	IF < IM	IF < IM
5-14 yrs	Sex	No difference		
15-44 yrs	Sex	.0001	IF < IM	IF < IM

IM = Intake of males

IF = Intake of females

Table 4.7

Mean Vitamin A Intake as total retinol equivalents and the retinol equivalents of carotene (μg/person/day ± S.D.) in different seasons

Sex/age	Socio-economic class	March-April	June	Sept.-Oct.	December
Male: 1-14 yrs	Poor	155 ± (149)	341 ± (335)	65 ± (65)	145 ± (143)
	Better-off	35 ± (29)	378 ± (353)	125 ± (118)	162 ± (150)
	Rich	86 ± (29)	458 ± (413)	84 ± (68)	24 ± (24)
Female: 1-14 yrs	Poor	207 ± (202)	654 ± (651)	174 ± (174)	138 ± (136)
	Better-off	63 ± (48)	410 ± (402)	189 ± (184)	148 ± (139)
	Rich	335 ± (251)	493 ± (452)	132 ± (132)	55 ± (52)
Male: 15 yrs +	Poor	212 ± (194)	697 ± (695)	240 ± (240)	309 ± (300)
	Better-off	59 ± (53)	1362 ± (1351)	306 ± (297)	664 ± (657)
	Rich	242 ± (198)	812 ± (788)	1148 ± (1141)	161 ± (131)
Female: 15 yrs +	Poor	336 ± (331)	739 ± (735)	177 ± (177)	264 ± (259)
	Better-off	175 ± (165)	630 ± (623)	212 ± (208)	390 ± (383)
	Rich	537 ± (484)	597 ± (544)	356 ± (354)	98 ± (79)

Figures in parentheses are retinol equivalents of carotene (carotene X .167).

Fig. 4.7

Intake of green, leafy and yellow vegatables, fruits and dietary fat in different seasons : 1 - 14 years

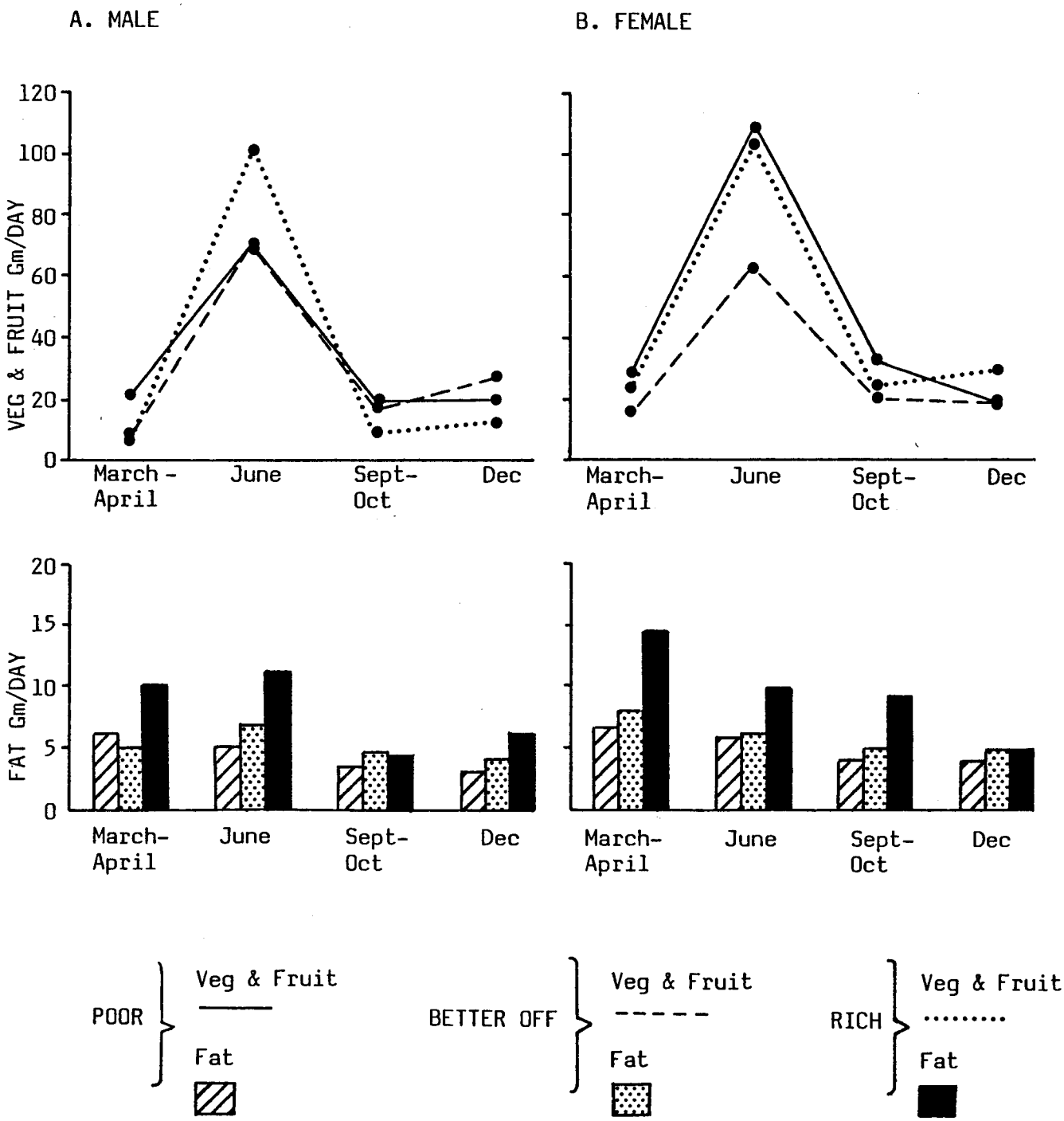
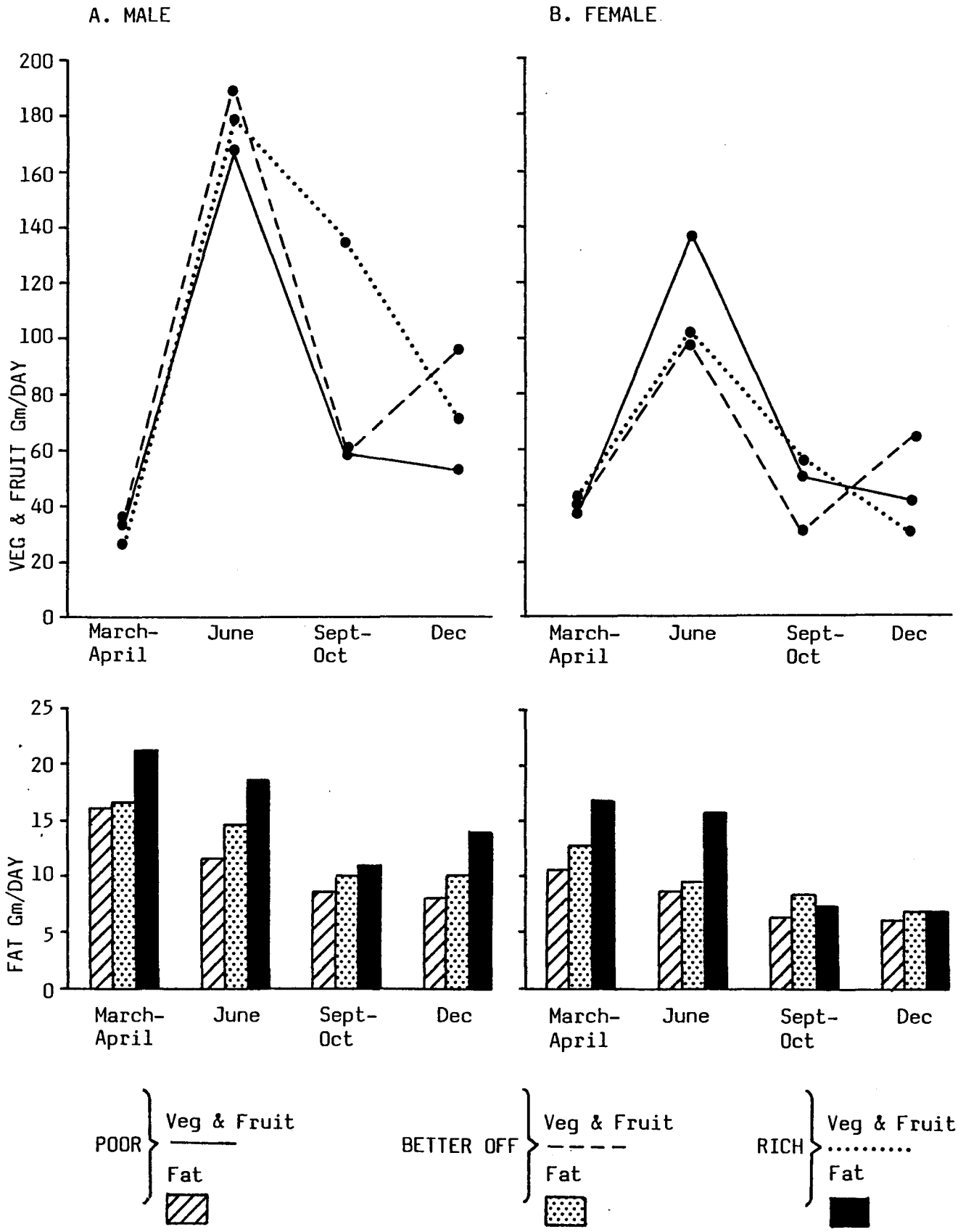


Fig. 4.8

Intake of green, leafy and yellow vegetables, fruits and dietary fat in different seasons : 15 - 44 years.



the absorption and utilisation of carotene (Jayarajan et al., 1980; Geervani and Devi, 1981)

Fat intake is extremely low. The intake of dietary fat does not increase corresponding to the increase in carotene intake. Figures 4.7 and 4.8 show the intake of carotene-rich leafy green and green and yellow vegetables and fruits in different seasons. When the intake of carotene-rich foods was the highest in June, intake of dietary fat was even lower compared to other seasons of the year.

Signs associated with vitamin A deficiency were not looked for in the present study. One hospital records-based study conducted in Bangladesh demonstrated that the incidence of Keratomalacia was lowest in June when vitamin A intake was the highest in the year (US-DHEW, 1966) The lowest fat intakes (around 2% of total calories) are consonant with consumption of milled rice and vegetables only, and occur in the 'poor'.

4.4 GENERAL DIETARY PATTERN

The usual diet of the community is predominantly cereal based. Well over 80% of the energy intake is derived from cereals alone. Table 4.8 shows the intake of the foods which provide the bulk of macro-nutrients in the diet of adults between 15 and 44 years. It is interesting to note the amount of wheat in the diet of the 'poor' in March-April, constituting 57% of total cereal intake of males as against barely 6% in December. During March-April the landless labourers were working in 'Food for Work' projects and received wheat as wages. Wheat is also grown in the area and the first round dietary intake study was conducted just after the wheat-harvest. Large amounts of wheat were therefore also consumed by the 'better-off' and 'rich'. Even then the 'poor' man's wheat intake was considerably higher than the other two groups (157% of 'better-off' and 175% of 'rich').

Compared to cereals, intake of roots and tubers was insignificant. Legume intakes were also very low, but 'better-off' and 'rich' groups

consumed more legumes than the 'poor'. Intake of molasses (crude sugar) was highest in March-April as it was eaten with *roti* (unleavened wheat bread). The food intake pattern of females was similar to that of males.

The proportion of legumes:cereals was small in all classes, and possibly reflected recent trends in cropping patterns in Bangladesh, where farmers have been moving away from growing legumes and to the more profitable cereals. Consequently legumes are quite expensive. The principal legume produced and consumed in the area is *khesari* (*Lathyrus sativus*).

Table 4.8

Intake of Foods providing Macro-nutrients in the adult (15-44 yrs) diet in different seasons

(Gm/person/day)

Food items	Poor				Better-off				Rich			
	March-April	June	Sept.-Oct.	Dec.	March-April	June	Sept.-Oct.	Dec.	March-April	June	Sept.-Oct.	Dec.
Male:												
Rice	322.3	543.5	527.0	579.4	424.2	603.8	614.6	625.3	465.1	606.6	689.1	662.4
Wheat	442.2	110.6	79.1	39.7	281.0	86.1	8.9	8.7	253.1	82.5	12.7	13.3
Other	5.2	27.6	.1	45.2	5.2	66.3	10.1	36.2	33.1	6.5	20.3	19.2
Total	769.7	681.7	606.2	664.3	710.4	756.2	633.6	670.2	750.8	695.6	722.1	694.9
Roots and tubers	52.5	9.4	46.5	6.7	68.6	61.9	66.6	7.0	43.1	84.6	1.2	27.1
Molasses (crude sugar)	27.5	.6	2.5	11.8	15.1	1.9	.7	21.0	31.2	0	5.5	11.5
Legumes	16.2	3.4	5.9	10.6	20.6	17.8	18.1	15.4	48.2	32.7	27.2	13.7
Female:												
Rice	200.5	384.1	407.9	415.6	339.8	467.8	469.2	498.6	329.8	439.7	468.6	452.4
Wheat	319.5	117.1	56.2	32.5	239.4	46.5	21.2	2.9	180.9	71.3	0	3.7
Other	23.8	10.5	3.1	17.2	.9	26.0	30.7	20.0	22.9	9.3	66.6	14.4
Roots and tubers	22.7	44.1	42.0	4.0	97.3	37.4	55.8	4.1	44.0	46.6	.9	14.5
Molasses (crude sugar)	37.7	1.9	1.4	3.5	37.2	3.6	2.8	11.1	26.0	0	5.8	6.1
Legumes	12.7	17.2	6.2	d9.8	23.0	14.7	16.8	18.7	38.8	20.7	15.1	3.9

5

ANTHROPOMETRY

This chapter presents the description and analysis of anthropometric (weight and height) data obtained by consecutive measurements of the study population. Weight measurements were done once every month from March to January. Height was measured at baseline on all samples and thereafter at 3 monthly intervals on growing children up to 14 years. Weight and height data have been analysed by socio-economic class with the primary object of identifying changes and trends over time rather than comparing them with international standards. However weight data of children up to 5 years of age have been compared with international standards for the purpose of quantifying proportions below or above certain cut-off points between seasons so that the differentials in food intake could be better understood.

5.1 WEIGHT CHANGES

5.1.1 Children Between 1 and 4 years

Mean weights of children between 1 and 4 years are presented in Table 5.1. Apart from fluctuations over time the mean weights of both 'poor' and 'better-off' children appear to remain more or less unchanged between baseline measurement until September-October. In other words these children have not been growing during the period. During July-August and September-October the mean weight declined slightly. From October-November the mean weights exhibit an upward trend and by December the children are 1-2 kg heavier relative to the baseline measurement. The growth pattern does not show any difference between the 'poor' and the 'better-off' groups. The difference between the 'poor' and the

Table 5.1

Mean Weight of Children 1-4 yrs by month of measurement

by socio-economic class (kg ± S.D.)

Sex	Socio-economic class	March	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Male	Poor	10.3 ±2.0 (12)	10.3 ±2.0 (15)	10.5 ±2.0 (20)	9.7 ±1.8 (21)	10.2 ±1.9 (19)	10.2 ±2.2 (19)	10.2 ±2.2 (19)	10.4 ±2.1 (18)	10.8 ±2.1 (21)	11.4 ±2.2 (22)
	Better-off	9.6 ±2.4 (7)	9.1 ±1.3 (6)	10.6 ±2.3 (17)	10.1 ±2.1 (16)	10.5 ±1.8 (15)	10.3 ±2.3 (16)	10.6 ±2.2 (17)	10.2 ±1.8 (16)	11.0 ±2.2 (17)	11.6 ±2.0 (16)
	Rich	12.0 ±.7 (3)	12.4 ±.7 (3)	13.1 ±.6 (3)	12.3 ±.8 (4)	12.1 ±.7 (3)	12.5 ±.6 (4)	13.7 ±0 (1)	13.2 ±.4 (4)	13.6 ±.4 (4)	14.1 ±.3 (3)
Female	Poor	9.0 ±1.9 (7)	9.6 ±1.4 (5)	9.7 ±2.1 (11)	9.2 ±2.3 (10)	9.3 ±1.9 (9)	9.5 ±2.1 (10)	9.8 ±1.9 (10)	9.7 ±1.5 (10)	10.5 ±1.9 (10)	10.4 ±1.8 (10)
	Better-off	10.7 ±2.3 (2)	10.7 ±2.3 (2)	10.1 ±1.9 (4)	9.8 ±1.7 (4)	8.9 ± .3 (3)	9.7 ±1.7 (4)	9.4 ±1.6 (5)	9.5 ±1.9 (5)	10.7 ±2.7 (4)	10.9 ±2.2 (5)
	Rich	11.4 (1)	11.4 (1)	12.2 (1)	11.8 (1)	12.2 (1)	12.2 (1)	12.2 (1)	12.2 (1)	13.2 (1)	14.1 (1)

Figures in parentheses are numbers of children.

'better-off' children in mean weight is very small. In most months the 'better-off' children's mean weight is greater than the 'poor'; but also their mean age is slightly greater. During early childhood they are more or less the same, but as they grow older the socio-economic differential widens as will be seen in the 5-14 years age group. The number of children in the 'rich' group is very small (3-4). Although the pattern of their growth is similar to the other two groups they are all along heavier in weight.

5.1.2 Boys and Girls: 5-14 years

Mean weight data of boys and girls between 5 and 14 years are given in Table 5.2. The mean weights of boys show the same pattern of fluctuation as children in 1-4 years age group but the girls exhibit a better growth pattern from July-August onward. Socio-economic differential in the mean weight of both sexes is clearly seen. 'Better-off' children are heavier by 2-3 kg. However there is an age differential between these two groups. 'Better-off' children, are on average a year older than the poor children. Nevertheless the socio-economic differential is clearly manifested.

5.1.3 Adult: 15-44 years

Table 5.3 presents mean weights of men and women between 15 and 44 years. Apart from minor falterings the mean weights of 'better-off' adults remained more or less constant throughout the year. Poor males show quite marked deviations at certain points. In August the mean weight of 'poor' males was 3 kg higher than in the previous month. A closer look however reveals that the mean is based on less than half the observation in two adjacent months. It is quite probable that the lighter individuals were missed during August weighing.

Table 5.2

Mean Weight of Boys and Girls (5-14 yrs) by month of measurement by socio-economic class (kg ± S.D.)

Sex	Socio-economic class	March	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Male	Poor	17.7 ±3.7 (15)	18.0 ±3.7 (12)	17.8 ±5.0 (20)	16.9 ±4.9 (19)	17.4 ±4.7 (17)	17.0 ±4.0 (19)	16.7 ±4.2 (20)	17.7 ±4.8 (18)	19.2 ±5.3 (20)	18.6 ±4.6 (19)
	Better-off	20.4 ±2.7 (7)	20.2 ±3.7 (6)	20.3 ±3.5 (11)	19.3 ±3.4 (11)	20.7 ±3.0 (7)	20.0 ±3.1 (12)	20.4 ±2.3 (12)	19.7 ±3.4 (12)	21.2 ±3.1 (12)	21.1 ±2.5 (11)
	Rich	17.8 ±4.2 (2)	18.2 ±3.3 (2)	21.6 ±8.7 (2)	20.3 ±6.8 (3)	17.1 ±5.4 (2)	21.0 ±6.6 (3)	24.5 ±5.1 (2)	21.2 ±5.9 (3)	25.8 ±4.6 (2)	22.7 ±7.0 (3)
Female	Poor	19.0 ±4.9 (17)	19.3 ±4.9 (17)	18.9 ±4.9 (29)	17.8 ±5.3 (23)	18.6 ±5.0 (22)	18.4 ±5.3 (26)	19.5 ±4.9 (25)	19.7 ±5.3 (24)	20.2 ±5.0 (28)	20.4 ±5.5 (28)
	Better-off	21.0 ±5.9 (8)	21.6 ±6.5 (7)	20.7 ±6.2 (13)	20.7 ±6.4 (9)	19.5 ±5.9 (10)	20.3 ±7.0 (10)	21.3 ±6.4 (10)	21.8 ±7.7 (10)	21.9 ±6.9 (11)	22.3 ±6.4 (10)
	Rich	26.2 ±8.0 (2)	22.7 - (1)	22.1 ±5.1 (4)	22.2 ±5.2 (4)	19.8 ±3.2 (3)	22.8 ±7.1 (4)	20.0 ±3.3 (3)	22.2 ±2.5 (2)	21.8 ±3.3 (3)	21.8 ±3.6 (3)

Figures in parentheses are numbers of boys/girls.

Table 5.3

Mean Weight of Adult (15-44 yrs) men and women by month of measurement by socio-economic class

(kg ± S.D.)

Sex	Socio-economic class	March	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
Male	Poor	46.6 ±7.4 (13)	46.8 ±6.9 (12)	45.7 ±6.1 (17)	46.5 ±5.4 (19)	49.7 ±4.3 (9)	46.1 ±4.7 (21)	46.2 ±4.9 (18)	46.0 ±3.8 (13)	46.3 ±5.0 (17)	48.1 ±4.5 (15)
	Better-off	46.6 ±3.1 (9)	47.2 ±3.2 (8)	47.2 ±4.4 (16)	46.7 ±4.5 (15)	46.8 ±5.3 (12)	47.0 ±5.0 (14)	46.5 ±4.6 (14)	46.8 ±4.0 (14)	47.2 ±3.5 (18)	46.9 ±3.5 (11)
	Rich	50.6 ±9.9 (9)	51.1 ±11.3 (8)	50.3 ±9.7 (10)	47.1 ±5.1 (6)	50.4 ±11.5 (7)	52.4 ±12.1 (6)	47.6 ±5.7 (5)	50.8 ±12.3 (7)	52.8 ±11.6 (6)	48.4 ±5.6 (5)
Female	Poor	40.7 ±4.1 (18)	41.5 ±3.1 (16)	41.8 ±4.5 (27)	41.5 ±5.5 (26)	41.5 ±5.5 (26)	41.1 ±5.3 (27)	40.9 ±5.2 (26)	40.7 ±5.4 (24)	41.9 ±5.2 (29)	42.0 ±4.8 (31)
	Better-off	39.9 ±5.7 (13)	39.6 ±5.1 (14)	40.6 ±4.9 (20)	39.9 ±4.8 (18)	39.5 ±4.7 (12)	38.6 ±4.7 (17)	39.6 ±4.4 (18)	39.4 ±4.3 (20)	40.4 ±4.3 (20)	40.3 ±3.0 (2)
	Rich	42.5 ±6.2 (5)	41.9 ±5.2 (5)	43.9 ±5.7 (5)	42.7 ±6.8 (5)	41.1 ±5.9 (5)	43.1 ±6.2 (6)	43.2 ±8.1 (4)	43.3 ±6.9 (6)	44.1 ±6.0 (6)	42.7 ±6.7 (3)

Figures in parentheses are number of persons.

Similarly in January the mean weight of the 'poor' males was higher than that of 'better-off' males by a kilogram. If these two points are ignored the 'better-off' males are generally slightly heavier than the 'poor' males. Among the few 'rich' the mean weights do not exhibit any consistent pattern because of missing observations. Nevertheless the 'rich' are all through heavier than the remaining two groups. A decline in the mean weights of all groups in September-October is also noticeable.

More disturbing are the mean weights of women in the 'better-off' group who are 1-2 kg lighter than the 'poor' women. It is not understood why the 'better-off' women are lighter than the 'poor' women. Possibly they happened to be ligher and remained so throughout. Both groups had a decline in their mean weights during September-October.

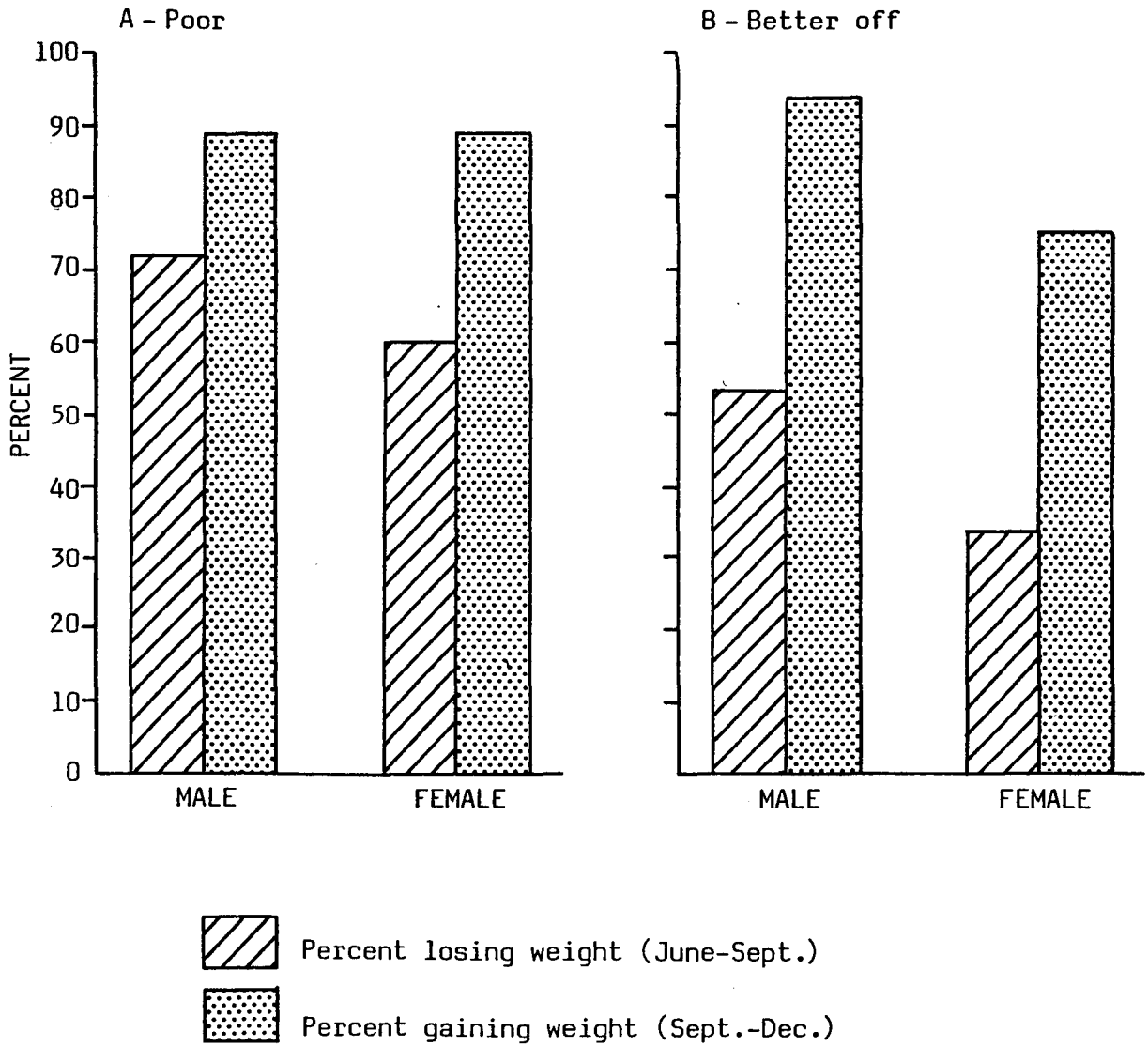
5.2 BETWEEN SEASONS WEIGHT CHANGE

Figure 5.1 shows the proportion of 1-4 year old children losing and gaining weight between seasons. Between June and September the proportion of children (both sexes) losing weight was higher among the 'poor' than among the 'better-off'. In both the groups more boys than girls lost weight. Among the 'poor' the proportion of both male and female children gaining weight in December, relative to September was the same. In the 'better-off' group more boys than girls gained weight during that period.

In the 5-14 year age group more boys than girls among the 'poor' but more girls than boys among the 'better-off' lost weight between June and September (Figure 5.2). As to the gain in weight in December, relative to September the proportion of male and female children was almost the same among the 'poor' but among the 'better-off' more boys than girls gained weight.

Fig. 5.1

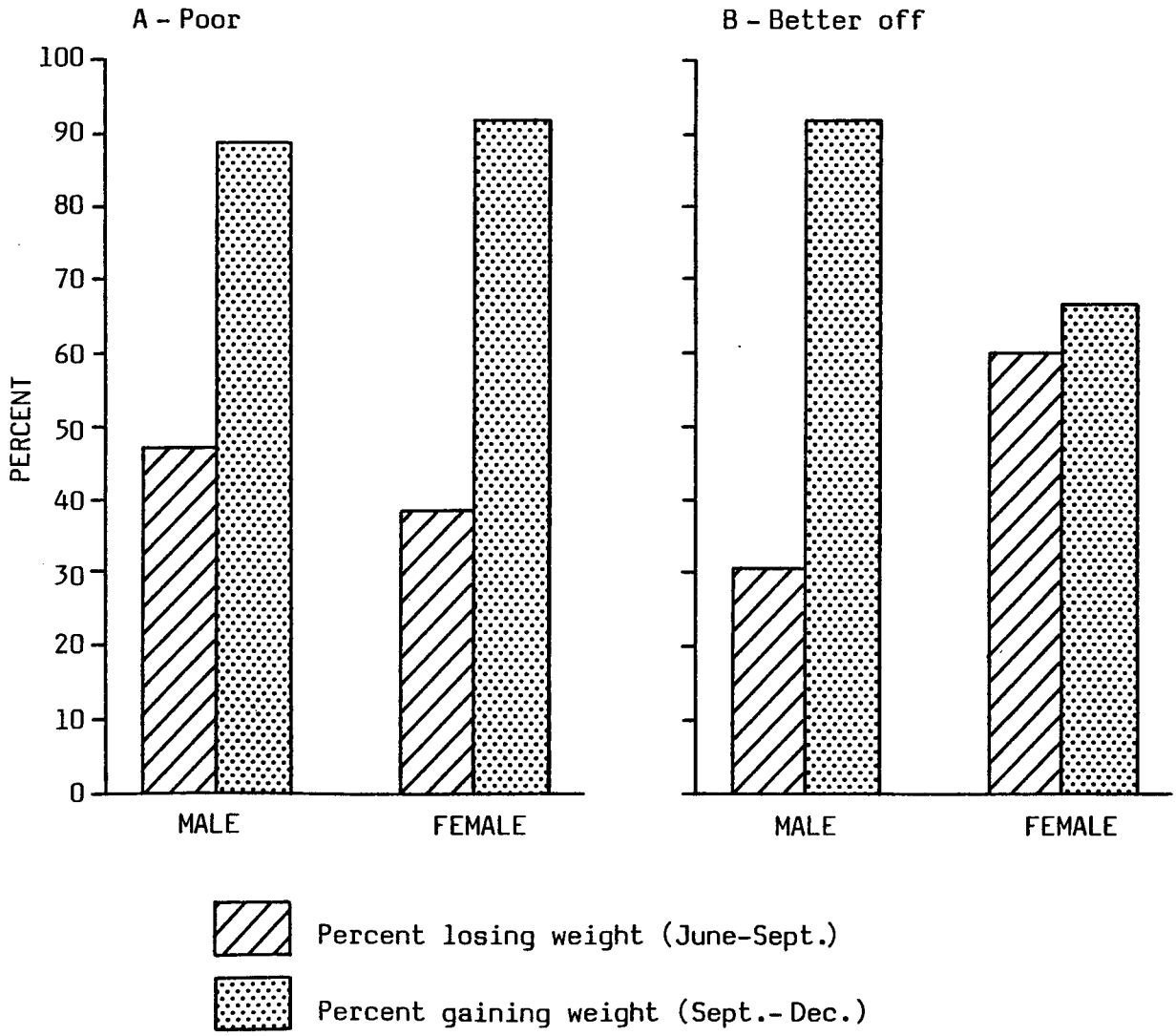
Proportion of children (1-4 yrs.) losing and gaining weight between seasons



(Data used in this figure are given in appendix Table D-3)

Fig. 5.2

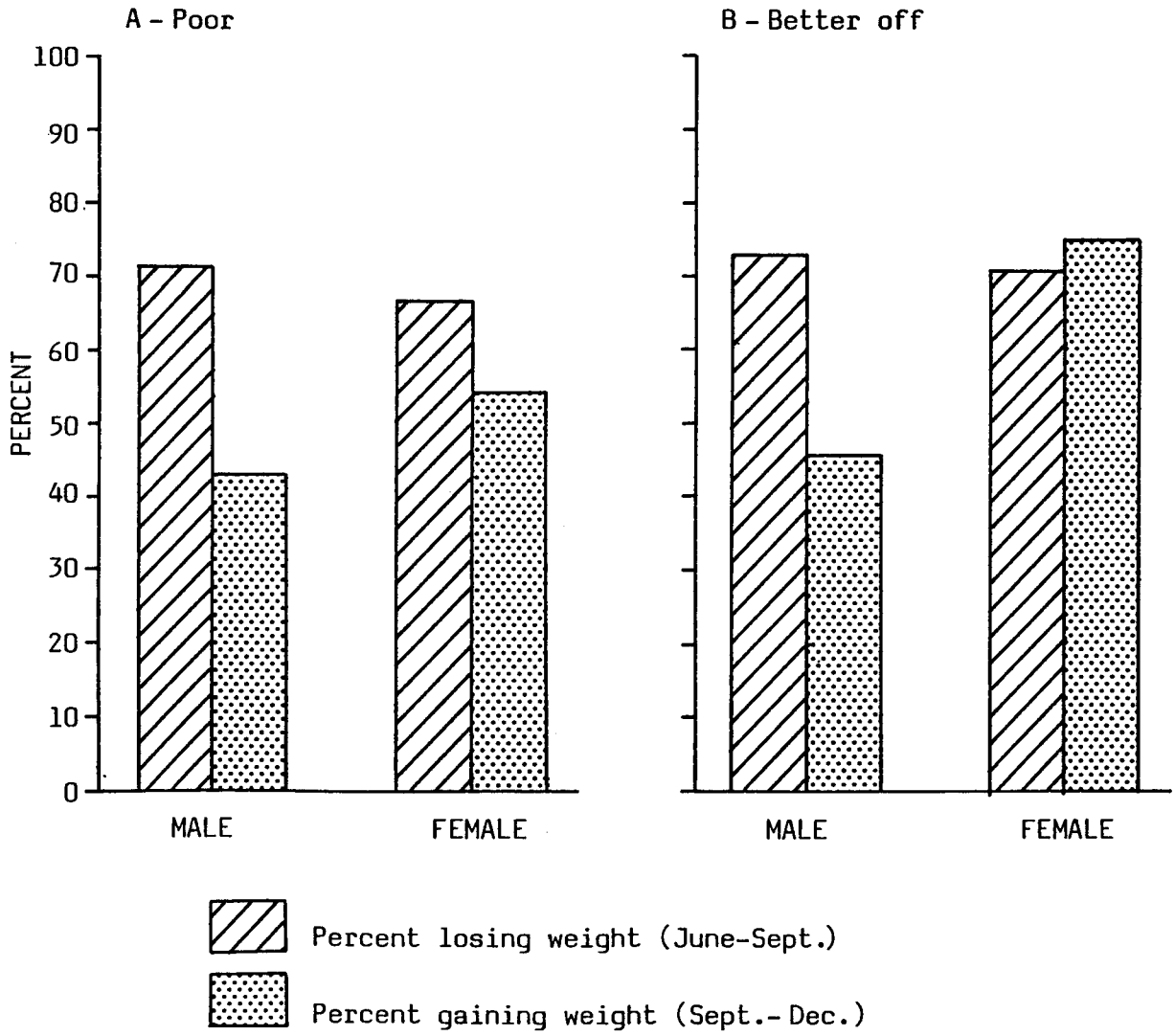
Proportion of boys and girls (5-14yrs.) losing and gaining weight between seasons



(Data used in this figure are given in appendix Table D - 3)

Fig. 5.3

Proportion of adults (15-44 yrs.) losing and gaining weight between seasons.



(Data used in this figure are given in appendix Table D - 3)

As is seen in Figure 5.3 much larger proportions of both men and women in both the socio-economic groups experienced weight loss during the period of food shortage (September). Between sexes the proportion of males losing weight was slightly higher in both the groups.

As to the weight gain in December relative to September the proportions of both men and women among the 'poor' were lower than the corresponding proportions losing weight between June and September. In the 'better-off' group the proportion of men gaining weight was lower than that of losing weight, but among the females the proportion gaining weight was slightly higher than the proportion losing weight. Proportions of children and adults losing weight by October are given in Appendix Table D-3.

5.3 COMPARISON OF CHILDREN BETWEEN 6 MONTHS AND 5 YEARS OF AGE WITH NCHS WT/AGE MEDIAN

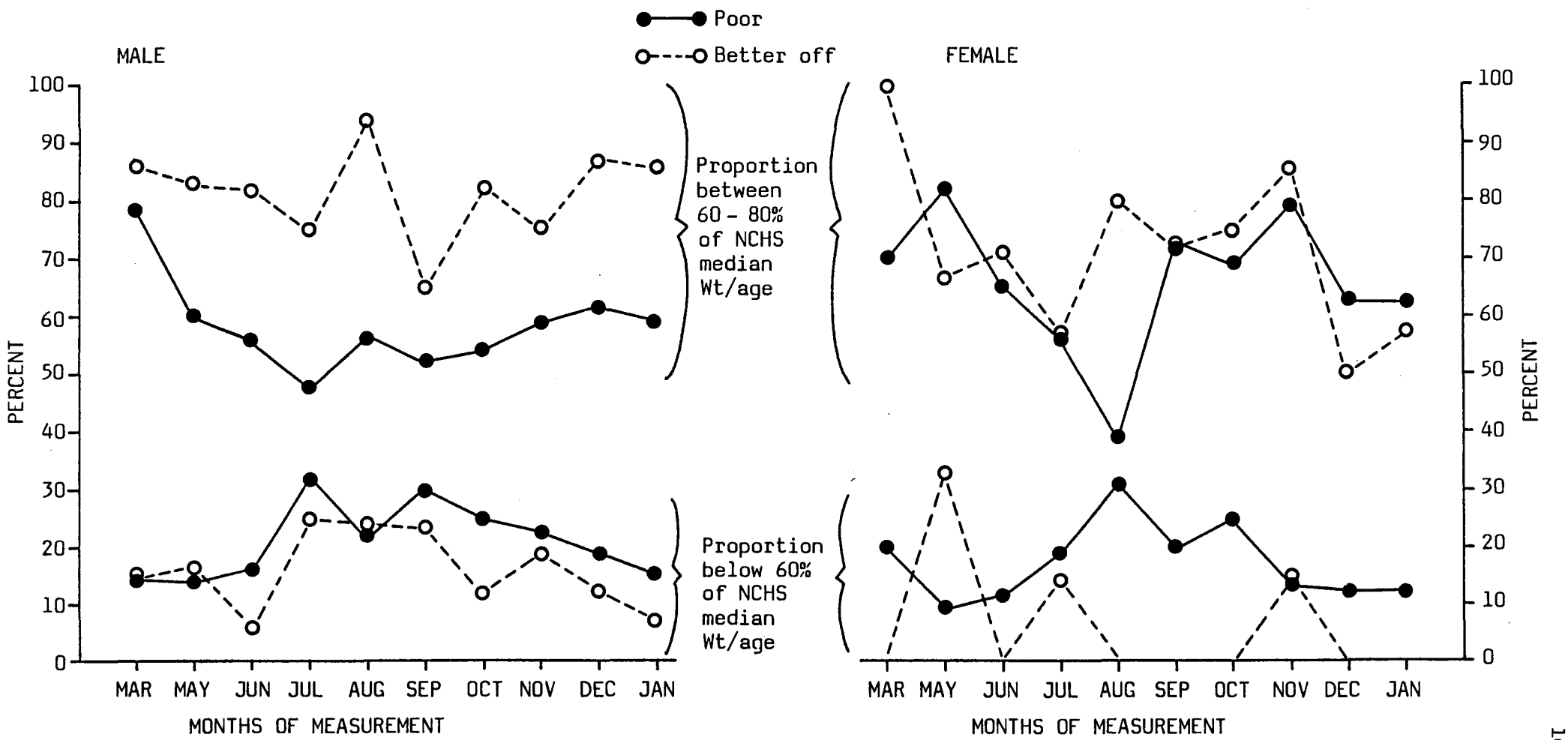
Children between 6 months and 5 years have been compared individually with NCHS median weight for age and grouped into three categories e.g. below 60%, 60-80% and above 80% of NCHS median for age (see Appendix Table D-2). Figure 5.4 plots the proportion of children below 60% and between 60 and 80% by months of measurement. Figure 5.4 demonstrates that generally speaking more boys and girls in the 'poor' group than in the 'better-off' group are below 60% of NCHS median. On the other hand the proportion of children between 60 and 80% of NCHS median is higher in the 'better-off' group. Socio-economic differential although not very significant can be seen in analysis.

5.4 HEIGHT CHANGES: 1-14 YEARS

As the number of successful height measurements are small especially in children it does not make sense to compare height change differentials between socio-economic groups. Height data of all children

Fig. 5.4

Distribution of childern (6m - 5yr) as proportion below 60% and 60 - 80% of NCHS Median Wt/age.



in 1-14 yr age group relating to two points of time (June and December) have therefore been combined by single year and sexes separately and plotted in Figure 5.5 (boys) and Figure 5.6 (girls). It appears that during early childhood both boys and girls are very close to the NCHS 3rd percentile of height/age.

As the age increases they deviate downward and by the age of 4 years both boys and girls are already below the NCHS 3rd percentile of height/age. Figures 5.5 and 5.6 also show that during a span of 6 months (June-December) these children increased in height by 2-3 cm.

Fig. 5.5

Height change of boys (1-14 yrs) between June and December compared to NCHS 3rd percentile of height/age.

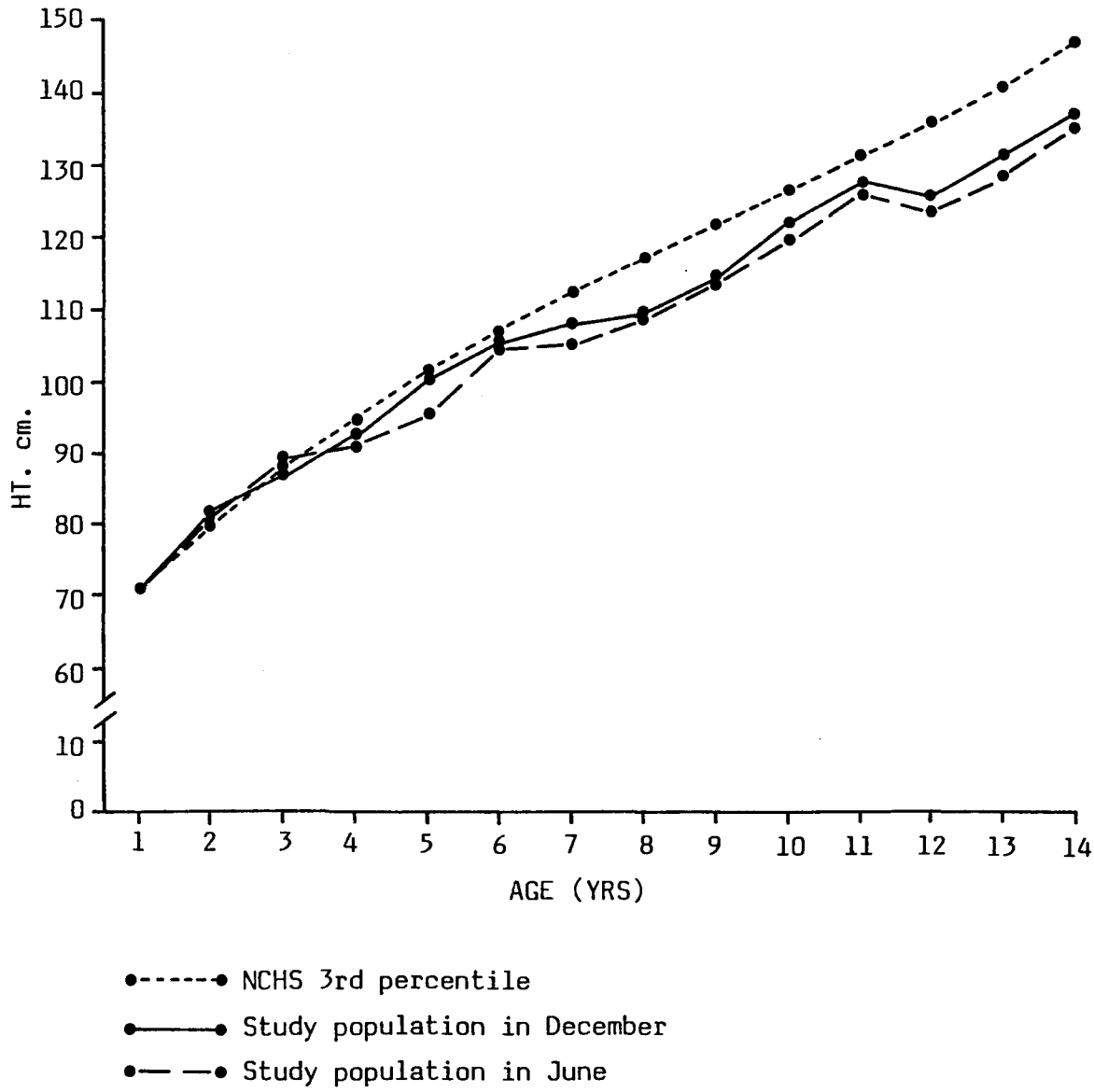
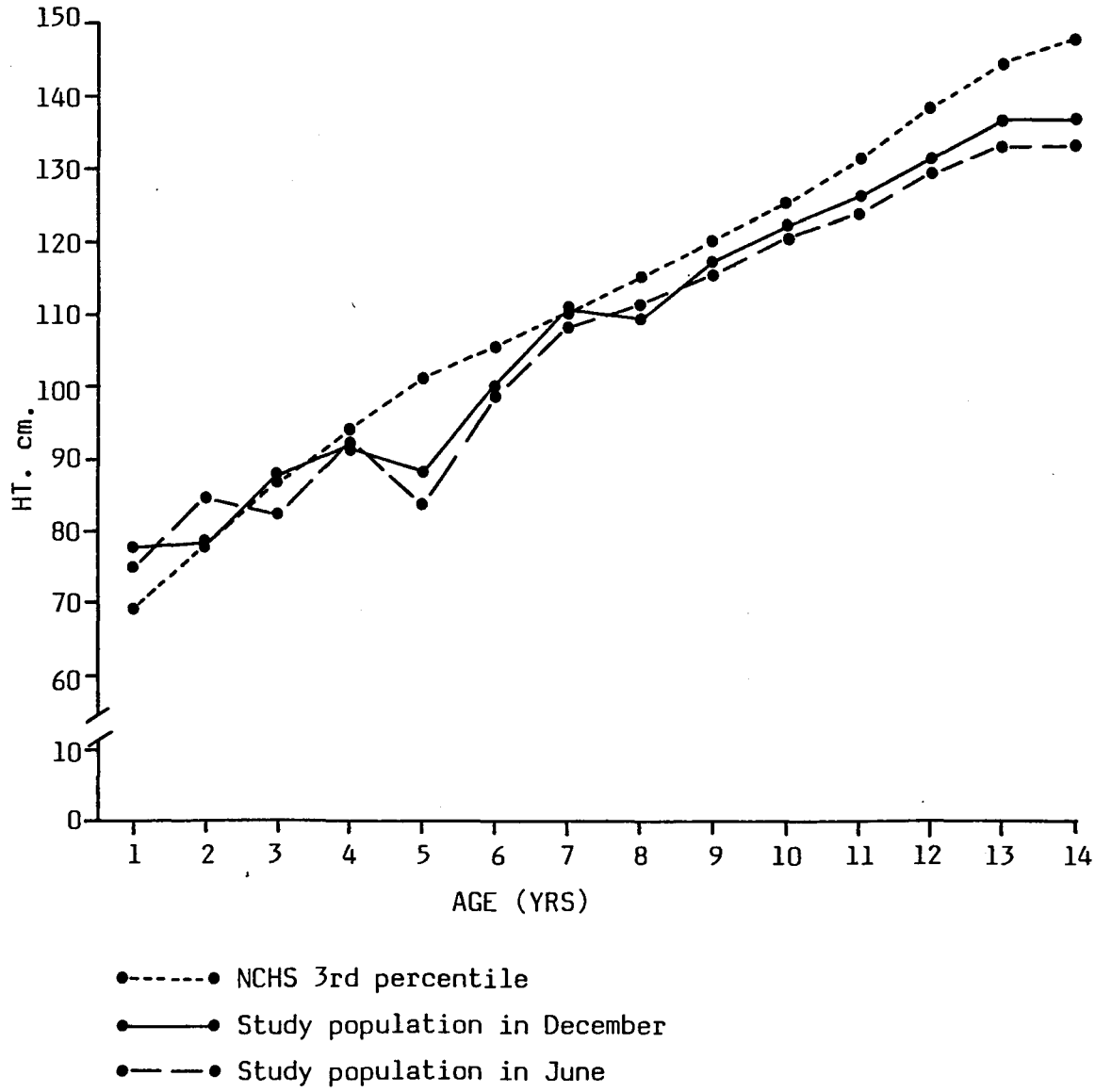


Fig. 5.6

Height change of girls (1-14 yrs) between June and December compared to NCHS 3rd percentile of height/age.



6

PEOPLE'S PERCEPTION OF INDIVIDUAL FOOD NEEDS, HOUSEHOLD DECISION-MAKING PROCESS, ECONOMIC STATUS AND STRATEGIES

This chapter examines the qualitative data relating to people's perception of individual physiological needs for food, and their strategies for dealing with food shortages. The household decision-making process and the economic condition of households as perceived by the people themselves, as well as their strategies toward improving their overall economic condition, are described and discussed.

It has already been said that the information on these aspects of the household food system were obtained through informal discussions with people throughout the period of field-work, and finally through an unstructured interview in each household (Chapter 2). As before, households have been grouped into the three categories of 'poor', 'better off' and 'rich'. This part of the study included 23 households from the 'poor', and 12 from the 'better-off' group. Five households classified as 'rich' are so heterogeneous in character that they cannot be regarded as a homogeneous single group. A brief description of the 'rich' households is presented separately at the end of this chapter. These interviews were conducted mainly with men, but 11 'poor' and 3 'better-off' women were also present and consulted. In three of the 'poor' households interviews were conducted with women in the absence of men.

People's perceptions are basically qualitative. When they are quantified, much of their underlying meaning is lost. An overview of some of the interview data may provide additional insight into the complexity of people's perceptions. Therefore, whenever considered relevant, direct quotations have been inserted throughout this chapter.

6.1 PERCEPTION OF INDIVIDUAL FOOD NEEDS

Perceptions with regard to the food needs of different individuals within the household are summarised in Table 6.1. It will appear from the range of perceptions that irrespective of socio-economic position men are regarded as needing the most quantity of food and women the least. Some people in both the socio-economic groups think that in addition to quality men should also be given priority of choice in the intra-household distribution of prestige foods, e.g. certain portions of fish, the beautifully shaped ripe mango, the biggest banana etc. Differences between the socio-economic groups appear in people's perception of prioritization of food allocation to children.

Table 6.1: Households' perception of relative food needs of different members of household: classification of opinion expressed by household heads (n = 37) and wives (n = 17)

	Poor	Better-off
No of households	23	12
Men and Women		
1) Men need the most food	21	10
2) Men need the most food and should be served first (when food is not in short supply)	2	2
3) In order of priority, the food needs of productive individuals are to be met first, then those of children	6	1
4) Women need less food than men	23	8
5) Although women's needs are quantitatively less, their needs must be fulfilled, for if they suffer from ill health the household activities will be affected	-	2
Children		
1) Children need a greater share of "good"foods than their size would suggest	7	3
2) Children should be given preference when food is in short supply	9	4

	Poor	Better-off
Children (continued)		
3) Children should always be given priority over men	7	4
4) Children's food needs must be fulfilled	-	1
Post-productive (elderly) men and women		
1) They need "good" (protein-rich and choice) food	1	1
2) They should be given preference when food is in short supply	1	1
3) They should be treated like children	-	2
4) They should be treated sympathetically, remembering their past contributions to the household	-	1
5) They should be given priority in the allocation of "good" foods	-	1
6) They need less food than adults	2	1
Sex discrimination among children?		
1) Boys should be given preference over girls	1	1
2) Girls should be given preference over boys with regard to choice foods	2	-
3) Boys and girls should be treated equally	19	11
4) Although both boys and girls are equal in the eyes of parents, yet boys are given slight preference	1	-

A quarter of the households in the poor group (6/23) as against 1/12 in the better-off group, think that the productive individual's food needs should be met before those of children, because they think that if their food needs are not fulfilled they will not be able to work properly in the fields.

As they say,

> **"We have to work in the field. If we do not eat a stomachful of rice how could we undertake such hard work?"**

All respondents think that women need the least food, because they are not required to undertake energy-demanding field work. They say that women stay inside the homestead and undertake petty household activities, requiring less energy than agricultural work. Two individuals in the better-off group maintained that although women's food needs are quantitatively less, their needs must also be met, otherwise they might suffer from ill health and eventually household activities will be affected. These two individuals implicitly considered women as productive, and as contributing to household productivity through their efficiency.

Regarding the food needs of children, opinions are apparently more diverse. Yet it can be safely said that in one way or the other, people do recognise their food needs. Twenty-nine percent of households think that children need relatively more protein rich foods, 31 per cent think that when family food is in short supply the children should be given preference in the intra-household allocation, while 37 per cent say that children should receive priority over men in the allocation of family food. Most people say that if the children are not fed properly they will neither grow well nor have strength. The concepts of preference, priority and relative needs are overlapping and people confuse them. But the general pattern is that people are conscious of

the food needs of growing children.

When family food availability is relatively good, allocation is done in such a way as to satisfy the eating desires of everybody. In times of shortage, distribution is done keeping in view the perceived relative needs of individuals, simultaneously trying to absorb the effect of shortage by rationing the adults. In other words, children are affected but to the least possible extent. When food is in extremely short supply, parents may even go hungry at certain meals and distribute the little amount available to the children. As a poor mother (Abul's wife) says,

> **"They are young and unable to withstand hunger. So they have to be fed even if we ourselves have to starve."**

As regards the food needs of post-productive individuals, the elderly members of the family who no longer work in the field or at home are generally considered to be like children and their absolute needs are thought to be low. It may be seen from Table 6.1 that the proportion of post-productive men and women is higher among the better off than among the poor, which is expected. Some people also think that elderly people should be treated sympathetically, remembering their past contributions to the family. Only one individual, who himself happened to be an elderly man, was of the opinion that post-productive people should receive priority over others in the allocation of choice foods like meat, fish, milk and banana.

It might be more enlightening to look into peoples' perception of a post-productive individual's food needs in their own words. Sultan (better-off) says,

> "Elderly people's needs are less in terms of both foods and other necessities. For instance, an old man wouldn't need a costly *lungi* (1) because he would not be going to places."

Sultan's wife says,

> "They should be treated sympathetically remembering their past contributions to the family".

Nazimuddin (better-off) says,

> "We must give preference to old people over choice foods like milk, meat, fish and banana, because their days are limited".

When asked about his 80 year old father, Nimai (poor) said,

> "He needs less in quantity but he should be given preference when food is in short supply. He is old and respected, he must be fed even if we ourselves have to starve".

Asked whether he regarded his old father as a burden, he replied that he didn't think so. Later I asked the old man whether his daughter-in-law considered him as a burden. The old man replied,

> "Not exactly, because I am given to eat what everybody else in the family eats. But at times she (daughter-in-law) behaves in such a way that seems to me unbearable".

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(1) *Lungi* is a kind of skirt worn by males.

Gorjan (better-off) thinks,

> "During old age people once again become children. Their desires for good foods like meat, fish, milk and banana are like those of children".

6.2 SEX DISCRIMINATION AMONG CHILDREN ?

The widely held notion that there is sex discrimination in the allocation of family food to children was almost totally denied by the people. Only two individuals, one each in the 'poor' and 'better-off' groups, thought that boys should be given preference over girls in the allocation of family food. Another individual from the poor group mentioned that boys are given only marginal preference over girls (probably because of their high physiological needs). On the other hand, two individuals thought that since the girls would eventually leave their parents' house after marriage they should rather be given preferential treatment in the allocation of choice foods. In her own words, poor Mannan's mother says,

> "I don't know whether there is any difference in the food needs of boys and girls, but it is certain that the girl will one day be married and move to somebody else's house. We don't know how she will be treated there or what will she be given to eat. We therefore try to give her more of whatever little choice foods we have."

Another mother says,

> "After marriage the girl will move to her father-in-law's house. In case her future mother-in-law happens to be a bad woman the girl might not be properly fed. Some day they might prepare a sweet dish but give nothing to the girl. Or one day a good curry is cooked but nothing is left for the girl. That is why girls should be given preference over choice foods so long as they remain in their parents' house".

Yet another mother says,

> **"As you feel pain when your right palm is pinched, so you will on the left. The son is mine, so is the daughter".**

Occurrence of sex discrimination, even though it might well occur, is not explicit in so far as intra-household allocation of food is perceived by people. Dependence on grown son(s) during old age implies discriminating allocation of scarce resources in favour of son(s). Interview data do show that parents desire to be supported by son(s) during their old age, but then the future is perceived as very uncertain. A poor father (Arshad) having four sons says,

> **"It is still a long way to go when my sons will become earning and help me financially. I only wish may God help them survive".**

Poor Darbesh and his wife say,

> **"The carp in the pond will grow well and taste good only when you take good care of them, but we are poor and unable to take good care of the children".**

6.3 HOUSEHOLD DECISION MAKING

Decisions are not made in isolation. They are rather the other side of the coin - the resource control process. The individual who has control of resources has the *de facto* right to take decisions. Control of resources on the other hand gives the power to influence allocation. of food and other resources within the family (which may not however be necessarily true). Table 6.2 summarises the processes as to how decisions are arrived at in the families. Traditionally, resource control is exercised

Table 6.2: Household decision making process - role of husband vis-a-vis wife and grown sons

	Poor	Better-off
No. of respondents	21	11
General decisions		
Households having grown sons		
1) Husband consults wife and son(s)	1	6
2) Husband consults wife but not son(s)	1	1
3) Husband himself decides (wife or sons not consulted)	-	1
4) Consults people outside the family (father, brother, cousin, village elders)	1	5
Households not having son(s)		
1) Husband consults wife	12	2
2) Husband himself decides	7	1
3) Consults people outside the family	-	1
Decisions relating sale and purchase of food grains:		
Sale		
1) Husband consults wife and grown son(s)	1	3
2) Husband himself decides	2	5
Purchase		
when food stores (if any) are exhausted:		
1) Wife informs husband, who decides how much to purchase (grown sons are also asked to make purchase)	19	9
2) Mother informs son (household head) who decides how much to purchase	1	-
3) Husband himself decides when and how much to purchase	1	-

Table 6.2 continued	Poor	Better-off
Decisions relating to agricultural activities:		
1) Husband decides himself	3	2
2) Father consults grown son(s)	1	7
3) Dictated by the landowners (for sharecropping)	2	2
4) Wives' voluntary advice ignored	-	2
Decisions relating to treatment and diet of sick children:		
Treatment when children fall ill:		
1) Mostly wife asks husband to arrange for treatment	8	8
2) Always wife (never husband) asks husband to arrange for treatment	7	1
3) Husband himself takes initiative	3	1
4) Both husband and wife discuss and decide as to how to arrange for treatment	3	1
Diet		
1) Usually no special diet is given (because of inability)	8	-
2) Husband decides	5	1
3) Wife decides	2	2
4) Both husband and wife discuss and decide	6	8
5) Sick diet is given as per doctor's advice	2	7

by the household head. It is his privilege to consult or not to consult other member(s) of the family. In practice however consultations do take place in the family on various matters and at varying degrees.

As is seen in Table 6.2 even the majority of the poor, who have very little to decide about, do consult their wives on various routine matters. A third of the poor households do not consider it necessary to consult their wives on all routine matters. In contrast all but one, in the 'better-off' group consult their wives. Grown sons are also consulted in household decision making. Two individuals among the 'better-offs' do not consult their grown sons, because one of them is still a student and the other is neither a student nor does he participate in any other economic activity of the household. They are therefore not considered worthy of being consulted.

While talking to the people regarding household decision-making process the most frequently encountered comment among the poor was that they hardly have any worthwhile matter to consult and take decisions about. One woman (Darbeh's wife) said,

> **"Where there is stew in the pot everybody can distribute. But if there is none, who on earth could decide to do a thing?"**

This is the reality. This is the state of affairs among the vast majority of the poor - the state of their resourcelessness. In spite of this, most people do consult their wives on routine matters, however trivial those might be. On the other hand there are people who think that they only have to discuss with their wives when there is need for optimum utilization of the limited resources they have. When Aziz says,

> **"When rice is in short supply one has to discuss with the woman. I wish I had enough money, then I could do whatever I wished, without being obliged to consult anybody".**

he indicates his desire to have access to resources and do things at his will, which is characteristic of a male dominated society. Conversely lack of access to adequate resources renders an individual indecisive and compels him to seek others' counsel for optimum utilization of the limited resources.

6.4 PURCHASE AND SALE OF FOODGRAINS

Irrespective of socio-economic status, the food budget is essentially controlled by men. Within the household a woman's job is limited to informing her husband about the stock position. When stocks run out she is to remind her husband that food is to be provided. How much to provide or of what kind is essentially decided by the husband, and is determined by his purchasing power. The poor wage labourers have to buy their food on almost a daily basis, yet their wives routinely remind them of the necessity of procuring food for the next day or even the next meal. One poor housewife doesn't even think it necessary to remind her husband, because she says,

> **"There is hardly any stock. He (husband) knows how much he brought last time and how long that could last".**

None of the households, even in the 'better-off' group, produce enough food to meet their year-round needs, yet some of them are required to sell part of their produce after harvest to meet their need for cash. While selling foodgrains, some of them consult their wives and grown son(s), most of them do not. Even though wives are consulted, the decisions are essentially the husbands'. In most cases wives do not want to sell foodgrains, but, in spite of this husbands go ahead with the sale. Some women are said to agree to what their husbands decide. One such woman says,

> "When my husband wants to sell some of our foodgrains to meet the immediate demand for cash, I agree with him, although I know it for certain that we will later have to buy the same amount at higher prices".

6.5 AGRICULTURAL ACTIVITIES

Traditionally, women are excluded from farm activities and they are never consulted on agricultural matters. Even when they volunteer suggestions, those are ignored. Grown sons participating in agricultural activities are always consulted. Share-croppers have little to decide on their own regarding cultivation. The owner of the share cropped land dictates as to what is to be grown.

6.6 TREATMENT AND CARE OF SICK CHILDREN

Women's role is most important in the care of children during sickness. When a child gets sick it is nearly always the mother who becomes anxious and asks the husband to bring some medicine or take the sick child to the doctor. It is not to say that fathers do not care for their sick children. In fact they do, but mothers play a more important role and take the initiative. In some families fathers take the initiative without first being asked by the mothers.

Lack of resources among the poor limit the fathers' response to provide medicine for their sick children, which is demonstrated in Table 6.2. In a third of the poor households it is always the mother who urges the husband to arrange for the sick child's treatment. To quote a mother:

> "I quarrel with him (husband). I cry, but he hardly brings any medicine or goes to any doctor. I understand my husband does not have the means",

she continues.

Several mothers expressed similar views. That poverty cripples a man's ability and restrains him from trying to mitigate the sufferings of his beloved ones, is the reality of life among the vast majority of the poor.

Table 6.2 further demonstrates the prevalence of socio-economic differentials in the provision of a special diet during sickness of the children. More than a third of the poor households can hardly ever afford any special diet. When a sick diet is at all given, both the husband and wife jointly or independently decide the menu. The socio-economic differential is also seen in the provision of sick diet according to the doctor's advice. Roughly two-thirds of 'better-off' households, as against only two among the 'poor', are said to provide sick diet such as rice gruel in diarrhoea and barley or puffed rice or *roti* in fever, as per doctor's advice. Obviously, better-off people more frequently consult doctors when their children get sick.

6.7 PEOPLE'S PERCEPTION OF THEIR ECONOMIC STATUS

Informal enquiries were made as to how people perceive their current economic status and how they visualise future improvement. Data presented in Table 6.3 show that over half of the poor households, most of whom are landless wage labourers, are perpetually in a shattered economic condition, while another 30% perceive themselves as economically worse off relative to their previous condition. Three out of twenty perceive their present economic status as improved. These three are landless labourers whose fathers had died while they were young. Their mothers would work in rich people's houses for their upkeep. Now they are grown up and are themselves wage earners. Obviously they perceive their current economic status as improved relative to the hard days of struggle for bare survival.

Two-thirds of the 'better-off' households also perceive themselves as worse off relative to their previous economic status, which is a fact, generally true for the whole of the rural sector in Bangladesh.

Data presented in Table 6.3 on how people visualise improvement of their overall economic condition demonstrate significant socio-economic differentials. Half of the poor households have neither any plan or hope of any improvement in their economic condition. Obviously the poorest of the poor are continuously struggling for bare survival and can hardly think of tomorrow. This is clearly demonstrated in what Aziz (poor) says,

> **"I have fallen into the stream and am swimming for the shore. Before reaching the shore I woldn't know what to do".**

In contrast, most of the people in the 'better-off' group have some kind of plan or strategy for improving their overall economic condition. Even among the poor, those who have access to some resources do visualise future improvement. The resourceless poor are trapped in a vicious cycle which they are unable to break. At times of highest availability of employment the poor wage labourers do make some savings, but then they have to eat every bit of saving during slack seasons and even borrow against future employment. The cycle repeats and the landless labourer accepts it as his fate, as Lalon says,

> **"While coming to this temporal world, I have not brought anything with me from God, so I have to pull on like this until my return to Him".**

The poor man does dream of a better future but does not know how to make the dream a reality, as Mannan says,

> "Who doesn't have hopes? Even the wild birds have hopes, they make nests for a future. We are humans, we also have hopes for a better future, but we don't have means".

More households in the 'better-off' group than in the 'poor' visualise their sons as economically productive towards improving their overall economic condition. This seems obvious in view of the differences in the demographic characteristics of the two groups. There are more extended families in the 'better-off' group, while the poor households are mostly nuclear.

Irrespective of socio-economic position, access to land is considered as the principal means of improving overall economic condition because traditionally most of the economic activities in rural Bangladesh centre around the land.

6.8 PERCEPTIONS, DECISIONS AND STRATEGIES OF THE RICH

Because of their heterogeneous character the rich households have not been included in what has so far been described in this chapter. In so far as household decision-making process is concerned there is no fundamental difference between the 'rich' and the 'better-off' groups.

It has already been mentioned that of the five rich households two are the largest land-owners, one is a middle landowner-school teacher, another is a middle landowning shop keeper and the fifth one, also a middle landowner has been classified as rich because he received a substantial amount of remittance from his serviceman brother. Regarding their perceptions of individual food needs there are basic differences amongst them. One big landowner and the school teacher mentioned the reproductive needs of women. In saying so, one may wonder whether the school teacher had not been echoing his classroom rhetoric, while the big land owner was reported to have undergone a nutrition orientation training from a local government institution. In contrast, the other

big landowner was of the opinion that elderly people need more good foods like milk, meat, fish and banana, while the food needs of growing children can be met with what is ordinarily cooked in the family. The shopkeeper, on the other hand, thinks that children behave as if they are perpetually hungry, and should not be given too much food which may be rather harmful.

As to further improvement of their economic condition, the rich have well defined strategies. The ultimate aim is, of course, the buying of more land. The shopkeeper, in addition, aims at expanding his business.

Table 6.3: Households perception of their current economic condition and strategies to improving the overall economic status

	Poor	Better-off
No. of Households	20	12
Current Economic Status:		
1) Continue to be bad	11	-
2) Previously bad, currently worse	2	-
3) Previously better, currently bad	4	8
4) Previously bad, now improved	3	1
5) Continue to be good	-	2
6) Neither good nor bad	-	2
Strategy to overall improvement		
1) Aims to get savings from petty trade/(wage) and invest in land	5	4
2) Aims to get surplus through modernisation of agriculture, seasonal trade and earning of grown son(s) - and invest in land	-	4
3) Aims to save but has no plan to invest	2	-
4) Aims to cultivate more land on share-crop basis	2	-
5) Currently no strategy but hope son(s) will become earning and improve the economic status	1	3
6) No hope/strategy	10	1

7

DISCUSSION: INTEGRATION OF RESULTS AND CONCLUSIONS

The aim of this study was to address the precise question: Does differential allocation of food within the family put certain members at extra risk, and is it among the poor, and in terms of 'deficit', that differential allocation has harmful effect? The underlying assumptions were that there would be socio-economic and seasonal variations in the intake and outcome, and that under stress, and when food supply is deficient, the intra-familial allocation of food would move away from equity, adversely affecting women and children.

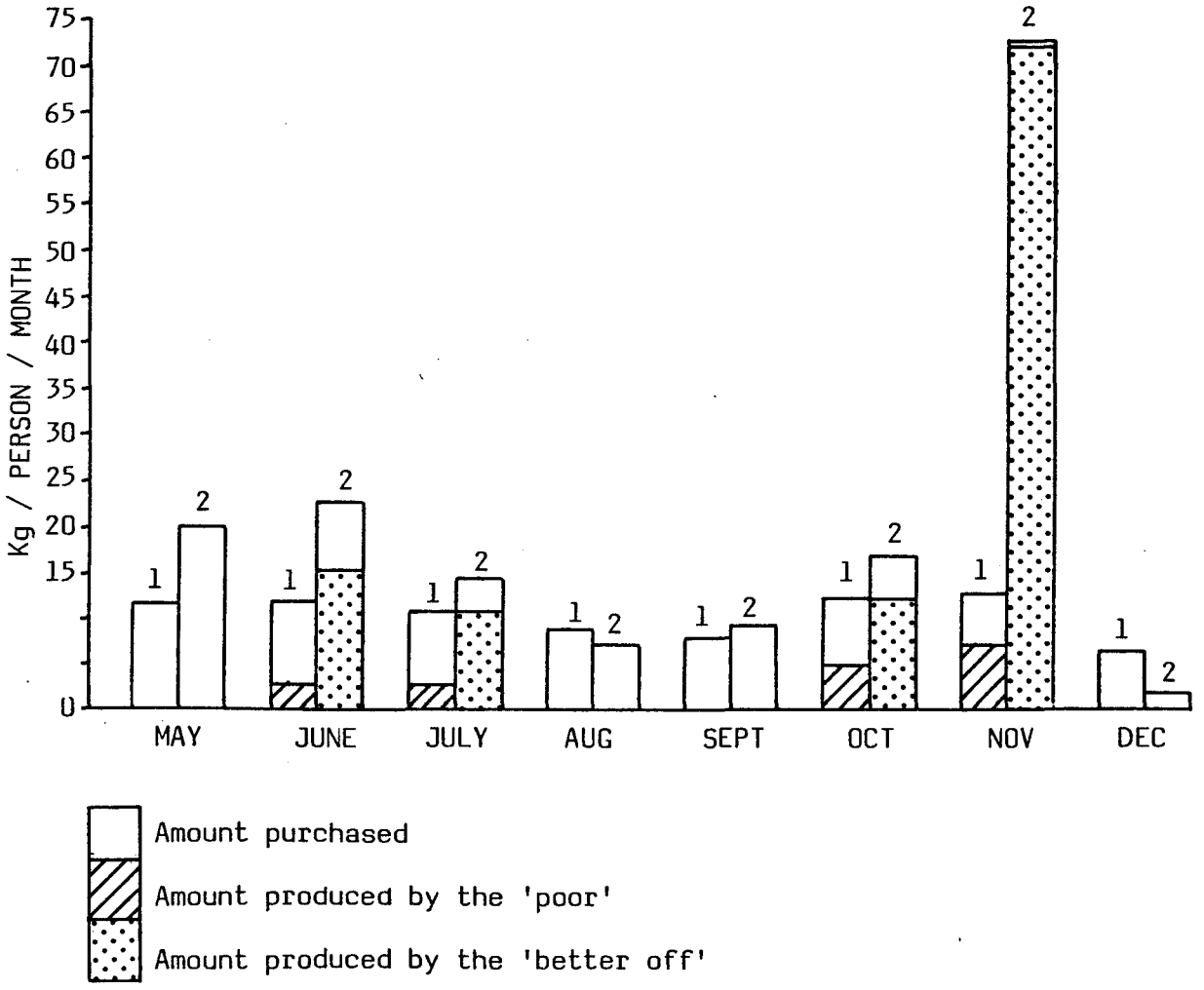
Information was collected on socio-economic status of households and within-household allocation of food as well as on nutritional status of household members. Assessment of intra-household allocation of food was timed to cover periods of differing food availability in terms of 'normal', 'deficit' and 'relative abundance'. Data collected on household food stocks (see Chapter 2) to establish a link-up with different periods in terms of food availability are presented in Figure 7.1 which clearly illustrates the existence of a deficit period in the study community.

7.1 SOCIO-ECONOMIC DIFFERENTIALS IN INTRA-HOUSEHOLD ALLOCATION OF FOOD, AND IN NUTRITIONAL OUTCOME

First analysis of the intake data by socio-economic status of households did show some differences in the intakes in certain age and sex groups among different socio-economic classes. Energy intake data presented in Table 4.1 (Chapter 4) show apparent socio-economic differentials in the absolute intake of adults between 15 and 44 years. However, when the energy and protein intake data are expressed per kg

Fig. 7.1

Per capita monthly food availability in poor and better off groups from May to December (1 indicates poor and 2 indicates better off)



body weight the apparent differentials are considerably reduced (Figure 4.1). Statistical treatment of energy intake data showed that overall there was no significant difference either in absolute intake or per kg intake of adult males among different socio-economic groups. The adult female intake in the 'poor' group was however significantly lower ($P < .001$) than in the 'better-off'. This can be linked with the (unexplained) observation that 'poor' women were heavier than 'better-off'. There was no statistically significant difference in the energy and protein intake between the 'poor' and the 'rich' women. Non-existence of any significant difference between the intake of 'rich' and 'poor' women should not however be considered as conclusive, because of the relatively small number of subjects in the 'rich' group (n = 4-6 in different seasons).

Insofar as the energy intake of children in concerned, apart from seasonal fluctuations the data do not exhibit any consistent trend across socio-economic groups. No significant socio-economic differential could be detected in the energy intake of children between 1 and 4 years by the analysis of variance. However a significant difference does exist in the absolute intake of children in the age of 5-14 years. But when the intake data are expressed per kg of body weight the differential disappears. There was an apparent socio-economic differential in the mean energy intake of elderly men of 45 years and above. However, analysis of variance did not show the existence of any significant difference among different socio-economic groups either in absolute energy intake or in the per kg intake of energy.

There is a very small difference in the mean weight of young children (1-4 years) between the 'poor' and 'better-off'. The few 'rich' children are however generally heavier than the 'poor' and 'better-off'. Socio-economic differential between the 'poor' and 'better-off' is clearly seen in the mean weights of older children (5-14 yrs). Although

during early childhood the children in both the groups are almost the same in weight yet as they grow older the differential becomes apparent. Even after correcting for age differences (the 'better-off' children's mean age was on average greater than the 'poor' by about a year) the 'better-off' children of both sexes are still heavier than the 'poor'. Among the adult males, like the young children, the difference between the 'poor' (46.6 kg) and 'better-off' (46.9 kg) is very small. Thus although there is a difference in the mean weight of older children (5-14 yrs) between the 'poor' and 'better-off', by adulthood there is very little difference among them. The unexpected difference between the 'poor' and 'better-off' women (poor women being heavier than the 'better-off') is not explicable.

In the few 'rich' households the mean weights of all age and sex groups were higher than the corresponding groups among the 'poor' as well as the 'better-off'.

In interviews, parents consistently expressed concern about childrens' food intakes, and it would appear that the measured intakes are achieved only with difficulty in the 'poor' group. The childrens' mean intakes are below FAO/WHO recommendations and their mean weights are below the NCHS (3rd percentile) level. This population is not declining in terms of nutritional state and food intake: it is existing at a low level. The much higher values for the few 'rich' in the village are a clear reminder of this. It is among the 'poor-better off' that clear, unambiguous socio-economic differences cannot be demonstrated.

7.2 SEASONAL DIFFERENTIALS

Seasonal variations in the energy intake of both men and women in all socio-economic groups are clearly demonstrated. Table 4.1 and Figure 4.1 illustrate the differentials in absolute amounts and per kg

intakes respectively. Analysis of variance showed that even by a rather conservative test of difference the intake in the second half of the year is significantly lower ($P < .0001$) than in the first half. The findings are in accord with nationally estimated seasonal intake pattern (INFS, 1977). The question is whether any socio-economic group is more affected by seasonal fluctuations in the availability of food. Obviously the 'poor' and the landless are more vulnerable to seasonal food shortage,and the intake data do show that the intake of 'poor' was somewhat lower than the 'better-off' during the period of food shortage (Sept.-Oct.). Unexpectedly, there was no difference between the 'rich' and the 'poor' groups. A decline in the intake of 'poor' group during the period of food shortage and to a lesser extent in the intake of 'better-off' group (all of whom are dependent on market for the food grain needs at this time of the year) is understandable, but a decline in the intake of the 'rich' group, also of greater magnitude, cannot be explained by this study. The possible reason might be a significant reduction in high energy-demanding activities. During this period there is virtually no agricultural activity. Another apparent anomaly in the seasonal intake pattern is that during the period of relative abundance of food in December after the main rice harvest, intake did not rise substantially. In this case also the possible explanation can be traced in the activity pattern. As is seen in Figure 1.4, the *Rabi* crops have already been sown,which virtually do not need any after-sowing care,and the land preparation for the principal crops has not yet started. It would have been ideal if a detailed record of activities could be maintained,in which case energy intakes could be related to estimated expenditures in different seasons. Nevertheless the Crop Calendar does provide some indication of agricultural activities in different seasons,and the relatively lower intake in December can be related to corresponding slack agricultural activities during this time

compared to intensive agricultural activities in May-June. Even in minor agricultural activities total hours of labour that can be put in have to be fewer due to shorter day length in December.

Relatively low intake during post harvest period is not unique in the study community or generally speaking in Bangladesh. Simmons (1976) reported lowest intakes in the immediate post-harvest period in Nigeria and suggested that people voluntarily ration their intake, anticipating the balance of energy availability and need. Bharati and Basu (1982) reported from the Indian State of West Bengal that people experiencing predictable periodic uncertainties (in the sense of deficit) tend to stretch out the estimated available food supply for a given period to cover a longer period, thus settling to low levels of intake even during somewhat better periods. While the suggestions made by Simmons and Bharati and Basu may be partly true, especially for the households having an overall deficit, yet evidence in support of their propositions is lacking. Particularly when we observe a post-harvest decline in the intake of the 'rich' (compared to the first half of the year) it does not seem probable that they would ration their intake or that it would be necessary for them to stretch out their available food supply.

Apparently there are some seasonal variations in the energy and protein intake of children. Figure 4.5 demonstrates that the per kg intake of 5-14 year old children (particularly of boys) tends to be higher during the first half of the year. Compared to boys the intake of girls is less fluctuating. The apparent seasonal differential is not however statistically significant. Seasonality in the intake of younger children (1-4 yrs) is even less apparent except that they had slightly lower intake in December, which is not, however, related to food shortage. In Chapter 4 it has been speculated that shorter day length and less frequent eating in winter could be the possible reason. It should be noted here that a number of children in the 1-4 year age group were still being breast-fed. Islam encourages breast-feeding which may be

continued up to 2½ years for boys and 3 years for girls. But it is not known whether the decline in their energy intake from sources other than breast milk could have been compensated by increased suckling during longer nights when the child is with the mother in bed. Daytime suckling time has however been shown to decline in November-December (Chowdhury *et al.*, 1981).

One important aspect of the seasonal changes in food availability is the carotene sources, which peak in the month of June and do not follow the same pattern as the main cereal crop. Thus while rice is the major source of protein, energy and B vitamins, fruit and vegetables are supremely important for vitamin A and, to a lesser extent, also for iron.

It is hoped subsequently to make further analyses of the mass of food intake data; meanwhile some points emerge from these food consumption patterns. The closely parallel changes in energy and protein intake are characteristic of a cereal-based diet (Table 4.8) with insignificant amounts of animal protein and fat. The fluctuations in vitamin A intake are explained by seasonal availability of carotene sources (Figures 4.7 and 4.8). There are not marked differences between 'poor' and 'better-off' dietary patterns; it is the 'rich' who eat more animal protein. The main difference between 'poor' and 'better-off' is in the balance of wheat:rice.

Between-season analysis of weight data shows that all age, sex and socio-economic groups are affected by the seasonal food shortage (Sept.-Oct.) as judged by weight loss. Certain groups are however more affected than the others. As is demonstrated in Figure 5.1 the proportion of children (1-4 yrs) losing weight in September (relative to June) was higher among the 'poor' than among the 'better-off'. This figure does not however show what happens beyond September when food shortage was still persisting. By October the proportion of male children losing weight drops by 10% among the 'better-off' and by 13% among the 'poor' while the proportion of females losing weight increases to 75% in the 'better-off' group. The female children in the 'poor' group remain unchanged. The observed differences in the proportion of children losing weight in September and October relative to the same point of time (June) may at first appear to be puzzling, but not unexpected. It has already been said that both the 'poor' and 'better-off' groups experience seasonal food shortage in September-October. The onset of food shortage may be earlier in some groups (especially among the poor) than in the others so are their reflections in the weight changes. It has also been shown in Chapter 6 that during periods of food shortage children receive preferential treatment in the allocation of family food. A closer examination of the between season weight loss data supports this. Even though the young children cannot escape the initial impact of food shortage subsequently their intake may improve. This is reflected in the decline (males in both the 'poor' and 'better-off' groups) or check ('poor' females) in the proportion losing weight throughout the period of food shortage.

Among the older children (5-14 yrs) the proportion of weight loss in September (Figure 5.2) was higher among 'poor' males and 'better-off' females. By October the proportions increased from 47 to 65 among 'poor' males, from 30 to 40 among 'better-off' males and very slightly among 'poor' females (from 38.5 to 40.0) but that of 'better-off' females

dropped from 60 to 20. The pattern of weight loss among the 5-14 year old children is slightly different from that among the younger ones. That is, most of the younger children losing weight are affected at the onset of the deficit season while some of the older children escaping weight loss at the outset are affected later during the period of food shortage.

Among the adults the proportions of both men and women losing weight were substantially higher than the children in both the socio-economic groups. The anthropometric finding is in agreement with the corresponding intake data. During the period of food shortage (Sept.-Oct.) the decline in adult intake was far more steep than that among children. Furthermore the adults continue to absorb the impact of food shortage throughout the period of scarcity, as is reflected in a further increase in the proportion losing weight by October while endeavouring to relieve the children of the impact of shortage to some extent at least.

Thus, while cross sectional analysis of weight data shows similar weights for 'poor' and 'better-off' small children, longitudinal analysis shows the 'poor' losing weight more frequently between seasons. The two are not incompatible and it appears that the 'poor', due probably to higher incidence of seasonal infections such as gastroenteritis, do experience more weight fluctuation than the 'better-off'. This would imply a less efficient utilization of food. More detailed individual studies in this type of community might elucidate a pattern of infection and weight change such as has been demonstrated in, for example, Latin America (Mata and Behar, 1975) and West Africa (Cole and Parkin, 1977).

How do these results compare with studies in other rural areas of Bangladesh? In March-April there was a flow of 'aid' into the village in the form of food-for-work. This would result in high energy expenditure by the men (earth-cutting and carrying), and high food intakes. Also food would come to the family members, and this is seen

in the seasonal pattern of intake. The main aman rice harvest in 1982 was a good one, better than for several years previously. This meant that the village was not in food shortage during the year, though there were seasonal ups and downs in food intake. The food and energy intakes recorded here can be regarded as those of a Bangladeshi village in a 'good' year, but on the understanding that heavy work and high morbidity are part of the 'good' environment.

The weights and heights of children are similar to those found in other studies in Bangladesh (e.g. Brown, Black, Becker and Hoque, 1982; Bairagi, 1983; Chen, Huq and d'Souza, 1981). In the study of Brown et al., the 90th centile of height was below the NCHS 10th centile, and for weight it was below the 5th centile, for children under 5 years old. The study population does not appear to be significantly more under-nourished than these others.

Not many other other measurements of food intake have been done in Bangladesh. Some have been published as per caput data and these are shown in Table 7.1.

The per caput intakes in other studies are between about 100 and 110% of those in this study. Obviously, comparison of per caput intakes means that the assumption is made, that the structure of each population is the same. In the studies quoted, the proportion of under-15's and over 15's was similar. It may also be mentioned that the 1972-4 Food Balance Sheet estimate of per caput food supply was 1950 KCals/person/day (FAO, 1977), but the methodology in this case is so different as to make comparisons unrealistic.

One comparable study where intakes were analysed by age and sex is that of Chen, Huq and d'Souza (1981). Their data, excluding breast-fed children, are compared in Table 7.2 with those of this study.

Table 7.1

Mean year-round per caput energy intake* of the entire study population compared with other studies conducted in areas with similar socio-economic background (KCal/p/d)

Seasons of Study**	This Study	Seasonal Study location 1 *** (Dhaka)	Seasonal Study location 2 *** (Rangpur)	Matlab Study****
1	1911	1584	1757	
2	1887	2012	2014	
3	1619	1766	1731	
4	1683	2061	2129	
Overall	1749	1854	1907	Male: 1927 Female: 1599
FAO (1977). Estimated requirement for Bangladesh: 2310.				

* Aggregated energy intake/total number of individuals surveyed

** Seasons of study are slightly different for different locations

*** Institute of Nutrition and Food Science (1977)

**** Chen, Huq and d'Souza (1981)

Table 7.2

Mean age-specific energy intakes from this and the Matlab study (Chen, Huq and d'Souza, 1981)

This study 'Poor' and 'Better-off': June/July)			Matlab (June/August)		
Age (yrs)	Male	Female	Age (yrs)	Male	Female
5-14	1480	1410	5-14	1590	1430
15-44	2830	2110	15-44	2700	2099

The two sets of intakes are broadly similar during the comparable period (June-August).

The methodology of the study included some possibilities both of underestimating and overestimating intakes. The weighment method can result in errors of ± 10%. It is unlikely that families could afford consistently to overeat to impress the survey workers and the investigator who was present in the village. The most likely source of overestimation would have been in converting 'cooked food' weights to 'raw food' for computation, but in Rounds 2-4 raw foods were weighed as well as cooked. Thus in Round 1 (which does not contain much higher intakes than others) there might have been an overestimation; but in general the energy intake data are probably subject to errors in both directions.

It seems therefore that adult food intakes which appear adequate by FAO standards, and poor nutritional status, do coexist in rural Bangladesh. (Of course if recommended intakes were calculated on 'ideal' body weights they would be higher than those shown here, but that is not realistic.) This apparent anomaly can be explained by two factors: the severe underdevelopment of Bangladeshi agriculture, which necessitates heavy energy expenditures by adults and children over 15, and the load of infection and parasites carried, especially by children when malabsorption reduces utilisation of nutrients (UNU, 1979).

In this study, the observed differentials between age and sex groups cannot be regarded as typical of food shortage situations, but they show what happens in between-season variation.

7.3 SEX DIFFERENTIALS IN ENERGY INTAKE

There are differences in the body size and activity of men and women. Physiologically the energy requirements of the two sexes are

different, so are their intakes. The observed differential did not exceed the expected limits of estimated physiological difference. Adult male (15-44 yrs) energy need is 47 Kcal/kg (Appendix Table C-1) and female need is 41 Kcal/kg (87% of male). If the male need is adjusted for activity the figure works out to be 55 Kcal/kg for the first half of the year in which case the female need becomes 75% of the males, assuming that women's activity level does not change markedly. In the secluded home environment in Bangladesh, this is a reasonable assumption. The female intake in the 'poor' group was 81% of males when their intake was the highest of the year, corresponding to high energy demanding activities ("Food-for-work"). During the period of food shortage the female intake was an average 90% of males: above the expected "physiological" differential (males being moderately active duuring this period). Similarly in the 'better-off' group when the male intake was highest of the year in June, corresponding to intense agricultural activities, the female intake was 84% of males although the expected differential was of the order of 25%. Even if the female intake had been 75% of the males', the differential could be accounted for by the physiological and activity differences. Table 7.1 shows the expected and observed differentials in the energy intake of adult men and women in different seasons.

Table 7.1

Expected and Observed Male-Female differentials in the per kg energy intake of adults (15-44 yrs) in different seasons

Socio-economic class	March-April		June		Sept.-Oct.		Dec.	
	Expected	Observed	Expected	Observed	Expected	Observed	Expected	Observed
Poor	24	19	25	7	10	10	9	21
Better-off		-3*		16		0		0
Rich		11		5		4		18

*Female exceeded male.

On the whole although males had higher energy intakes when they were physically more active yet the male-female differential was less than expected, on the basis of the international recommended allowances.

The data clearly demonstrate the non-existence of sex discrimination in the intra-household allocation of food to women beyond what can be accounted for by body size, activity and physiological differentials. Assumptions that when family food is in short supply, intra-household allocation discriminates against women, do not hold good for the study community and perhaps for similar communities in Bangladesh and elsewhere. It is rather the contrary that operates i.e. the effect of shortage in family food supply is absorbed to a greater extent by the male adults than the females. Energy intake data have also been analysed as a proportion of the intake of household heads (Figure 4.2) which clearly demonstrates that the relative intake of women in the age group of 15-44 years is almost constant the year round.

As regards the intake per kg of children between 1 and 4 years, differences between sexes are clearly seen. The female children had significantly lower ($P < .04$) intake than the males. There is no difference in the FAO/WHO (1973) recommended intake for boys and girls and the differential cannot be accounted for by activity differences. It appears, therefore, that contrary to the parents' assertion, somewhat less food is given to the young girls. It is of interest to note, however, that in times of food shortage the female children's position improves. Figure 4.3 demonstrates that compared to other seasons the female intake did not decline substantially during the period of food shortage in Sept.-Oct. In the 'better-off' group the per kg intake of female children was highest in September-October. Had there been any sex discrimination the female intake would have been more constrained during Sept.-Oct. The most interesting point to note is the pattern of within-family distribution of food; when the overall family food availability

decreases the proportional intake of children increases. Figure 4.4 demonstrates that the young children obtained highest intake values relative to the household heads in Sept.-Oct. when family food availability was at its lowest (Figure 7.1). This clearly substantiates people's statements that when family food is in short supply children are given preferential treatment in the allocation of available food (see Chapter 6). The finding is in sharp contrast to what has been generally postulated in this regard. As between male-female differentials the data demonstrate that although the male children do tend to have higher intakes yet at times of food shortage the differential is considerably reduced. As a matter of fact, relative to the household heads female children in both 'poor' and 'better-off' groups obtained their highest intake values during the scarcest season of the year (Sept.-Oct.). The observed male-female differential is not unique to Bangladesh. By a critical analysis of reported energy intake data Whitehead et al. (1982) has shown that even in developed industrialized countries for virtually all of childhood the males had higher intake than females. Recently McKillop and Durnin (1982) also demonstrated male-female differential in energy intake in a random sample of 305 children between 3m and 2 yrs in Glasgow. However, the widely held notion of deliberate discrimination against female children is not supported by interviews with parents. Thus when a 'poor' mother says,

> **"As you feel pain..... the son is mine**
> **so is the daughter"**

she is sincerely stating what she believes to be her practice.

Among the older children between 5 and 14 years the male intakes tend to be higher during the first half of the year, but the male-female differential is minimised or even slightly reversed during the second half. For instance the male-female differential among the 'poor' was of the

order of 13% in June which came down to 7% in Sept.-Oct. On the other hand among the 'better-offs' the male intake was 8% higher in June, but in Sept.-Oct. females had a 13% higher intake than the males. During December there was virtually no male-female differential. Higher male than female intake during the first half of the year may be possibly owing to differences in the activities of two sexes. It is probable that the older boys in this age group were performing more energy demanding activities during the first half of the year. In fact personal observations provide some basis for this comment. It was frequently observed that 10-14 year old boys do participate in such activities as ploughing, weeding and gathering fodder for the cattle.

Boys and girls (5-14 years) energy intakes, relative to the household head's, were adequate if allowance is made for the adult males' higher workload in March-June. The girls' intake/kg is slightly lower than the boys'; this again follows the pattern of recommended intakes.

7.4 CONCLUSIONS

To conclude, it seems imperative to ask what the study has shown and in what way it adds to our understanding of the seasonal variations in the availability and intake of food and how people cope with periods of predictable food shortage. The community studied was a poor one which had experienced several years' food shortage, but in which, currently, food supplies had improved. Nutritional status was similar to that of other rural Bangladeshi villages. The study demonstrated lack of marked and consistent socio-economic differentials in food intake, although there were differences in the resource status of households, which distinguished them into 'poor' and 'better-off'.

Other studies in South Asia have shown socio-economic differences in food intake and nutritional status: for example Rao and Satyanarayana(1976) found differences of about 200 Kcals between the mean energy intakes of upper, lower and middle income classes in a South Indian village. Few studies, however, analyse intakes in terms of body weight and it seems likely that the vast majority of 'non-rich' South Asian adults receive the similar levels of energy/unit body size. This also applies to small children. The socio-economic class differences in nutrtional status in many South Asian studies (Rao and Satyanarayana 1976, Sen and Sengupta, 1983) may be attributed partly to small, not 'significant' differences in intake at critical times, but partly also to differences in health care and particularly to expenditure on health (Chen *et al.*, 1981). Some of the 'poor' parents who were interviewed in this study expressed great difficulty in obtaining medicines and health care for sick children.

It is not only in South Asia that studies on socio-economic differences in nutrition provide ambiguous results. Munoz de Chavez *et al.* (1974) found in Mexico that income alone could not differentiate 'well nourished' from 'malnourished' children and that cultural factors, such as maternal education, were involved. In this Bangladeshi village the same cultural environment is shared by 'poor' and 'better-off' women, and education is hardly a factor.

One factor which certainly did operate in this case was the Government 'Food for Work' programme which employed virtually all the 'poor' men in March-April.

In interviews, the 'poor' expressed more hopelessness and less ability to plan for the future than the 'better-off'. It seems that to be 'better-off' (as opposed to 'rich') in this environment does not necessarily mean to eat more, but rather to produce one's own food, command a small surplus of cash for items like clothing, housing and medicine, to keep one's children from field labour until they are

in their teens, and generally to experience more control over one's lifestyle.

Seasonality in the intake and outcome with regard to certain age/sex groups has been conclusively shown while in certain other groups it could not be demonstrated, as was expected. Intra-household allocation of food discriminating against women and children as has been generally postulated in the literature, more often than not, based on qualitative information, could not be demonstrated. Seasonal food shortage affects everybody in the family but its impact is largely absorbed by adults.

A recent World Bank Staff Working Paper (Safilios-Rothschild, 1980) states:

> **'In general, labour, food and other resources and privileges are distributed unequally. These inequalities become more pronounced and have more serious repercussions for individual members as food and financial resources become scarcer.'**

On the basis of a reanalysis of Tamil Nadu Nutrition Study data, in the same paper Safilios-Rothschild (1980) suggested three different modes of intra-family food distribution e.g. 'equality', 'proportionate' and 'triage' modes. According to 'equality' mode each member receives amounts of food proportional to perceived needs and under 'proportionate' model all members receive some food, but only those who are considered important receive a high percentage of their minimum requirements, while according to 'triage' mode the most important members receive all they need and others only what is left. Analysis of data collected in the present study suggests that both the 'equality' and 'proportionate' models operate in the study community. Even though both the 'poor' and 'better-off' households studied experienced seasonal food shortage they were not subjected to starvation. Had there been a desperate struggle for survival, as might well be the case in

certain parts of the world, the pattern of intra-household food distribution could well have been different from what was observed. Evidence against the 'triage' mode of food distribution is, however, conclusive in this study. When food was in short supply (Sept.-Oct.) children's relative intake either improved or remained unchanged even though they are not considered as important members of the family in current economic sense. Intra-family food distribution was done in such a way as to absorb the impact of seasonal shortage largely by the adults particularly adult males rather than transferring it to children. The seasonal workload of women has been shown to have adverse effect on the growth of children as well as on the mother's own health (Rowland *et al.*, 1981). Under such circumstances when the infants and young children are left behind with older siblings or grandmothers, the detrimental effect of mother's work pattern on the child's health is obvious. In the community studied here, however, women are culturally secluded from farm activities. Moreover the period of food shortage was characterised by diminished agricultural activities. As has been illustrated in Figure 1.1 during the period of food shortage (Sept.-Oct.) crop labour demand was lowest in the year. It cannot therefore be argued that intra-household allocation of food would not have discriminated against women and children if the period of food shortage were characterised by intensive farm activities.

Finally it seems sensible to look at the distributional pattern from the point of view of the community itself. When people say,

> **'Women need less food because they are not required to undertake high energy demanding farm activities';**

in the light of the fact that women do receive 80-85% of food relative to men (household heads), this is a functionally correct statement.

Similarly the statement that

> **'When food is in short supply children should be given and are given preferential treatment in the allocation of available food'**

has been found to be a reality rather than an ideological statement. Professionals and planners often disregard what 'poor' people say about themselves, but here they have been proved to be correct in their self-description. The fundamental cause of malnutrition is poverty and resourcelessness rather than perceived maldistribution within, among the vast majority of populations in the developing world, who are already resourceless, living in utter hopelessness and lacking in their ability to plan for the future.

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APPENDIX A

SOCIO-ECONOMIC INFORMATION OF HOUSEHOLDS: QUESTIONNAIRE

Identification:

Household no: _____ Date of interview: _____

Name of Household Head: _____

Information on land holdings

1. Area of Homestead : decimals _____

2. Landholding (other than homestead): acre/decimals:

   1) Cropland owned: _____

   2) Cropland taken in for share-cropping: _____

   3) Cropland given for share-cropping: _____

   4) Cropland rented in: _____

   5) Cropland rented out: _____

   6) Net total area under cultivation: _____

   7) Water area (if any) owned: _____

   8) Quality of cropland, access to irrigation, distance, etc.

   _____

   _____

3. Draught and other animals and agricultural implements:

   1) No. of draught animals: _____

   2) No. of milk animals: _____

   3) No. of calves: _____

   4) No. of goats: _____

   5) No. of ploughs: _____

   6) Others: _____

Housing, household furnishings, prestige possessions, water supply, etc.

1. No. of houses by type: _____

2. No. of rooms: _____

3. Whether owns a kitchen ☐ Yes ☐ No

   If no, where do they cook? _____

4. Source of drinking water: _____

5. Source of cooking water: _____

6. Source of water for washing and bathing: _____

7. Household furnishings (if any) by type: _____

   (e.g. cots, chairs, tables)

8. Prestige possessions (if any): _____ _____

   (e.g. radio, bicycle, sewing machine, etc.)

Income and Expenditure:

1. Income from agriculture: From _____ to _____

Name of crop produced	Amount produced	Amount kept for own use	Amount sold	Estimated value

2. Expenditure on agriculture: From _____ to _____

   1) Whether ploughing done on hire basis: _____

      If so,how many units hired: _____

      Rate per unit (TK): _____

      Total amount spent on ploughing (TK): _____

   2) Cost of seeds/seedlings (TK): _____ _____

   3) Cost of fertilizer/manure (TK): _____

   4) Cost of irrigation water (TK): _____

   5) Cost of insecticides (TK): _____

6) Others (specify) (TK): _____

7) Total (TK): _____

Domestic production: From _____ to _____

Name of produce	Amount produced	Estimated value	Proportion kept for own use	Proportion sold	Cost (TK)
1) Poultry/ chicken					
2) Duck					
3) Eggs					
4) Vegetables					
5) Fruits					
6) Milk					
7) Date palm jaggry					
8) Other (specify)					

Cash Income: (From _____ to _____)

1. Source of income: _____ Amount (TK): _____

2) If engaged in trade, kind of trade: _____

Estimated monthly income from trade (TK): _____

3) If a wage labourer -

How many days/month worked: _____

Rate of wage (TK): _____

Total wage earned (TK): _____

4) Others (specify): _____

Change in assets:

1) Whether bought any land: _____

If so, area (acre/decimals): _____ Cost (TK): _____

2) Whether sold any land: _____

If so, area (acre/decimals): _____ Price (TK): _____

3) Whether bought animal(s): _____

If so, no. and type: _____ _____ Cost TK): _____

4) Whether sold animal(s): _____

If so, no. and type: _____ Price (TK): _____

5) Whether bought agricultural implement(s): _____

If so, no. and type: _____ Cost (TK): _____

6) Whether bought or sold any other thing such as ornaments, furniture, boat, tree, etc.) _____

If so, units and type bought: _____ Cost (TK): _____

Units and Type sold: _____ Price (TK): _____

Other economic transactions: (such as debt, debt repayment, government loan, investment, etc.)

_____

_____

_____

_____

* * *

APPENDIX B

SCORING INDICES OF SOCIO-ECONOMIC STATUS

For the purpose of dividing the households into three categories e.g. 'poor', 'better-off' and 'rich' four selected measures of socio-economic status were used (see Chapter 2: section 2.8.1). Each of these measures was assigned different scores and the way the scoring was done is detailed below.

B.1 LAND (OWNED LAND AND LAND ACTUALLY CULTIVATED)

Total maximum points: 15 + 15 = 30.

B.1.1 Land owned : 15 points

Per capita land (decimals)	Points allocated
.01 to 10.0	1
10.01 to 20.0	2
20.01 to 30.0	3
30.01 to 40.0	4
40.01 to 50.0	5
50.01 to 60.0	6
60.01 to 70.0	7
70.01 to 80.0	8
80.1 to 90.00	9
90.1 to 100.0	10
100.01 to 110.0	11
110.01 to 120.0	12
120.01 and above	15

B.1.2 Land actually cultivated : 15 points

The distribution of points was done in the same way as land owned.

Total land score = score for land owned + score for land cultivated.

B.2 ANNUAL INCOME:

Total maximum points: 40

Per capita income (TK)	Points allocated
50 and below	5
51 to 75	8
76 to 100	11
101 to 125	14
126 to 150	17
151 to 175	20
176 to 200	23
201 to 225	26
226 to 250	29
251 to 275	32
276 to 300	35
301 to 325	38
326 and above	40

B.3 RATIO OF EARNING TO NON-EARNING MEMBERS

Total maximum points: 10

Ratio (no. earning ÷ no. non-earning)	Points allocated
0.14 and below	2
0.15 to 0.24	3
0.25 to 0.49	5
0.50 to 0.74	7
0.75 and above	10

B.4 CLASSIFICATION OF HOUSEHOLDS:

The total score obtained by a particular household was then used to assign it to one of the three socio-economic classes in the following way:

Total score up to 20	: Poor
Total score 21 to 50	: Better-off
Total score above 50	: Rich

* * *

APPENDIX C

Appendix Table C-1

Computation of FAO-recommended Energy Intakes for different age and sex groups on the basis of actual body weights

Age (yrs)	Male				Female			
	Mean wt (kg)	n	Energy/kg (Kcal)	Energy/ person/ day (Kcal)	Mean wt (kg)	n	Energy/kg (Kcal)	Energy/ person/ day (Kcal)
1	8.8	70	103	906	8.5	38	106	901
2	9.7	69	100	970	9.1	20	100	910
3	11.6	99	100	1160	9.1	21	99	901
4	12.3	77	99	1218	12.1	43	96	1162
1-4			100	1076			100	994
5	13.0	33	91	1183	11.4	16	90	1026
6	14.6	20	87	1270	13.2	21	85	1122
7	14.5	19	83	1204	16.2	39	80	1296
8	17.9	21	79	1414	16.7	53	76	1269
9	18.5	49	76	1406	17.8	31	73	1299
10	20.4	53	74	1510	20.8	32	68	1414
11	21.3	20	71	1512	21.3	44	62	1321
12	21.1	14	67	1414	26.0	37	57	1482
13	23.9	6	61	1458	27.8	29	52	1446
14	26.6	25	56	1490	29.7	12	50	1485
5-14			74	1392			67	1325
15	37.9	6	53	2009	34.1	19	48	1637
16	38.1	10	51	1943	41.1	29	45	1850
17	41.2	12	50	2060	49.6	8	43	2133
18	45.2	21	49	2215	39.8	22	42	1672
19	43.4	4	47	2040	-	-	-	-
20-39	48.5	204	46	2230	41.5	289	40	1660
40-44	45.6	22	44	2006	40.1	38	38	1444
15-44			47	2186 2558*			41	1662**
45-49	45.0	59	44	1980	41.3	21	38	1569
50-59	47.6	46	41	1952	38.7	11	36	1393
60-69	42.2	17	37	1561	-	-	-	-
70+	45.1	6	32	1483	-	-	-	-
45+				1887			37	1463

* Adjusted for activity for first half of the year (2186 x 1.17)

** Adjusted for actual nos. of P/L women in relevant tables of intakes.

Appendix Table C-2

Mean Energy and Protein Intake of men and women between 15 and 44 years by socio-economic class in different seasons (Energy Kcal/kg/day ± S.D. and Protein Gm/kg/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept.-Oct.	December
Men: Energy/kg	Poor	62 ± 12 (8)	56 ± 14 (19)	49 ± 10 (20)	53 ± 11 (18)
	Better-off	58 ± 11 (5)	63 ± 12 (16)	52 ± 11 (18)	51 ± 12 (15)
	Rich	62 ± 10 (8)	57 ± 15 (7)	47 ± 13 (7)	49 ± 11 (7)
Men: Protein/kg	Poor	1.80 ± .46	1.37 ± .38	1.12 ± .34	1.23 ± .34
	Better-off	1.58 ± .60	1.56 ± .32	1.16 ± .23	1.28 ± .46
	Rich	1.83 ± .34	1.34 ± .33	1.11 ± .32	1.14 ± .32
Women: Energy/kg	Poor	50 ± 17 (12)	52 ± 15 (24)	44 ± 14 (27)	42 ± 10 (30)
	Better-off	60 ± 11 (10)	53 ± 9 (18)	52 ± 10 (20)	51 ± 10 (19)
	Rich	55 ± 9 (5)	54 ± 4 (4)	45 ± 3 (6)	40 ± 5 (6)
Women: Protein/kg	Poor	1.43 ± .41	1.29 ± .48	.99 ± .34	1.02 ± .33
	Better-off	1.59 ± .42	1.27 ± .25	1.22 ± .26	1.28 ± .38
	Rich	1.58 ± .36	1.33 ± .09	1.06 ± .18	.92 ± .22

Figures in parentheses are nos. of persons.

Appendix Table C-3

Mean Energy and Protein Intake of children 1-4 years by socio-economic class in different seasons. (Energy Kcal/kg/day ± S.D., and Protein Gm/kg/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept.-Oct.	December
Male: Energy/kg	Poor	91 ± 29 (8)	95 ± 38 (16)	79 ± 29 (21)	71 ± 29 (21)
	Better-off	83 ± 38 (6)	74 ± 28 (14)	84 ± 24 (15)	67 ± 20 (16)
	Rich	75 ± 8 (3)	66 ± 23 (3)	77 ± 36 (4)	75 ± 15 (4)
Male: Protein/kg	Poor	2.50 ± .83	2.28 ± 1.05	1.86 ± .65	1.69 ± .82
	Better-off	2.15 ± 1.19	1.78 ± .72	1.88 ± .55	1.62 ± .58
	Rich	2.15 ± .46	1.58 ± .60	1.79 ± .89	1.48 ± .48
Female: Energy/kg	Poor	70 ± 11 (4)	75 ± 32 (10)	74 ± 21 (10)	61 ± 17 (10)
	Better-off	70 ± 14 (2)	53 ± 16 (3)	77 ± 22 (5)	63 ± 17 (5)
	Rich	105 ± 0 (1)	97 ± 0 (1)	79 ± 0 (1)	30 ± 0 (1)
Female: Protein/kg	Poor	1.99 ± .30	1.70 ± .83	1.57 ± .44	1.42 ± .38
	Better-off	1.79 ± 1.00	1.16 ± .52	1.71 ± .51	1.52 ± .51
	Rich	3.17 ± 0	2.31 ± 0	1.57 ± 0	.76 ± 0

Figures in parentheses are nos. of persons.

Appendix Table C-4

Mean Energy and Protein Intake of boys and girls between 5 and 14 years by socio-economic class in different seasons (Energy Kcal/kg/day ± S.D., Protein Gm/kg/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept.-Oct.	December
Boys: Energy/kg	Poor	84 ± 17 (12)	86 ± 14 (14)	72 ± 17 (21)	68 ± 13 (21)
	Better-off	100 ± 34 (3)	80 ± 16 (11)	67 ± 14 (13)	69 ± 13 (11)
	Rich	83 ± 7 (2)	72 ± 4 (2)	83 ± 25 (3)	81 ± 28 (3)
Boys: Protein/kg	Poor	2.44 ± .51	2.08 ± .66	1.54 ± .47	1.62 ± .31
	Better-off	2.75 ± .73	1.95 ± .36	1.47 ± .41	1.73 ± .47
	Rich	2.28 ± .49	1.73 ± .06	2.01 ± .45	1.81 ± .43
Girls: Energy/kg	Poor	75 ± 24 (11)	75 ± 20 (24)	67 ± 16 (25)	70 ± 21 (25)
	Better-off	83 ± 28 (5)	78 ± 21 (10)	76 ± 23 (11)	68 ± 18 (11)
	Rich	83 ± 16 (2)	73 ± 20 (3)	87 ± 30 (4)	77 ± 11 (3)
Girls: Protein/kg	Poor	2.20 ± .87	1.93 ± .67	1.53 ± .48	1.64 ± .52
	Better-off	2.37 ± 1.04	1.85 ± .57	1.76 ± .52	1.66 ± .44
	Rich	2.42 ± .44	1.67 ± .38	2.11 ± .69	1.88 ± .18

Figures in parentheses are nos. of children.

Appendix Table C-5

Mean Energy and Protein Intake of elderly men and women 45 years and above by socio-economic class in different seasons (Energy Kcal/kg/day ± S.D., Protein Gm/kg/day ± S.D.)

Sex	Socio-economic class	March-April	June	Sept.-Oct.	December
Men: Energy/kg	Poor	66 ± 4 (3)	52 ± 10 (4)	48 ± 11 (7)	49 ± 10 (7)
	Better-off	64 ± 8 (3)	60 ± 6 (9)	52 ± 7 (12)	54 ± 8 (8)
	Rich	-	66 ± 0 (1)	64 ± 0 (1)	53 ± 0 (1)
Men: Protein/kg	Poor	1.84 ± .28	1.27 ± .21	1.08 ± .28	1.23 ± .25
	Better-off	1.70 ± .25	1.48 ± .24	1.20 ± .20	1.37 ± .29
	Rich	-	1.50 ± 0	1.37 ± 0	1.26 ± 0
Women: Energy/kg	Poor	37 ± 0 (1)	41 ± 21 (2)	41 ± 5 (4)	36 ± 1 (3)
	Better-off	57 ± 0 (1)	47 ± 0 (2)	40 ± 3 (2)	44 ± 0 (1)
	Rich	-	-	-	-
Women: Protein/kg	Poor	.94 ± 0	1.10 ± .81	.91 ± .27	.88 ± .06
	Better-off	1.64 ± 0	1.12 ± .13	.88 + 0	1.07 ± 0
	Rich	-	-	-	-

Figures in parentheses are nos. of persons.

Appendix Table C-6

Energy Intake of different age and sex groups as % of household heads in different seasons

Age/sex groups	Socio-economic class	March-April	June	Sept.-Oct.	December
1-4 yrs: Male	poor	40.4 ± 26.8 (9)	42.6 ± 29.8 (15)	36.5 ± 16.6 (21)	38.2 ± 21.9 (19)
	Better-off	27.2 ± 13.2 (6)	29.7 ± 12.2 (16)	36.2 ± 8.5 (19)	34.7 ± 13.4 (16)
	Rich	32.5 ± .2 (3)	28.7 ± 9.0 (3)	33.8 ± 19.5 (5)	45.9 ± 12.0 (4)
1-4 yrs: Female	Poor	22.2 ± 6.3 (4)	27.4 ± 12.7 (11)	37.9 ± 11.2 (10)	30.5 ± 13.7 (10)
	Better-off	28.0 ± 10.1 (2)	21.2 ± 11.8 (4)	32.3 ± 5.1 (5)	30.0 ± 7.1 (5)
	Rich	33.7 ± 0 (1)	47.2 ± 0 (1)	32.1 ± .1 (2)	12.2 ± 0 (1)
5-14 yrs: Male	Poor	53.5 ± 18.5 (10)	64.3 + 21.2 (12)	62.6 ± 12.4 (22)	63.0 ± 15.1 (21)
	Better-off	64.3 ± 6.4 (3)	64.4 ± 15.9 (11)	56.0 ± 16.1 (14)	62.4 ± 21.2 (12)
	Rich	47.4 ± 5.6 (2)	50.6 ± 13.4 (3)	60.5 ± 19.6 (6)	72.8 ± 35.1 (3)
5-14: Female	Poor	53.8 ± 34.1 (11)	68.3 ± 38.2 (24)	58.7 ± 12.5 (26)	65.2 ± 21.2 (26)
	Better-off	57.0 ± 7.0 (5)	60.4 ± 15.9 (10)	61.9 ± 14.3 (11)	61.1 ± 13.8 (11)
	Rich	60.4 ± 17.0 (4)	48.1 ± 2.7 (5)	65.5 ± 11.1 (5)	61.5 ± 10.6 (4)
15-44 yrs: Women	Poor	81.7 ± 45.2 (13)	82.8 ± 20.7 (31)	82.0 ± 14.1 (32)	80.0 ± 18.9 (31)
	Better-off	88.3 ± 21.8 (10)	86.2 ± 18.0 (22)	88.0 ± 12.9 (25)	87.9 ± 22.1 (21)
	Rich	80.9 ± 14.6 (5)	78.6 ± 5.7 (4)	81.0 ± 14.0 (7)	73.0 ± 22.9 (6)

Appendix Table C-7

Intake of Carotene-rich leafy and green and yellow vegetables (GYV) and fruits: 1-14 years. (Gm/person/day ± S.D.)

Socio-economic class/sex	Type	March-April	June	Sept.-Oct.	December
Poor: male		n = 22	n = 30	n = 43	n = 42
	Leafy	9.5 ± 23.0	11.8 ± 24.7	2.5 ± 7.1	12.7 ± 23.6
	GYV	11.8 ± 13.7	13.8 ± 10.0	16.9 ± 19.2	7.8 ± 9.7
	Fruits	-	44.6 ± 89.0	-	-
	Total	21.3	70.2	19.4	20.5
Poor: female		n = 15	n = 35	n = 36	n = 36
	Leafy	11.3 ± 32.4	12.3 ± 21.3	4.4 ± 9.1	12.5 ± 27.6
	GYV	17.4 ± 36.9	17.3 ± 20.0	28.3 ± 35.7	6.3 ± 7.5
	Fruits	-	80.0 ± 113.8	-	-
	Total	28.7	109.6	32.7	18.8
Better-off: male		n = 9	n = 27	n = 34	n = 28
	Leafy	.4 ± 1.1	9.7 ± 13.1	3.9 ± 8.1	14.3 ± 21.2
	GYV	5.7 ± 5.2	15.0 ± 16.1	13.9 ± 16.6	13.2 ± 22.7
	Fruits	2.0 ± 6.1	44.8 ± 69.2	-	-
	Total	8.1	69.5	17.8	27.5
Better-off: female		n = 7	n = 14	n = 16	n = 16
	Leafy	.5 ± 1.2	13.8 ± 19.4	8.3 ± 13.9	13.3 ± 22.7
	GYV	14.1 ± 11.8	18.0 ± 14.3	11.8 ± 11.3	5.7 ± 3.9
	Fruits	4.3 ± 8.3	31.3 ± 46.6	-	-
	Total	18.9	63.1	20.1	19.0
Rich: male		n = 5	n = 7	n = 11	n = 7
	Leafy	1.0 ± 2.2	3.4 ± 7.2	1.4 ± 4.5	3.0 ± 5.7
	GYV	4.5 ± 4.9	14.6 ± 24.0	8.4 ± 10.0	9.6 ± 12.0
	Fruits	-	84.3 ± 136.3	-	-
	Total	5.5	102.3	9.8	12.6
Rich: female		n = 5	n = 6	n = 7	n = 5
	Leafy	13.6 ± 27.2	4.8 ± 7.5	14.2 ± 37.5	9.7 ± 21.8
	GYV	9.9 ± 5.5	7.4 ± 8.9	9.9 ± 13.7	20.8 ± 21.3
	Fruits	-	90.5 ± 128.9	-	-
	Total	23.5	102.7	24.1	30.5

Appendix Table C-8

Intake of Carotene-rich leafy and green and yellow vegetables (GYV) and fruits: 15 years and above (Gm/person/day ± S.D.)

Socio-economic class/sex	Type	March-April	June	Sept.-Oct.	December
Poor: male		n = 12	n = 25	n = 31	n = 30
	Leafy	8.2 ± 15.8	13.7 ± 22.6	7.2 ± 20.0	29.5 ± 75.7
	GYV	25.6 ± 25.1	46.8 ± 39.4	57.6 ± 66.1	23.8 ± 32.3
	Fruits	-	107.0 ± 179.6	-	-
	Total	33.8	167.5	58.8	53.3
Poor: female		n = 15	n = 37	n = 39	n = 37
	Leafy	20.4 ± 53.0	20.5 ± 33.5	5.2 ± 15.6	25.0 ± 43.4
	GYV	16.0 ± 13.2	34.4 ± 25.8	39.6 ± 48.8	16.6 ± 21.8
	Fruits	-	81.1 ± 162.9	-	-
	Total	36.4	136.0	44.8	41.6
Better-off: male		n = 8	n = 33	n = 32	n = 32
	Leafy	.9 ± 2.6	37.0 ± 51.4	17.8 ± 43.5	70.3 ± 89.1
	GYV	34.5 ± 28.4	48.7 ± 54.3	41.0 ± 46.3	25.2 ± 22.3
	Fruits	.4 ± 1.8	104.5 ± 166.4	-	-
	Total	35.8	190.2	58.8	95.5
Better-off female		n = 11	n = 27	n = 30	n = 25
	Leafy	8.2 = 12.0	27.2 ± 36.9	6.3 ± 13.9	40.6 ± 47.1
	GYV	27.6 ± 24.8	26.0 ± 15.7	25.1 ± 25.7	23.6 ± 37.4
	Fruits	2.0 ± 5.1	46.1 ± 79.7	-	-
	Total	37.8	99.3	31.4	64.2
Rich: male		n = 12	n = 16	n = 14	n = 16
	Leafy	8.7 ± 14.5	15.6 ± 19.3	107.8 ± 123.2	21.5 ± 43.9
	GYV	18.2 ± 10.4	25.5 ± 16.5	27.4 ± 22.6	49.8 ± 72.0
	Fruits	-	137.8 ± 127.7	-	-
	Total	26.9	178.9	135.2	71.3
Rich: female		n = 6	n = 5	n = 9	n = 8
	Leafy	26.1 ± 28.8	10.6 ± 15.6	28.9 ± 57.3	9.6 ± 18.1
	GYV	16.7 ± 9.0	11.3 ± 8.6	26.9 ± 29.6	20.4 ± 17.8
	Fruits	-	80.1 ± 101.5	-	-
	Total	42.8	102.0	55.8	30.0

Appendix Table C-9

Intake of dietary fat in different seasons (Mean gm/person/day ± S.D.)

Age/sex	Socio-economic class	March-April	June	Sept.-Oct.	December
1-14 yrs Male	Poor	6.3 ± 3.3 (25)	5.0 ± 3.2 (30)	3.4 ± 2.4 (43)	3.0 ± 1.2 (42)
	Better-off	5.0 ± 2.9 (9)	6.8 ± 4.1 (27)	4.7 ± 3.0 (34)	4.0 ± 3.5 (28)
	Rich	10.1 ± 6.0 (5)	11.2 ± 6.5 (7)	4.5 ± 3.3 (11)	6.2 ± 6.2 (7)
1-14 yrs Female	Poor	6.7 ± 3.0 (15)	5.9 ± 3.6 (35)	4.2 ± 2.4 (36)	4.0 ± 2.7 (36)
	Better-off	8.0 ± 3.3 (7)	6.2 ± 4.6 (14)	5.0 ± 2.3 (16)	4.8 ± 3.7 (16)
	Rich	14.6 ± 2.6 (5)	9.8 ± 2.5 (6)	9.3 ± 9.1 (7)	4.8 ± 3.2 (5)
15 yrs + Male	Poor	16.3 ± 5.9 (12)	11.7 ± 5.5 (25)	8.6 ± 3.6 (31)	8.3 ± 2.7 (30)
	Better-off	16.6 ± 4.5 (8)	14.7 ± 5.9 (33)	10.2 ± 4.0 (32)	10.1 ± 4.8 (32)
	Rich	21.3 ± 7.6 (12)	18.6 ± 5.6 (16)	11.1 ± 6.6 (14)	13.9 ± 8.0 (16)
15 yrs + Female	Poor	10.7 ± 4.4 (16)	8.7 ± 3.9 (37)	6.4 ± 2.7 (39)	6.2 ± 2.6 (37)
	Better-off	12.9 ± 4.6 (11)	9.7 ± 3.5 (27)	8.5 ± 5.0 (30)	7.0 ± 3.3 (25)
	Rich	17.0 ± 6.0 (6)	16.0 ± 5.3 (5)	7.4 ± 4.6 (9)	7.1 ± 2.3 (8)

Figures in parentheses are numbers of persons.

APPENDIX D

Appendix Table D-1

Mean age of anthropometric samples by age/sex groups by months of measurements

Age/sex groups	Socio-economic class	March	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
1-4 yrs Male	Poor	2.8 (12)	3.0 (15)	2.9 (20)	2.9 (21)	3.1 (19)	3.3 (19)	2.9 (22)	3.1 (20)	3.0 (25)	3.1 (26)
	Better-off	2.7 (7)	2.7 (6)	3.1 (17)	3.2 (16)	3.1 (15)	3.2 (15)	3.2 (15)	3.2 (15)	3.1 (14)	3.4 (13)
	Rich	2.9 (3)	3.1 (3)	3.7 (3)	3.1 (5)	3.0 (4)	3.2 (5)	4.8 (1)	3.8 (5)	3.5 (3)	4.0 (2)
1-4 yrs Female	Poor	3.2 (6)	3.3 (5)	2.9 (11)	3.1 (10)	2.9 (10)	2.7 (12)	2.7 (15)	2.5 (15)	2.7 (16)	2.6 (16)
	Better-off	3.7 (2)	3.8 (2)	3.0 (4)	3.1 (4)	2.2 (3)	2.9 (4)	3.1 (5)	3.2 (5)	2.4 (6)	2.7 (7)
	Rich	4.0 (1)	4.2 (1)	4.3 (1)	4.3 (1)	2.7 (2)	2.8 (2)	2.9 (2)	3.0 (2)	3.0 (2)	3.1 (2)
5-14 yrs Male	Poor	8.6 (15)	9.2 (12)	8.8 (20)	8.7 (19)	9.2 (17)	8.8 (19)	8.9 (20)	9.3 (18)	9.8 (20)	9.1 (19)
	Better-off	9.9 (7)	10.3 (6)	10.2 (11)	9.8 (11)	11.2 (7)	10.1 (13)	9.8 (14)	9.7 (13)	9.7 (15)	9.4 (14)
	Rich	7.5 (2)	7.7 (2)	10.1 (2)	9.9 (3)	7.9 (2)	10.1 (3)	12.0 (2)	10.3 (3)	12.1 (2)	9.1 (4)
5-14 yrs Female	Poor	9.1 (17)	9.3 (16)	9.4 (29)	9.1 (23)	9.5 (22)	9.4 (26)	10.0 (25)	10.0 (24)	9.9 (28)	10.0 (28)
	Better-off	10.4 (8)	11.0 (7)	10.5 (13)	10.4 (9)	10.3 (10)	10.6 (10)	10.6 (10)	11.1 (10)	11.2 (11)	11.1 (10)
	Rich	12.0 (2)	12.2 (1)	10.5 (4)	10.6 (4)	10.1 (3)	10.7 (4)	10.2 (3)	11.5 (2)	10.4 (3)	10.5 (3)

cont.

Appendix Table D-1 cont.

Age/sex groups	Socio-economic class	March	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15-44 yrs Male	Poor	30.8 (13)	30.8 (12)	32.3 (17)	31.2 (19)	31.9 (9)	33.0 (21)	33.0 (18)	32.4 (13)	33.5 (17)	33.5 (15)
	Better-off	24.2 (9)	23.9 (8)	23.7 (16)	24.2 (15)	25.2 (12)	25.5 (14)	25.0 (14)	24.1 (14)	25.3 (18)	24.4 (11)
	Rich	26.6 (9)	27.0 (8)	25.9 (10)	28.0 (6)	26.8 (7)	29.8 (6)	29.1 (5)	28.3 (7)	30.1 (6)	29.4 (5)
15-44 yrs Female	Poor	26.4 (18)	27.4 (16)	26.2 (27)	26.7 (26)	26.6 (26)	26.8 (27)	26.8 (26)	26.9 (24)	26.7 (29)	26.4 (31)
	Better-off	26.2 (13)	26.0 (14)	27.6 (20)	28.9 (18)	27.6 (12)	28.1 (17)	29.4 (18)	28.4 (20)	28.1 (20)	28.8 (18)
	Rich	21.6 (2)	21.8 (5)	24.6 (5)	24.0 (5)	22.0 (5)	24.1 (6)	27.0 (4)	24.3 (6)	24.4 (6)	24.8 (3)
45 yrs+ Male	Poor	46.7 (3)	45.0 (2)	46.6 (5)	50.9 (4)	45.3 (3)	45.4 (4)	49.5 (7)	49.3 (7)	50.6 (6)	50.7 (7)
	Better-off	51.7 (6)	50.9 (7)	53.4 (12)	52.7 (10)	55.6 (7)	53.0 (11)	52.0 (9)	52.1 (9)	54.5 (10)	54.0 (12)
	Rich	-	-	45.0 (1)	45.0 (1)	-	45.0 (1)	45.0 (1)	-	45.5 (1)	45.6 (1)
45 yrs+ Female	Poor	45.0 (2)	45.0 (2)	45.0 (2)	50.0 (2)	48.7 (3)	59.0 (4)	45.6 (2)	45.7 (1)	60.7 (3)	46.0 (2)
	Better-off	45.0 (1)	45.0 (1)	47.6 (2)	50.0 (1)	47.8 (2)	47.9 (2)	48.0 (2)	48.0 (2)	48.0 (2)	48.0 (2)
	Rich	-	-	-	-	-	-	-	-	-	-

Appendix Table D-2

Distribution of children (6m-5 yr) in three categories as % of NCHS median weight for age: by months of measurement by socio-economic class

Month	Sex	Below 60%			60-80%			80% and above		
		Poor	Better off	Rich	Poor	Better off	Rich	Poor	Better off	Rich
March	M	14.3 (1)	14.3 (1)	-	78.6 (11)	85.7 (6)	50.0 (2)	7.1 (1)	-	50.0 (2)
1	F	20.0 (2)	-	-	70.0 (7)	100.0 (2)	100.0 (2)	10.0 (1)	-	-
May	M	13.3 (2)	16.7 (1)	-	60.0 (9)	83.3 (5)	50.0 (2)	26.7 (4)	-	50.0 (2)
2	F	9.1 (1)	33.3 (1)	-	81.8 (9)	66.7 (2)	100.0 (2)	9.1 (1)	-	-
June	M	16.0 (4)	5.9 (1)	-	56.0 (14)	82.4 (14)	33.3 (1)	28.0 (7)	11.8 (2)	66.7 (2)
3	F	11.8 (2)	-	-	64.7 (11)	71.4 (5)	100.0 (2)	23.5 (4)	28.6 (2)	-
July	M	32.0 (8)	25.0 (4)	-	48.0 (12)	75.0 (12)	60.0 (3)	20.0 (5)	-	40.0 (2)
4	F	18.8 (3)	14.3 (1)	-	56.3 (9)	57.1 (4)	100.0 (2)	25.0 (4)	28.6 (2)	-
Aug.	M	21.7 (5)	-	-	56.5 (13)	93.8 (15)	100.0 (4)	21.7 (5)	6.3	-
5	F	30.8 (4)	-	-	38.5 (5)	80.0 (4)	100.0 (2)	30.8 (4)	20.0 (1)	-
Sept	M	30.4 (7)	23.5 (4)	-	52.2 (12)	64.7 (11)	60.0 (3)	17.4 (4)	11.8 (2)	40.0 (2)
6	F	20.0 (3)	-	-	73.3 (11)	71.4 (5)	100.0 (2)	6.7 (1)	28.6 (2)	-
Oct.	M	25.0 (6)	11.8 (2)	-	54.2 (13)	82.4 (14)	100.0 (1)	20.8 (5)	5.9 (1)	-
7	F	25.0 (4)	-	-	68.8 (11)	75.0 (6)	100.0 (2)	6.3 (1)	25.0 (2)	-

cont.

Appendix Table D-2 cont.

Month	Sex	Below 60%			60-80%			80% and above		
		Poor	Better off	Rich	Poor	Better off	Rich	Poor	Better off	Rich
Nov.	M	22.7 (5)	18.8 (3)	-	59.1 (13)	75.0 (12)	40.0 (2)	18.2 (4)	6.3 (1)	60.0 (3)
8	F	13.3 (2)	14.3 (1)	-	80.0 (12)	85.7 (6)	100.0 (2)	6.7 (1)	-	-
Dec.	M	19.2 (5)	12.5 (2)	-	61.5 (16)	87.5 (14)	20.0 (1)	19.2 (5)	-	80.0 (4)
9	F	12.5 (2)	-	-	62.5 (10)	50.0 (3)	100.0 (2)	25.0 (4)	50.0 (3)	-
Jan.	M	14.8 (4)	7.1 (1)	-	59.3 (16)	85.7 (12)	33.3 (1)	25.9 (7)	7.1 (1)	66.7 (2)
10	F	12.5 (2)	-	-	62.5 (10)	57.1 (4)	50.0 (1)	25.0 (4)	42.9 (3)	50.0 (1)

Figures in parentheses are numbers

Appendix Table D-3

Proportion of People losing and gaining weight between seasons

Age group	Socio-economic class	Male % (nos.)			Female % (nos.)		
		Losing wt June-Sept	Losing wt June-Oct.	Gaining wt Sept.-Dec.	Losing wt June-Sept.	Losing wt June-Oct.	Gaining wt Sept.-Dec.
1-4 yrs	Poor	72.2 (13)	58.8 (10)	89.9 (16)	60.0 (6)	60.0 (6)	88.9 (8)
	Better-off	53.3 (8)	43.8 (7)	93.8 (15)	33.3 (1)	75.0 (3)	75.0 (3)
	Rich	66.7 (2)	0	100.0 (4)	0	0	100.0 (1)
5-14 yrs	Poor	47.1 (8)	64.7 (11)	88.9 (16)	38.5 (10)	40.0 (10)	92.0 (23)
	Better-off	30.3 (3)	40.0 (4)	91.7 (11)	60.0 (6)	20.0 (2)	66.7 (6)
	Rich	50.0 (1)	0	100.0 (2)	75.0 (3)	0	100.0 (3)
15-44 yrs	Poor	71.4 (10)	91.7 (11)	42.9 (6)	66.7 (16)	82.4 (19)	53.8 (14)
	Better-off	72.7 (8)	70.0 (7)	45.5 (5)	70.6 (12)	82.4 (14)	75.0 (12)
	Rich	50.0 (3)	80.0 (4)	66.7 (4)	60.0 (3)	75.0 (3)	66.7 (4)

Figures in parentheses are numbers