CHILD NUTRITIONAL STATUS, FOOD AND NUTRIENT INTAKE PATTERN OF LANDLESS AND MARGINAL FARM HOUSEHOLDS OF CHEHELGAZI UNION IN DINAJPUR DISTRICT

A THESIS

BY

MIR SABBIR AL MAHMUD
Student No. 1105028
Session: 2011-12
Semester: January – June, 2012

MASTER OF SCIENCE
IN
FOOD ENGINEERING AND TECHNOLOGY

DEPARTMENT OF FOOD ENGINEERING AND TECHNOLOGY

HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY UNIVERSITY, DINAJPUR

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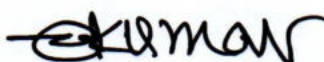
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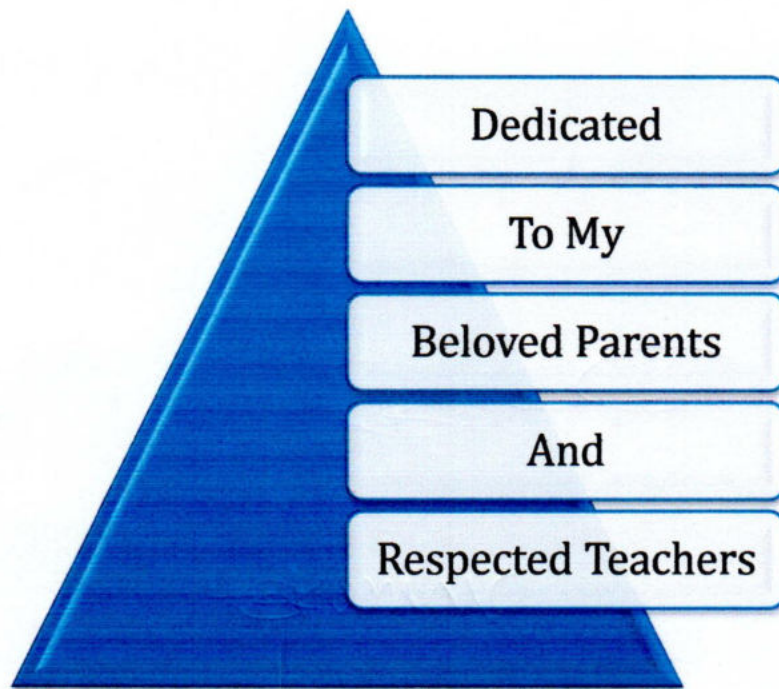
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JUNE, 2012

Dedicated

To My

Beloved Parents

And

Respected Teachers

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ABSTRACT

Balanced food intake is needed by individual human being for maintaining good health and nutritional status for active and prosperous life. Household food & nutrient intake pattern and child nutritional status for the landless and marginal farm households for rural are not well known. This study is therefore undertaken to know the socio-demographic and economic condition, food and nutrient intake pattern and child nutritional status of the landless and marginal farm families of rural areas. In this regard this study was carried out on 75 landless and marginal households having under five years children in family of Chehelgazi union in Dinajpur district. Survey method was employed for data collection. Information on dietary intake for past 24 hours recall and direct weighing method, anthropometric measurements and socio-economic indices were recorded. This study found that about 9% are working mother and 91% are housewife, 80% HHs have one earning member and 20% HHs have 2 & above earning members in family. The average monthly income and average monthly expenditure on food of the studied households are 6452Tk and 5046Tk respectively. About 65% HHs are poor families; this figure is much higher than the national percentage of poor families. The percentages of stunting, underweight and wasting children (6-59 months) are 29.4%, 28% and 4% respectively. Results revealed that boy children are more sufferers in stunting than girls children, while girl children are more sufferers in underweight than boy children. There is no significant difference found for stunting and underweight children according to landless and marginal farmer's children. Mean total food intake is found 864.15 gm/day. Per capita per day total food intake is found 991.46gm, 872.14gm and 703.92gm respectively for the families of non-poor, absolute poor and hard core poor. The mean per capita per day energy intake by the landless and marginal families is found 2001.38 kcal. Per capita per day mean energy intake by landless households are lower (1989.9kcal) than for marginal households (2056.05kcal). Household heads education, mother's education, monthly income of the household (Tk.) and monthly expenditure from food item has significant positive correlation with total food intake and nutrients intake. With the increases of parental education the protein and fat intake by the HHs increases but carbohydrate intake decreases. Positive relationship is found with economic status of the HHs with protein, fat, and calcium intake by the family members. The findings regarding low food and nutrient intake as well as poor nutritional status of children for the landless and marginal family obviously indicate their inability to lead a socially useful and economically productive life.

CONTENTS

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LIST OF ABBREVIATIONS

AHFS	:	Assessment of Household Food Security
BARC	:	Bangladesh Agricultural Research Council
BDHS	:	Bangladesh Demographic and Health Survey
BINP	:	Bangladesh Integrated Nutrition Programmer
BMI	:	Body Mass Index
BNNS	:	Bangladesh National Nutritional Survey
BSS	:	Bangladesh Bureau of Statistics
CED	:	Chronic Energy Deficiency
CMNS	:	Child and Mother Nutrition Survey
HDR	:	Human Development Report
HFA	:	Height for Age
HKI	:	Helen Keller International
INFS	:	Institute of Nutrition and Food Science
ICDDR,B	:	International Center for Diarrhoeal Diseases Research, Bangladesh
ICMR	:	Indian Council of Medical Research
IDD	:	Iodine Deficiency Disorders
IU	:	International Unit
Kcal	:	Kilo-calorie
LBW	:	Low-Birth-Weight
MAC	:	Mid Arm Circumference
MG	:	Micro gram
NCHS	:	National Center for Health Statistics
NSP	:	Nutrition Surveillance Project
PEM	:	Protein Energy Malnutrition
RNI	:	Recommended Nutrition Intakes
UNDP	:	United Nations Development Programme
UNICEF	:	United Nations Children Emergency Fund
USAID	:	US Agency for International Development
WFA	:	Weight for Age
WFH	:	Weight for Height
WFS	:	World Food Security
WHO	:	World Health Organization

Chapter 1

INTRODUCTION

CHAPTER I
INTRODUCTION

1.1. Background of the Study

The performance of human body is carried out by eating different food items and drinking water. The energy giving food items provide energy to the body that is required principally for physical activities. Several foods provide protein for physical growth and maintenance of body tissue and some other foods regulate the body processes. At what time different kinds of food items are consumed adequately according to the requirement, the body become well nourished and healthy and thus become fit for maintaining active and prosperous life. Therefore, it implies that food of all kinds must be available to everybody to satisfy his/her daily nutrient requirement at all times throughout the year. But a great majority of the rural poor people of Bangladesh is survived with the lacking of required food supply almost round the year. That has been tinted in the findings of different national nutrition surveys mentioned in literature review.

World leaders convened at FAO Headquarters for the World Summit on Food Security unanimously adopted a declaration pledging renewed commitment to eradicate hunger from the face of the earth sustainably and at the earliest date[1] during World Food Summit held in Rome in 2009. For the reason that adequate food is a basic need of individual human being for his/her sound health and good nutritional status in turn sound health and nutritional status is obviously needed to achieve and maintain an active and prosperous life.

Bangladesh Integrated Nutrition Project[2] report showed 54% of children under five years were severely or moderately malnourished and 35-50% of newborn babies were below the normal weight of 2500 grams. Approximately 70% of mothers and children suffered from iron-deficiency anemia. The prevalence of night blindness was 1.7% due to vitamin A deficiency, and iodine deficiency disorders affected 68.9% of the population. Another report[3] showed that about 94% of the children suffer from varying degrees of malnutrition. About 20,000-33,000 children go blind every year due to chronic vitamin A deficiency. This statistics can be considered as good indicators that showing widely prevalent of malnutrition in the country.

Nutritional deficiencies are caused by inadequate dietary intake and poor nutrient absorption. Many people residing in Bangladesh always have been obliged to go without adequate food and nutrition. The phenomenon is not new. A study investigated among the prim gravid Bengali women[4] and found that the dietary patterns were inadequate in quality and quantity. He also showed that as cereals and vegetables provided most of the caloric intake, protein intake was also inadequate as was iron intake. Inadequate protein intake was associated with various grades of nutritional anemia.

The preliminary report[5] of the Bangladesh Nutrition Survey of 1975-76 underlined an overall reduction in per capita food intake compared to the 1962-64 survey. The report also showed that food intake varies seasonally with a potential period of protein-calorie deficiency between June and November. From the Child Nutrition Survey of Bangladesh[6] revealed that more than 50% of child mortality was linked to malnutrition.

In Bangladesh, malnutrition is a serious health concern. The report on situation analysis of nutrition status in Bangladesh, prepared for UNICEF-Bangladesh[5] showed protein-calorie malnutrition, diarrhoea-disease related malnutrition and vitamin A deficiency are still major problems. The situation has been further aggravated by natural disasters and is linked to such factors as food availability, medical service, environment, sanitation and education. They showed that malnutrition is also affected by economic and social factors like low salaries and employment levels, and low women's status in the society.

The nutrition survey conducted in rural Bangladesh in 1975/76 to 1981/82 showed that the average level of intake of calorie and some other nutrients were declined over time and the extent of malnutrition in the country worsens [7&8]. Nutrition survey of 1981-82 showed that more than 80 percent of rural poor households were deficient in calorie, while 77% in protein, 88% in vitamin-A, 97% in vitamin-B2 and 87% households were deficient in vitamin C intake[8]. Ninety three percent households had intake below the requirement of calcium and fat intake was only 10gm per person per day.

National nutrition survey of Bangladesh 1995-96[11] also showed that per capita food intake of rural people was only 731gm per day, which were 765gm in 1981-82[8] and 807gm in 1975-76[7]. Average cereal food intake continuously decreased from 537gm in 1962-64 through 523gm in 1975-76 and 488gm in 1981-82 to 452gm in 1995-96. Average per capita calorie intake in rural population was 1892 kcal which was 15.9, 9.6 and 2.6 per cent less than that of 1962-64, 1975-76 and 1981-82 figures respectively. Per capita

calorie intake was also more than 7 per cent less than the estimated national average calorie requirement.

Bangladesh Bureau of Statistics (BBS) has been conducting the Household Income and Expenditure Survey (HIES) on a regular basis as the core survey to provide with very important data like income, expenditure, consumption and poverty situation. The latest survey was in 2010, named as HIES 2010[9]. The average monthly household income in 2010 is estimated at Tk. 11,479 at the national level, Tk. 9,648 in rural area and Tk. 16,475 in urban area. In 2005, the same was Tk. 7,203 at the national level, Tk. 6,095 in rural area and Tk. 10,463 in urban area. Average nominal income increased by 59.38 percent at the national level, 58.27 percent in rural area and by 57.48 percent in urban area in 2010 relative to 2005. In 2010, the average monthly household expenditure is estimated at Tk. 11,200 at the national level, Tk. 9,612 in rural area and Tk. 15,531 in urban area. In 2005 the same was Tk. 6,134 at the national level, Tk. 5,319 in rural area and Tk. 8,533 in urban area. In nominal terms, it increased by 82.59 percent at the national level, 80.71 percent in rural area and by 82.01 percent in urban area relative to 2005.[9]

The HIES 2005 & HIES 2010 showed the food intake (gram per capita per day). The overall calorie intake per capita per day increased by 3.56 percent to 2318.3 k.cal in 2010 from 2238.5 k.cal in 2005. It increased by 4.06 percent in rural and 2.3 percent in urban areas. Per capita per day protein intake (in grams) has significantly increased in 2010, although it did not change in last two surveys (2005 and 2000). At national level, it has increased to 66.26 grams per capita per day in 2010 from 62.52 grams per capita per day in 2005. Per capita per day protein intake has increased to 66.24 grams in 2010 from 61.74 in 2005 in rural areas. In urban areas, the same increased to 69.11 grams in 2010 from 64.88 grams in 2005. In HIES 2005, the food intake (gram per capita per day) for cereal, pulse, vegetable, fish, meat, egg, milk and milk product and fruit was found 469.2, 14.2, 157.0, 42.1, 20.8, 5.2, 32.4 and 32.5 respectively at national level. Whereas in HIES 2010, the food intake (gram per capita per day) for cereal, pulse, vegetable, fish, meat, egg, milk and milk product and fruit was found 463.9, 14.3, 166.1, 49.5, 19.0, 7.2, 33.7 and 44.7 respectively at national level[9].

Soil types of Bangladesh are greatly diversified. The total land area of Bangladesh is 143999 square kilometer out of which 122955 square kilometer (85%) is used for agriculture[10]. The Household Expenditure Survey 1995-96 conducted by BBS indicated

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that about 6% of the rural households did not own any land[13]. According to Bangladesh National Nutrition Survey[11], 5% of the selected households in the rural areas did not possess any land. The Centre on Integrated Rural Development for Asia and the Pacific, CIRDAP-BBS Poverty Monitoring Survey (1995-96) also showed that, among the rural households 4-6% did not own any land. According to the Agricultural Census[12], the percentage of landless in the rural areas is around 10%. The report also indicates that the number of land owning households in the rural areas has gone up from 12 million (1983-84) to 16 million in 1996 at an annual compound growth rate of about 2.3%.

In food consumption behavior and nutritional situation of the children as well as for the family members of the country, there has been no significant improvement recorded. This is because of widespread incidence of landlessness people leading to intensification of poverty pressures, sharp decline in death rates resulting high population growth rates and inadequate public investment in agriculture & rural development preventing increases in productivity. Inadequate diet, proper food habit, required food distribution among the family members; dietary pattern, income and education of the family members are also important factors contributing to the present state of malnutrition in the country. These problems are costing the country substantially in terms of premature deaths, permanent disabilities and loss in productivity and income.

However, the manner in which the above changes have affected the nutritional status of the people of the country remains unclear, specially for landless and marginal farm households. Since the availability of nutritious foods to consume in required quantities and to balance the diet is one of the basic needs to reduce malnutrition, research in this direction can go a long role to play in increasing the production of nutrient dense foods, ensure their proper utilization, minimize wastage and provide food security at the household level. Therefore, this study is proposed to gather some important data and understand the relating food consumption behavior of the landless and marginal farmer's family and also to assess the changes that have taken place in the community in the present scenario. Here, the main reasons for selecting this Chehelgazi union were time and resource constraints for the research.

1.2. Objectives of the Study

Determining the child nutritional status, socio-economic and demographic factors affecting food and nutritional intake pattern by the landless and marginal households and to recommend measures to improve the present status of dietary pattern and to ensure food security, a study is therefore proposed to:

(i)   Investigate socio-economic and demographic status of the studied households.

(ii)   Identify nutritional status of the children (6-59 months old).

(iii)   Investigate the food intake pattern by socio-economic characteristics of the households.

(iv)   Assess the nutrient intake pattern by socio-economic factors of the households.

(v)   Determine the relationship between socio-economic variables with food and nutrient intake pattern.

Chapter 2

REVIEW OF LITERATURE

CHAPTER II
REVIEW OF LITERATURE

Dietary and nutrient intake pattern of Bangladeshi population was investigated by four national nutrition surveys (1962-1996) and other small scale nutritional studies. In 1962-64 national nutrition survey for the first time was conducted in Bangladesh.

The result of second Bangladesh Rural Nutrition survey in 1975-76[7] showed that per capita per day food intake was 807 gm contributed by cereals-65%, vegetables & other plant foods-30% and animal foods-5%. Per capita intakes of cereals, pulses, animal foods, vegetables and fruits were 523, 23.8, 44, 126, and 20.6 gm respectively. Per capita per day calorie, protein and fat intakes were 2094 kcal, 58.5 gm and 12.2 gm respectively[7]. About 59, 60, 81, 89 and 93 per cent households were found to have deficient in calorie, protein, Calcium, vitamin A and vitamin C intakes respectively in 1975-76.

Third Bangladesh rural nutrition survey[8] conducted in 1981-82. Cereals contributed 64%, vegetables & plant foods contributed 30% and animal foods contributed 6 per cent of the total food intake. Per capita per day cereals, pulses, animal foods, vegetables and fruits intakes were 488, 8.0,1 20, 17.4 gm respectively. Per capita per day calorie, protein and fat intakes were 1943 kcal, 78.4 gm and 9.8 gm respectively. Only 24% and 23% of the households had adequate calorie and protein intakes. About 93, 88 and 87 percent households were deficient in calcium, vitamin A and vitamin C intakes.

In 1995-1996, fourth national nutrition survey conducted and showed that per capita per day food intake of Bangladeshi population was 728 gm and that of rural population was 730.8 gm[11]. Cereal, roots & tubers, pulses, animal foods, vegetables and fruit intakes of the rural population were 452, 70, 10, 54, 112 and 13 gm respectively, Cooking fat intake was only 6 gm per day per capita. Intakes of cereals, roots & tubers, vegetables, milk & milk products were significantly increased in the post-harvest period compared to the pre-harvest period of main cropping season. Households having monthly household income less than Tk.3000/-, per capita per day food intake was 713 gm including cereals 452 gm, roots & tubers 66 gm, pulses 9.6 gm, vegetables & fruits 122 gm, animal foods 44.6 gm and 5.7 gm of cooking oil.

Household Expenditure Surveys conducted in Bangladesh[13] showed that average national per day per capita calorie intake increased from 2215 Kcal in 1988-89 to 2299 Kcal in

1991-92 with an increment of calorie by 51 Kcal. On the other hand, per capita daily protein intake at the national level in 1988-89 was 64 gm which marginally decreased to 63 gm in 1991-92.

In a study by Bhuyan *et. al.* (1990) among rural pre-school children (aged 24-72 months) of Malaysia showed that the intakes of calorie, protein, iron, vitamin A, vitamin B2 as estimated by 24 hours dietary recall, were inadequate among 69, 20, 75, 26 and 65 per cent children respectively. Rice and wheat flour were their main source of energy and 71, 18 and 11 per cent of their energy intake was derived from carbohydrate, fat and protein respectively[14].

A representative sample of French Chadian Montrealers (614 adults age 19 years & above and 182 children aged 5-18 years) were surveyed to collect data on food habit, nutrient intakes, socio-demographic characteristics and 7 days food records. The results showed that energy intakes were 83% to 98% of the 1990 Canadian Recommended Nutrition Intakes (RNIs) with 16-18 years old adolescent girls having lower energy consumption. Calcium was most frequently found below the 66% of the recommended intakes (RNLs). On an average protein comprised 16% of energy, fat 36-37%, and carbohydrates 48-49% of energy. Simple sugars comprised 16-19% of energy among boys and 16-20% among girls fluctuating with age. Only 15.4% respondents had low total fat and saturated fat intakes providing 30-34% and 10-12% of energy respectively, no differences in mean nutrient intake levels were found between low, medium and higher fat consumers. Among those with inadequate intakes, 26% lived in one lower middle income sector of Montreal, however no clear pattern linking dietary adequacy and socio-economic factors was noticed[15].

To a better understanding of factors influencing the consumption of fruits, vegetables, and potatoes among the consumers a study was carried out in Norway. The study data was collected from two consumers groups; one including 1103 persons and the other one including 13,857 persons. The data indicate that a considerable proportion of the consumers had a very low frequency of consumption when compared to present recommendations of intakes; 31% consumed vegetables, and 24% fruits twice a week or less. Multivariate analysis (logistic regression) showed that age, sex income and household structure were important determinants for the consumption of fruits. These factors as well as education and place of living were important determinants of the

consumption of vegetables and potatoes. Consumers, who were very interested in health issues, were more likely to have a high consumption of fruits and vegetables, whereas those who had a preference for quickly prepared food tended to have low consumption of vegetables[16].

Bangladesh has the severest malnutrition problem in the world, as 68% and 64% of children of under-5 years are severely and moderately underweight and stunted respectively and 17% are suffering from wasting says World Bank Bulletin[17].

Nutritional status of under-5 children of Bangladesh as found in 1975-76 national nutrition survey showed that 57-9 and 5.8 per cent respectively were stunted and wasted and 15.8% were both stunted and wasted according to Water low classification. The corresponding figures for 5.11 year old children were 54.2, 2.7 and 9.6 per cent respectively[7]. According to Gomez classification, 96.55 of under-5 children were malnourished of whom 25.8% were third degree (severe) malnourished; while in 5.11 years age group more than 99% were malnourished of whom 36% were severely malnourished. Malnutrition was higher among 0.59 months old girls (97.3% including 27.7% sever) than that in boys (95.7% including 23.8% severe). but among 5.11 years age group the nutritional status of girls was a bit better (98.4% malnourished including 86.7% combined 2an & 3rd degree malnutrition) than boys (99.75% and 92.3% respectively). the prevalence of anemia, night blindness and angular steatites among 0.4 years old children were 82,1.3 and 3.3 per cent respectively, while the prevalence among 5-14 years male and female children were 43 &43; 3.8 & 0.6 and 8.7 & 8.7 per cent respectively[7].

Malnutrition has been considered as one of the major public health problem of national significance in Bangladesh as like other developing countries. Its prevalence is severe in rural communities compared to urban areas and women and children are the most vulnerable to malnutrition of various types. Insufficient food intake, loss of nutrients due to faulty milling, high percentage of breakage and loss during washing, cooking elevate the malnutrition in Bangladesh[18]. Illnesses extensively being caused in Bangladesh due to malnutrition are protein energy malnutrition (PEM), vitamin A deficiency disorders specially night blindness, iodine deficiency disorder-goiter, iron deficiency anemia and so on[19].

The 1995-96 national nutrition survey showed that the prevalence of stunting, wasting and underweight among 6-71 months old children were 60.7, 17.0 and 64.2 percent

respectively[11]. The prevalence of stunting, wasting and underweight were higher among rural children than urban children of both age groups. Stunting and underweight rates were higher (60.9% and 68.2%) among female children (6.71 months), than males (59% and 60.7%), while wasting was almost same (17.0% each). Among 10-17 years adolescents, 45.7% males and 62.8% females were normal in respect of BMI, while 54.3% and 36.6% respectively were malnourished (Thinness). Among adults, 47.2% and 49.7% males and females in feral areas respectively were chronic energy deficient (CED), while 2.2% males and 4.7% females were overweight. According to WHO criteria, the prevalence of anemia in Bangladesh was 74% with 77.1% in rural and 63.7% in urban areas. The prevalence of anemia among 0-4 years male & female was 69.5%, whereas in 5-14 years age group it was 78.1% in males & 82.9% in females. The prevalence of night blindness among 0 - <6 years, 6 - <10 years and 10-15 years children were 1.5, 1.9 and 1.4 per cent respectively, with an overall prevalence of 0.9% in Bangladesh. The prevalence of visible goiter and dental caries among Bangladeshi population were 24.5 and 23.0 per cent respectively[11].

Bangladesh Bureau of Statistics[20] conducted four national level child nutrition survey since 1985 till 1996. The first survey conducted in 1985-86 showed that more than 56.1% of Bangladesh Children aged 6-71 months were stunted. Only 6.6% children of same age group were normal according to Gomez classification as found in the second child nutrition survey in 1989-90 and the children suffering from second and third degree malnutrition were 47% and 6.8% respectively[21].

Nutritional status of children among 100 households in a village of Narayangonj was studied in 1988-89 and showed that 70 percent children were either stunted or wasted or both stunted and wasted. Almost all of them (98%) were found to suffer from malnutrition of various degrees and 49% were anemic and vitamin a deficiency disorders were more severe than those of 1981-82 survey [22].

The study conducted among 2000 under-5 children (6-59 months) attended Pediatric outpatient department of Sher-E-Bangla Medical college Hospital, Burial, showed that 10.0% children had normal nutrition, while 41.3, 33.6 and 13.7 per cent respectively had mild, moderated and severe under nutrition according to McLaren's classification. According to Wellcome classification, 8.6 children had kwashiorkor, 12.2% had under nutrition, 7.8% had marasmic kwashiorkor and 18.7% had marasmas[23].
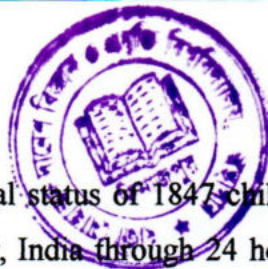
To assess the dietary intake and nutritional status of 1847 children aged 0-6 years from 396 villages of 17 tribal districts of Bihar, India through 24 hours dietary recall method and anthropometric measurements of height and weight a study was therefore conducted by Yadav *et. al.* (1999)[24]. The results showed that the mean intake of energy and other nutrients were lower in all age groups as compared to Indian Council of Medical Research Recommended Dietary Allowances, while protein intake was broadly in line with the Recommended Dietary Allowances in all age groups of children. Calorie deficiency was 38%, whereas protein deficiency was about 19% and more than 50% of the children were calorie deficient in 4 villages. The overall prevalence of stunting was about 60% and underweight was about 55% which were comparable in boys and girls, Wasting was more prevalent among girls (urban 34.5% vs. 16.3% and rural 34.9% vs. 18%). The level of malnutrition was not very different in rural and urban areas.

National Nutrition survey of Philippine in 1998 showed that among per-school children (0-5 yrs) 34%, 32% and 6% were stunted, underweight and wasted respectively. Among the school-age children (6-10 yrs) 30.2% were underweight and 40.8 percent were stunted. Among adolescents (11-19 yrs) 57% had normal BMI, 40.2% were underweight, and 2.9% were overweight including 0.3% obese. Adolescent males were more underweight (47.1%) than females (33%). About 50% of adults had normal BMI, while the prevalence of chronic energy deficiency (CED) among adults was 13.2% prevalence of CED was higher among female (15.4%) than males (11.1%) and the severity of CED was found to increase with age and as such older group of 60 years & above exhibited the highest prevalence of CED (25.4%). The prevalence of obesity among Philippino adult population was 3.3 percentage[25].

Recent results found from *Child and Mother Nutrition Survey of Bangladesh 2005*[26] that represents nutritional status of child and mother, which is rather subject oriented to our studies covering households. The summary of this findings are extracted below as for our convenience.

The Bangladesh Bureau of Statistics (BBS) conducted a Child and Mother Nutrition Survey (CMNS) in 2005 to assess the current nutritional status of children and mothers in Bangladesh. The survey covered 3797 children aged 0-59 months and 3050 mothers living in 3069 households in rural and urban Bangladesh.

According to new growth reference standards of the World Health Organization, 40% of under five children in Bangladesh were underweight in 2005, 46% were stunted and 15% were wasted. These new findings indicate that the nutritional status of children is improving; nevertheless, the levels of under nutrition remain unacceptably high.

According to criteria of the World Health Organization the prevalence of underweight and stunting was "very high", and the prevalence of wasting indicated a "critical problem". Severe underweight, severe stunting, severe wasting and obesity were found in 11%, 19%, 3% and 0.3% of the population. This Chronic energy deficiency of mothers is also declining; currently 32% have a low body mass index.

Over 95% of household heads were male, 57% were illiterate or had never attended school and the most common occupation group was agriculture (40%). About 60% of households relied on kerosene as their major source of light and the remainder had access to electricity. Only 18% of households had a sanitary toilet (defined as having either a flushing mechanism or a water seal) and 94% of household had access to tube well drinking water. The per capita food energy consumption was 2077 kcal/day, and was 65kcal/day higher in rural areas than urban areas.

The mean age of mothers of under-5 children was 28 years. Almost three-quarters (69%) of mothers marries before 18 years of age and 72% had their first pregnancy before 20 years of age. Almost one half (47%) of mothers were illiterate or had never attended school. Less than 10% of mothers were able to make their own decisions on how much money the household spends on food, what food is bought for the household, and whether the mother or her child attends a health facility.

The nutritional status of children was closely linked with several maternal characteristics. The prevalence of underweight, stunting and wasting was significantly higher among mothers with low education status, and with mothers who had chronic energy deficiency (CED, defined as a body mass index less than 18.5 kg/m).

Child underweight, stunting, and wasting showed a predictable association with wealth quintile: all three indices significantly decreased with increase in wealth quintile, and there was almost a two-fold difference in prevalence of under nutrition between the poorest and richest wealth quintiles. Similarly, the prevalence of all three indicators decreased with an increase in household land ownership, income and expenditure. Indicators of lower

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household food security, including low per capita kilocalorie consumption and loan for food, were associated with a higher prevalence of underweight, stunting and wasting.

Compared with the NCHS 1977 GRS, the WHO 2005 GRS estimate of child underweight is lower (45% vs. 40%) and the estimate of child stunting (40% vs. 46%) and child wasting (13% vs.15%) are higher. These differences are consistent with the predicted differences between the two GRS.

A number of factors prevent poor households in the rural areas to acquire enough food. The factors include insufficient income level for which the poor farmers are unable to purchase the necessary foods prevailing in the market. The rural households also lack the necessary assets or access to credit to assist them during the adversities. One of the main reasons of food insecurity among the rural poor is lack of their access to productive resources. Land- oriented poverty is a crucial factor in augmenting food insecurity in the rural households. The people who do not have access to food are vulnerable due to the function of various economic, ecological, geographical and demographic factors. Among the economic factors, level of income, occupation, ownership of land etc are predominant.

Chapter 3

METHODOLOGY

CHAPTER III

METHODOLOGY

3.1. Study Population

Landless and marginal households having under five years aged children of Chehelgazi Union in Dinajpur district constitute the study population. In this study landless household was defined as the household having 0-49 decimals of land and marginal household was defined as the household having 50-99 decimals of land regardless of whether the household owned, or leased or cultivating on share - cropping a part or the whole of the land. (BBS, 2010)

3.2. Study Locations

This study was carried out among the landless and marginal households having under five children from randomly selecting three villages of Chehelgazi Union in Dinajpur district. The main reasons for selecting this union were time and resource constraints for the research.

3.3. Selection of Households

Due to financial and time constraints, purposively selected 25 households from each of the three randomly selected villages of Chehelgazi Union. Finally, a sample of 75 landless and marginal farm households (HHs) having under five children was considered as the studied HHs in this study. Before selection of the sample a sampling frame of landless and marginal HHs (HHs having less than 100 decimals of land) with at least one under five children for each selected village was prepared.

3.4. Preparation of Questionnaires and Pre-testing

The objective oriented questionnaire was prepared following a series of consultation with my expert supervisors. The prepared questionnaires were pretested in the selected village near HSTU campus for two days. During pretesting some lapses were detected in the questionnaires, which were finalized through modifications as needed. After finalization the questionnaires were printed for conducting the study.

3.5. Data Collection and Instruments

Data were collected through direct interview of the respondents by the interviewers using a structured questionnaire that composed of both open and close ended questions. The questionnaire was designed to collect a bulk of the information on socioeconomic and demographic characteristics, consumption and distribution pattern of different food items among the household members, and anthropometric measurement of the children under five. Data was collected by qualified female field enumerator. Adequate training related data collection technique was given to field enumerator and to the researcher also by my expert supervisors and teachers. Data collection was supervised and quality of collected data was checked by me as a researcher. Each questionnaire could be divided into following 3 broad groups based on the type of information and interviewee:

Group A: Interview of household heads/spouses, mainly male members of the household: This group sought household related information such as family size, age, sex and occupation of household members; land ownership; dwelling type; wealth; monthly income from different sources and expenditure for food and non-food items; food production from cultivated land as well as from homestead gardening including poultry, cattle and fish culture etc.

Group B: Interview of mother/female guardians: This includes data on household dietary practice through 24 hours dietary recall method for the household. The interviewer used cups, spoons, plates and glasses of different sizes for determining weights. Respondents were asked to provide information on the amount of different food items they served to their family members and consumed by her by identifying the extent of these cups, spoons, plates and glasses. The interviewer then compared the identified extent with the standard codes to determine the weights of the consumed food items.

Group C: Anthropometric measurements: This group produced data on height and weight of children below five years old. This is for estimating nutritional status of the individuals Data were analyzed according to standard deviation scores (Z-score) classification using NCHS reference standard for height-for-age, weight-for-age and weight-for-height of children.

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3.6. Anthropometric Measurements

The procedures followed for anthropometric measurements of children under five are described below:

- **Height-for-age**: Height or stature reflects genetic background, skeletal maturity and past nutritional status trough linear growth. Compared with a reference standard, height-for-age detects stunting. Height was measured by a meter scale fixed with a wooded flat frame placed on a platform with a sliding head piece. In case of children under two years of age or could not be measured at standing position, their length was measured in laying position.

- **Weight-for-age**: Weight is the simplest and most common indicator of children's nutritional health. Compared with a reference standard, weight-for-age detects under weight. Weight of the children was measured without shoes and wearing light or no clothes using standard (Salter) spring balance to the nearest 10 grams.

- **Weight-for-height**. Weight-for-height is an expression of leanness or wasting and indicates recent or short-term changes in nutritional status. This parameter is thus considered an index of current nutritional status. Compared with a reference standard, this parameter detects wasting, a term widely used to describe recent and severe pathological process leading to significant weight loss, usually as a consequence of acute food shortage and/or disease.

Height and weight data of adolescence below five were compared with the international reference standard, the NCHS developed by the United States as recommended by the World Health Organization based on Z-score. NCHS standard met most of the criteria suggested by the International Union of Nutritional Sciences as ideal reference data for children 0-10 years old (Gibson, 1990).

3.7. Dietary Calculation

Dietary intakes calculation (edible part of different food items consumed) by the households were made with the formula suggested by dietary expert. All the cooked food items consumed were converted into raw weight of edible portion according to conversion factors for specific cooked food items developed by the Institute of Nutrition and Food Science (Ali and Pramanik, 1991) University of Dhaka. Total food consumed in a day by

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an individual member irrespective of frequency of meals is considered one consumption unit. By aggregation consumption units of all individual family members food consumption unit of the household is determined by which total household food consumption is divided to obtain per capita food and nutrient intake per day.

3.8. Data Analysis and Computer Software

3.8.1. Data analysis: Preparations of simple tables of proportions describing the concentration of categorical variables are made. Computation of summary measures such as means, variances, proportions, etc are done. Bivariate tables showing the relationship or association (correlation coefficient) between two categorical variables are prepared.

3.8.2. Computer software: There are several types of computer software available for data entry and analysis of food consumption data. Choosing the appropriate software requires careful consideration. This is because food consumption studies often contain different types of data for analyses and as a result require different types of software.

Socio-economic and demographic details, household-purchasing practices, perceptions of consumption of various food items software Statistical Package for Social Science (SPSS, Ver. 16.0) is used. Another type of software *ANTHRO* is needed to calculate risk factors associated with child health and nutrition. On the other hand, to calculate nutrient values for nutrient or dietary variables e.g. energy, protein, Vitamin C, iron, foods and their amounts consumed by the households and/or individuals the *FORTRAN* software was used.

Chapter 4

RESULTS & DISCUSSION

CHAPTER IV

RESULTS AND DISCUSSION

4.1. Demographic and Socio-economic Aspects of Households

Demographic and socio-economic information are carried out on various aspects to the households. These aspects are conducted on 75 households to the topics of religion of households, age group of children, sex of children, family size, education of households heads, mothers education, mother's working status, lighting system in the residence, total no. of earning family member, landownership, poverty incidence of Direct Calorie Intake (DCI) method, monthly income of the household, household monthly expenditure from food item. The results are presented in the table 4.1.

This table showed that the religion of households has 49 households (65.3%) of Islam and 26 households (34.7%) of Hindu in total 75 households. In the manner of age group of children, 15 households (20%) have 6-23 months children, 26 households (34.7%) have 24-42 months children, 34 households (45.3%) have 43-59 months children.

Boys and girls are found about 43 households (57.3%) and 32 households (42.7%) respectively to the sex of children. Fifty households (66.7%) have family size 1-4 persons and 25 households (33.3%) have family size 5 & above persons.

In education of household head, 59 households are under SSC and 16 households are found SSC passed. In mother's education, 63 households (84%) are under SSC and 12 households (16%) are found SSC passed.

In mother's working status, 7 households (9.3%) are found in working condition and 68 households (90.7%) are found in no work condition. Kerosene lamp is used in 52 HHs and electric light is used in 23 households.

In the circumstances of total earning member in the family, 60 households (80%) have earning member of 1 person and 15 households (20%) have 2 & above earning members. Sixty two households (82.7%) are landless (have 0-49 decimals) and 13 households (17.3%) are marginal (have 50-99 decimals land). In poverty incidence by DCI method, 26 HHs (34.7%) are in no poor status, 27 HHs (36%) are absolutely poor and 22 HHs (29.3%) status are hardcore poor.

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Table 4.1: Distribution of household members by their socio-demographic characteristics

Socio-demographic Characteristics	Levels	No.	%
Religion of HHs	Islam	49	65.3
	Hindu	26	34.7
Age group of children (months)	6 - 23	15	20.0
	24-42	26	34.7
	43-59	34	45.3
Sex of children	Boy	43	57.3
	Girl	32	42.7
Family size	1-4	50	66.7
	5 & above	25	33.3
Education of H/H head	Under SSC	59	78.7
	SSC passed	16	21.3
Mothers education	Under SSC	63	84.0
	SSC passed	12	16.0
Mother's working status	Work	7	9.3
	No work	68	90.7
Lighting system in the residence	Kerosene lamp	52	69.3
	Electric light	23	30.7
Total No. of earning family member	1 person	60	80.0
	2 & above	15	20.0
Landownership (Decimals)	Landless (0-49)	62	82.7
	Marginal (50-99)	13	17.3
Poverty incidence by DCI method	No poor[c]	26	34.7
	Absolute poor[b]	27	36.0
	Hard core poor[a]	22	29.3

Average per capita per day calorie intake by the HHs <1805 kcal[a], <2122 kcal[b], and ≥2122 kcal[c].

Table 4.2: Average monthly income and expenditure of the studied households

Economic Variables	Mean ± S.E of Mean (Tk.)
Average monthly income	6452 ± 54.8
Average monthly expenditure on food	5046 ± 36.5
Total monthly expenditure	6038 ± 49.0

Table 4.2 showed that average monthly income, monthly expenditure on food and total monthly expenditure of the studied households are Tk. 6452, 5046, and 6038 respectively. On the other hand, HIES 2010 report revealed that average monthly income and average monthly expenditure of rural household were Tk. 9648 and 9612 respectively.

4.2. Anthropometric Measurements and Nutritional Status of Children

This section represents the physical growth in respect of anthropometric measurements such as height and weight of children. In this study the anthropometric measurements are made on only 75 children among whom 43 individuals were male and 32 were female. In this study, estimation of the proportion of stunting, underweight, wasting was done by using Z-score and by comparing the observed heights and weights with NCHS reference value.

Table 4.3: Percentage distribution of studied children (6-59 months) according to height for age (stunting), weight for age (underweight) and weight for height (wasting) z-scores indices

Indices	Reference Value	No.	%
Height-for-age Z-score (Stunting)	Severe (-3.00 SD & below)	11	14.7
	Moderate (-2.99 SD to -2.00 SD)	11	14.7
	Normal (above -2.00 SD)	53	70.7
	Total	75	100.0
Weight-for-age Z-score (Under weight)	Severe (-3.00 SD & below)	1	1.3
	Moderate (-2.99 SD to -2.00 SD)	20	26.7
	Normal (above -2.00 SD)	54	72.0
	Total	75	100.0
Weight-for-Height Z-score (Wasting)	Severe (-3.00 SD & below)	1	1.3
	Moderate (-2.99 SD to -2.00 SD)	2	2.7
	Normal (above -2.00 SD)	72	96.0
	Total	75	100.0

Table 4.3 showed the percentage distribution of studied children (6-59 months) according to height for age (stunting), weight for age (underweight) and weight for height (wasting) z-score indices. Severe stunting children (-3.00 SD & below) found in 11 households (14.7%), moderate stunting (-2.99 SD to -2.00 SD) found in 11 households (14.7%) and 53 households (70.7%) are found normal (above -2.00 SD) with all 75 households. In terms of underweight, severe found in 1 households (1.3%), moderate found in 20 households (26.7%) and 54 children (72%) are found normal. Severe wasting found in 1 household (1.3%), stunting found in 2 households (2.7%) and 72 children (96%) are found normal.

Table 4.4: Percentage distribution of children according height for age, weight for age and weight for height z-scores by sex.

Z-scores	Reference Value	Sex of children					
		Boy		Girl		All	
		No.	%	No.	%	No.	%
Height-for-age Z-score (Stunting)	Severe (-3.00 SD & below)	7	16.3	4	12.5	11	14.7
	Moderate (-2.99 SD to -2.00 SD)	7	16.3	4	12.5	11	14.7
	Normal (above -2.00 SD)	29	67.4	24	75.0	53	70.7
	Subtotal	43	100.0	32	100.0	75	100.0
Weight-for-age Z-score (Under weight)	Severe (-3.00 SD & below)	0	.0	1	3.1	1	1.3
	Moderate (-2.99 SD to -2.00 SD)	11	25.6	9	28.1	20	26.7
	Normal (above -2.00 SD)	32	74.4	22	68.8	54	72.0
	Subtotal	43	100.0	32	100.0	75	100.0
Weight-for-Height Z-score (Wasting)	Severe (-3.00 SD & below)	1	2.3	0	.0	1	1.3
	Moderate (-2.99 SD to -2.00 SD)	2	4.7	0	.0	2	2.7
	Normal (above -2.00 SD)	40	93.0	32	100.0	72	96.0
	Subtotal	43	100.0	32	100.0	75	100.0

Table 4.4 showed the percentage distribution of studied children (6-59 months) according to height for age (stunting), weight for age (underweight) and weight for height (wasting) z-scores by sex of children. Among 75 children severe stunting found for boy in 7 households, for girl in 4 households and overall found 11 households (14.7%). Stunting

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condition also found for boy in 7 households, for girl in 4 households and overall in found 11 households (14.7%). Fifty three households (70.7%) are found normal where boys carry 29 households and girls carry 24 households. Consequently, severe underweight found for boy in 0 household, for girl in 1 household and overall in 1 household (1.3%). Underweight condition found for boy in 11 households, for girl in 9 households and overall in 20 households (26.7%). Fifty four households (72%) are found normal (above -2.00 SD) where boys carry 32 households and girls carry 22 households.

Severe wasting found for boy in 1 household, for girl in 0 household and overall in 1 household (1.3%). Wasting condition found for boy in 2 households, for girl in 0 household and overall in 2 households (2.7%). Seventy two households (96%) are found normal where boys carry 40 households and girls carry 32 households.

Table 4.5: Percentage distribution of children according height for age, weight for age and weight for height z-scores by landownership

Z-scores	Reference Value	Landownership (Decimals)					
		Landless (0-49 decimal)		Marginal (50-99 decimal)		All	
		No.	%	No.	%	No.	%
Height-for-age Z-score (Stunting)	Severe (-3.00 SD & below)	9	14.5	2	15.4	11	14.7
	Moderate (-2.99 SD to -2.00 SD)	9	14.5	2	15.4	11	14.7
	Normal (above -2.00 SD)	44	71.0	9	69.2	53	70.7
	Subtotal	62	100.0	13	100.0	75	100.0
Weight-for-age Z-score (Under weight)	Severe (-3.00 SD & below)	1	1.6	0	.0	1	1.3
	Moderate (-2.99 SD to -2.00 SD)	16	25.8	4	30.8	20	26.7
	Normal (above -2.00 SD)	45	72.6	9	69.2	54	72.0
	Subtotal	62	100.0	13	100.0	75	100.0
Weight-for-Height Z-score (Wasting)	Severe (-3.00 SD & below)	1	1.6	0	.0	1	1.3
	Moderate (-2.99 SD to -2.00 SD)	1	1.6	1	7.7	2	2.7
	Normal (above -2.00 SD)	60	96.8	12	92.3	72	96.0
	Subtotal	62	100.0	13	100.0	75	100.0

Table 4.5 showed the percentage distribution of studied children (6-59 months) according to height for age (stunting), weight for age (underweight) and weight for height (wasting) z-scores by landownership.

Among 75 households children severe stunting found in 9 landless households and 2 marginal households and overall found in 11 households (14.7%). Stunting condition also found in 9 landless households and 2 marginal households and overall found in 11 households (14.7%). Fifty three households (70.7%) were found normal in which 44 households are within landless and 9 households are within marginal.

Consequently, severe underweight found in 1 landless household and 0 marginal household and overall found in 1 household (1.3%). Underweight condition found in 16 landless households and 4 marginal households, overall found 20 households (26.7%). Fifty four households (72%) were found normal in which 45 households are within landless and 9 households are within marginal groups.

Severe wasting found in 1 landless household and 0 marginal household and overall found in 1 household (1.3%). Wasting condition found in 1 landless household and 1 marginal household and overall found in 2 households (2.7%). Seventy two households (96%) were found normal in which 60 households are within landless and 12 households are within marginal groups.

4.3. Food Intake Pattern of the Studied Households

Family members of the households have different traditions in eating meals. Food consumed in 24 hours by the household members may be eaten either by a single meal or two or three meals-depending on the supply of foods and with food habits in the households. Per capita per day food intake was, however, calculated by total household food intake in 24 hours divided by the number of individuals consumed food in that day.

Table 4.6 represents the mean per capita per day food intake (gm) of studied 75 households. Per capita mean total food intake by the HHs was found 864.15 gm/day. Per capita mean intake of cereal, rice, wheat, roots and tubers are found 465.77, 435.54, 10.04 and 145.67 gm/day respectively. Eggs, fish, fresh milk, fats and oil, meat, beef and fruits are found 4.31, 43.56, 27.24, 22.13, 15.41, 5.52, and 8.27 gm/day respectively. The others are also been found in the following table (Table 4.6).

Table 4.6: Mean per capita per day food intake (gm) of studied households

Food Items	No.	Mean	Std. Deviation
Cereal	75	465.77	106.531
Rice	75	435.54	119.077
Wheat	75	10.04	36.755
Other cereals	75	20.18	29.933
Root & tubers	75	145.67	84.726
White potato	75	106.51	85.923
Other roots & tubers	75	39.16	41.654
Sugar	75	5.12	16.570
White sugar	75	5.12	16.570
Pulse & nut	75	9.51	18.590
All pulses	75	9.51	18.590
Vegetables	75	109.69	134.555
Green vegetables	75	42.08	72.754
GY vegetables	75	56.20	101.978
NL vegetables	75	11.40	34.563
Fruits	75	8.27	21.985
Jack fruit	75	.33	2.868
Other fruits	75	7.94	21.919
Meats	75	15.41	41.648
Beef	75	5.52	26.726
Mutton	75	1.55	13.471
Poultry	75	8.33	31.237
Eggs	75	4.31	14.703
Fish	75	43.56	57.535
Fresh fish	75	42.48	57.476
Dry fish	75	.25	1.605
Crustace	75	.82	7.159
Milk product	75	27.24	58.089
Fresh milk	75	27.24	58.089
Fats & oil	75	22.13	18.440
Total food weight (gm)	75	864.15	195.443

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Per capita per day mean intake of cereal, rice, roots & tubers are found 463.55gm, 420.12gm and 129.39gm respectively for absolute poor families. Fish, fresh milk, fats & oil, meat, beef and poultry intake are found 40.07gm, 36.44gm, 21.79gm, 10.68gm, 0gm and 10.68gm mean values per capita per day respectively.

This table indicates that the mean values of per capita per day food intake (gm) by the non-poor status households for cereal, rice, other cereals, other roots and tubers, sugar, GY vegetables, meats, fats & oil and the total food weight are highest than the mean values for absolute poor and hard core poor status household. Similarly, for this food items the mean values for absolute poor status household are higher than the mean values for hard core poor status household.

The mean values of per capita per day food intake (gm) for roots and tubers, beef, fish, fresh fish food items are highest for non poor status household and lowest for absolute poor status household.

The mean values of per capita per day food intake (gm) for pulse & nut, all pulses, vegetables, NL vegetables, poultry, milk product and fresh milk food items are highest for absolute poor households. For white potato, the mean value of per capita per day food intake (gm) is highest for hard core poor status and lowest for absolute poor status households. For green vegetables, the mean value of per capita per day food intake (gm) is highest for absolute poor status households and lowest for non poor status households. The mutton intake is found 4.49 gm/day for non poor status of households.

Table 4.8 represents per capita per day food intake (gm) according to earning members of households. Here, the mean values according to 1 person and 2 & above persons earning members in HHs. Per capita per day mean intake of total food weight were found 858.24gm and 887.82gm for 1 person and 2 & above persons earning members respectively. Per capita per day mean intake of cereal, rice, roots & tubers are found 860.46gm, 427.10gm and 143.27gm respectively for 1 person earning member of the households. Fish, fresh milk, fats & oil, meat, beef and poultry intake are found 42.64gm, 28.94gm, 22.52gm, 12.37gm, 1.34gm and 9.08gm mean values per capita per day respectively. Per capita per day mean intake of cereal, rice, roots & tubers are found 487.07gm, 469.32gm and 155.32gm respectively for 2 & above earning members of the households. Fish, fresh milk, fats & oil, meat, beef and poultry intake are found 47.26gm,

20.49gm, 20.62gm, 27.59gm, 22.26gm and 5.33gm mean values per capita per day respectively.

Table 4.8: Per capita per day food intake (gm) according to earning members of households

| Food Items | Total number of earning family member in HHs | |
	1 person Mean	2 & above persons Mean
Cereal	460.46	487.07
Rice	427.10	469.32
Other cereals	20.80	17.75
Root & tubers	143.27	155.32
White potato	104.37	115.10
Other roots & tubers	38.90	40.22
Sugar	5.70	2.81
Pulse & nut	9.93	7.86
All pulses	9.93	7.86
Vegetables	111.79	101.29
Green vegetables	40.33	49.11
GY vegetables	57.21	52.18
NL vegetables	14.25	.00
Meats	12.37	27.59
Beef	1.34	22.26
Mutton	1.94	.00
Poultry	9.08	5.33
Fish	42.64	47.26
Fresh fish	41.29	47.26
Milk product	28.94	20.49
Fresh milk	28.94	20.49
Fats & oil	22.52	20.62
Total food weight (gm)	858.24	887.82

Here, for some food items the mean value of per capita per day food intake (gm) are highest for 1 person of earning member in households, lowest for 2 & above in the households. On the other hand, for other food items the mean value are highest for earning member of 2 & above in the households, lowest for 1 person of earning member in the households.

Food items of sugar, other cereals, pulse & nut, all pulses, vegetables, GY vegetables, NL vegetables, mutton, poultry, milk product, fats and oil and fresh milk carry the highest mean values of per capita per day food intake (gm) for 1 person of earning member than 2 & above earning members in the households. On the other side, food items of cereal, rice, root & tubers, white potato, other roots & tubers, green vegetables, meats, beef, fish, fresh fish carry the highest mean values of per capita per day food intake (gm) for 2 & above earning members than 1 person of earning member in the households.

4.4. Nutrient Intake Pattern of the Studied Households

This portion provides an analysis of the amounts of different nutrients obtained from household food consumption. Tables 4.9 - 4.11 provides per capita intake of calorie and other nutrients. Among the study households per capita per day energy intake was 2001.38 kcal. Protein, fat, carbohydrate intake were 52.85, 11.40 and 420.94 gm per capita respectively (Table 4.9). Regarding minerals intake, 497.92mg calcium, 14.14mg iron and 8.00mg of zinc were consumed per capita. Vitamin A intake was 163.09 I.U., which was derived from animal sources of foods but from plant sources - carotene which is called pro-vitamin A was found to be consumed 6295.56 µgm per capita. Other vitamins such as thiamine, riboflavin and niacin intakes were 1.38, 0.55 and 21.63 mg respectively.

Table 4.9: Mean per capita nutrients intake of studied households

Nutrients	No.	Mean	Std. Deviation
Energy(kcal)	75	2001.38	390.44
Protein (g)	75	52.85	16.37
Fat (g)	75	11.40	10.94
CH (g)	75	420.94	85.50
Ca (mg)	75	497.92	478.75
Iron (mg)	75	14.14	8.57
Vit.A (IU)	75	163.09	325.68
Carotein (µgm)	75	6295.56	9601.22
Thia (mg)	75	1.38	0.31
Ribo (mg)	75	0.55	0.27
Niacine (mg)	75	21.63	5.30
Vit.C (mg)	75	51.31	33.57
Zinc (gm)	75	8.00	2.09
Vit.A (RE)	75	1103.62	1589.30

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The mean value of per capita per day nutrients intake of iron, vitamin-A (IU), carotene and vitamin-A (RE) are highest for absolute poor but lowest for non poor status households. The mean value of per capita per day nutrient intake of riboflavin is highest for absolute poor and lowest for hard core poor households. The mean value of per capita per day nutrient intake of vitamin-C found highest in hard core poor but lowest in absolute poor status households.

Table 4.11 represents per capita per day nutrient intake (gm) according to landownership and earning members of households. Here, the mean values according to the households landownership and earning members category. The landownership is also divided in landless (0-49 decimal) and marginal (50-99 decimal) section. The earning member is also divided in to 1 person and 2 & above person category. Per capita per day mean of energy gained by landless and marginal households are 1989.92 and 2056.05kcal respectively.

Table 4.11: Per capita per day nutrients intake according to landownership and earning members of households

Nutrients	Landownership (Decimals)		Total No. of earning family member in HHs	
	Landless (0-49)	Marginal (50-99)	1 person	2 & above
	Mean	Mean	Mean	Mean
Energy(kcal)	1989.92	2056.05	1986.09	2062.59
Protein (g)	52.94	52.46	52.00	56.27
Fat (g)	11.43	11.26	12.15	8.42
CH (g)	417.91	435.44	416.67	438.05
Ca (mg)	489.58	537.70	485.03	549.50
Iron (mg)	13.91	15.25	14.22	13.82
Vit.A (IU)	188.62	41.35	169.72	136.57
Carotein (µgm)	6518.47	5232.49	5888.61	7923.39
Thia (mg)	1.37	1.41	1.38	1.38
Ribo (mg)	.56	.51	.56	.52
Niacine (mg)	21.60	21.81	21.25	23.19
Vit.C (mg)	48.54	64.54	48.66	61.96
Zinc (gm)	8.02	7.94	7.81	8.78
Vit.A (RE)	1149.28	885.87	1038.01	1366.09

Consequently, per capita per day mean of energy gained by 1 person and 2 & above person of earning members of the households are 1986.09 and 2062.59kcal respectively.

The mean intake of protein, fat and carbohydrate for landless households are 52.94, 11.43 and 417.91gm/day/person, respectively. The mean intake of protein, fat and carbohydrate for marginal households are 52.46, 11.26 and 435.44gm per capita per day, respectively. Consequently, for 1 person earning households the mean of protein, fat and carbohydrate intake are 52.00, 12.15 and 416.67gm per capita per day, respectively. For 2 & above person earning members of the households per capita per day mean intake of protein, fat and carbohydrate are 56.27, 8.42 and 438.05gm, respectively.

From the table 4.11, the mean values of per capita per day nutrients intake for landless households for protein, fat, vitamin-A (IU), carotene, riboflavin, zinc and vitamin-A (RE) nutrients found highest than the mean values for marginal households. On the other hand, mean values of marginal households found highest in carbohydrates, calcium, iron, thiamine, niacin and vitamin-C than the mean values of landless households.

The per capita per day nutrients intake for 1 person of earning family member in the households for fat, iron, vitamin-A (IU) and riboflavin are more than the mean values of 2 & above person of earning family members in the households. On the other hand, mean intake of per capita per day nutrients intake for 2 & above person of earning family members in the households found highest in protein, carbohydrates, calcium, carotene, niacin, vitamin-C, vitamin-A (RE) and zinc than the mean values of 1 person of earning family member in the households.

4.5. Socio-economic Relationship with Food and Nutritional Intake Pattern

The relationship between the socio-economic variables of the households and the levels of intake of various kinds of foods as well as nutrients intake was examined by correlation analysis. We have considered socio-economic variables such as monthly income of the household (Tk.), monthly expenditure from food, age and education of HH head, mother's education, total cultivated land of the households etc. in order to find out relationships with intake of foods and nutrients.

Table 4.13: Correlations analysis of different nutrients intake with socio-demographic and economic variables

Background characteristics		Age of household head (Years)	Total cultivated land of the family	Household heads education	Mothers education	Monthly income of the household (Tk.)	Monthly expenditure from food item	Energy (kcal)	Protein (g)	Fat (g)	CH (g)	Ca (mg)
Age of household head (Years)	r	1	.013	-.057	.007	.134	.321**	.068	-.073	-.133	.113	-.100
	P value		.915	.626	.949	.250	.005	.564	.536	.256	.336	.394
Total cultivated land of the family	r	.013	1	.052	.060	.235*	.203	.227*	.144	.012	.227	.042
	P value	.915		.656	.609	.042	.081	.050	.217	.916	.050	.719
Household heads education	r	-.057	.052	1	.673**	.454**	.397**	-.216	.226	.305**	-.382**	.224
	P value	.626	.656		.000	.000	.000	.062	.051	.008	.001	.053
Mothers education	r	.007	.060	.673**	1	.425**	.259*	-.007	.384**	.346**	-.193	.412**
	P value	.949	.609	.000		.000	.025	.950	.001	.002	.097	.000
Monthly income of the household (Tk.)	r	.134	.235*	.454**	.425**	1	.766**	.106	.271*	.364**	-.046	.061
	P value	.250	.042	.000	.000		.000	.366	.019	.001	.695	.603
Monthly expenditure from food item	r	.321**	.203	.397**	.259*	.766**	1	.082	.270*	.194	-.026	.059
	P value	.005	.081	.000	.025	.000		.486	.019	.096	.823	.613
Energy(kcal)	r	.068	.227*	-.216	-.007	.106	.082	1	.541**	.302**	.926**	.052
	P value	.564	.050	.062	.950	.366	.486		.000	.009	.000	.657
Protein (g)	r	-.073	.144	.226	.384**	.271*	.270*	.541**	1	.386**	.318**	.585**
	P value	.536	.217	.051	.001	.019	.019	.000		.001	.005	.000
Fat (g)	r	-.133	.012	.305**	.346**	.364**	.194	.302**	.386**	1	-.043	.331**
	P value	.256	.916	.008	.002	.001	.096	.009	.001		.715	.004
CH (g)	r	.113	.227	-.382**	-.193	-.046	-.026	.926**	.318**	-.043	1	-.160
	P value	.336	.050	.001	.097	.695	.823	.000	.005	.715		.169
Ca (mg)	r	-.100	.042	.224	.412**	.061	.059	.052	.585**	.331**	-.160	1
	P value	.394	.719	.053	.000	.603	.613	.657	.000	.004	.169	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.12 indicates that household heads education have significant positive correlation with sugar, milk product, fats & oil intake. Household heads education have found significant negative correlation for cereal intake (at 1% level of probability).It means when household heads education increase; sugar, milk product, fats & oil intake will also get increased but cereal intake decrease. Mother's education showed positive correlation with total food weight, sugar, milk product, fats & oil intake. It indicates that with the increase of mother's education; total food weight, sugar, milk product, fats & oil intake are also become increasing. It is observed that mother's education have significant negative correlation with cereal intake.

Monthly income of the HHs (Tk.) found positive correlation with total food weight, sugar, milk product, fats & oil intake. It means when monthly income of HHs (Tk.) increases, then total food weight, sugar, milk product, fats & oil intake will also come in increase. Positive correlation of monthly expenditure from food is found with total food weight, sugar, milk product, fats & oil intake. It demonstrates that increasing of monthly expenditure from food brings the increase of total food weight, sugar, milk product, fats & oil intake.

Table 4.13 reveals that total cultivated land of the family has positive correlation with monthly income of the household (Tk.) and in energy (kcal) intake. So, increase in total cultivated land of the family gives the result of increase in intake of energy. It is found that household heads education have positive correlation with mother's education, monthly income of HHs (Tk.), monthly expenditure from food and fat intake. Negative correlation is found for household heads education with carbohydrate intake. So, increase in household heads education brings decrease of carbohydrate intake.

Mother's education also showed positive correlation with household heads education, monthly income of the HHs, monthly expenditure from food, protein, fat, and calcium intake. Monthly income of the HHs (Tk.), total cultivated land of the family, household head education, mother's education and monthly expenditure from food was found significant positive correlation with protein and fat intake. It means when there is an increase in economic status and education level of the family heads there is also increase of protein and fat intake.

Chapter 5

SUMMARY
&
RECOMMENDATIONS

CHAPTER V
SUMMARY AND RECOMMENDATIONS

5.1. Summary

The landless and marginal farmers are the key people of food production for the whole population. Therefore to increasing food production they are requisite to maintain good health to work hard. We know that adequate food and nutrient intake throughout the year is necessary to keep the body nutritionally firm and nourishing. However, due to inferior socio-economic conditions, the landless and marginal farmers often fail to have adequate food intake throughout the year. Accordingly they become sick and unfit to work hard. This aspect of a part of farmer's community has been reasonably reflected in the outcome obtained in this study at subsequent sections

(i) Socio-economic and demographic status of the households:

The religions of the studied households were 65.3% of Islam and 34.7% of Hindu families. Among the studied under 5 children 20% are 6-23 months old children, 34.7% are 24-42 months old children and 45.3% are 43-59 months old children. About 57% children are boys and 43% are girls respectively to the sex of children. In education of household head, 79% are under SSC and 21% are found SSC passed. In mother's education, 84% are under SSC and 16% are found SSC passed. About 9% of mothers are found in working and 91% are non-working i.e. housewife. Kerosene lamp is used in 69% HHs and electric light is used in 31% households.

In the circumstances of total earning member in the family, 80% HHs have one earning member and 20% HHs have 2 & above earning members. About 83% households are landless and 17% are marginal families. The average monthly income, average monthly expenditure on food, and total monthly expenditure of the studied households are 6452, 5046, and 6038 (Tk.) respectively. In respect of poverty status, about 65% HHs are poor and 35% are no-poor families according to direct calorie intake method. Among the poor families, 29% are hardcore poor. The numbers of percentages of poor families of the farmers are much higher than the national percentage of poor families.

(ii) Nutritional status of the children (6-59 months old):

The percentage distribution of studied children (6-59 months) according to height for age (stunting), weight for age (underweight) and weight for height (wasting) z-scores indices were found 29.4%, 28% and 4% respectively. According to sex of children 32.6% boys and 25% girls were stunted, 25.6% boys and 31.2% girls were underweighted. Results indicate that boy children are more sufferers in stunting than girls children, while girl children are more sufferers in underweight than boy children. According landless and marginal farmers children, 29% and 30% suffers for stunting, and 27% and 30% suffers for underweight respectively. This means that there is no significant difference found for stunting and underweight children according to landless and marginal farmer's children.

(iii) Food intake pattern by socio-economic characteristics of the households:

Mean total food intake was found 864.15 gm/day where the cereal and rice intake was found 465.7 and 435.5 gm/day/person respectively for landless and marginal farmer's family. Per capita per day total food intake were found 991.46gm, 872.14gm and 703.92gm respectively for the HHs of non-poor, absolute poor and hard core poor category. The mean per capita per day food intake (gm) by the non-poor households for cereal, rice, other cereals, other roots and tubers, sugar, GY vegetables, meats, fats & oil and the total food weight are highest than the mean values for absolute poor and hard core poor status households. Similarly, for this food items the mean values for absolute poor status households are higher than the mean values for hard core poor households. Per capita per day food intake (gm) according to 1 person and 2+ persons earning members in HHs of total food weight were found 858.24gm and 887.82gm respectively. It indicates that when the number of earning members of the households increases, then per capita per day food intake (gm) will also get in increase for farmers level households.

(iv) Nutrients intake pattern by socio-economic factors of the households:

The mean per capita per day energy intake by the landless and marginal households was found 2001.38 kcal. Mean intake of protein, fat, carbohydrate and calcium were 52.85g, 11.40g, 420.94g and 497.92 mg per capita per day respectively.

Per capita per day nutrient intake (gm) according to poverty status of households gave the mean values according to the HHs of non-poor, absolute poor and hard core poor categories. Mean per capita energy intake for non-poor, absolute poor and hard core poor

families were found 2413.22, 1964.45and 1560.0kcal respectively. Mean per capita per day intake of protein, fat, carbohydrate and calcium were 62.75g, 14.13g, 504.52g and 506.44mg for non-poor, 52.12g, 10.27g, 417.02g and 508.11mg for absolute poor, and 42.06g, 9.57g, 327.01g and 475.35mg for hardcore poor families respectively. This indicates that non poor households have the highest energy and nutrients intake level whereas in hard core poor status households consumed the lowest after absolute poor families.

Per capita per day mean of energy intake by landless households were lower (1989.9kcal) than for marginal households (2056.05kcal). Intake for marginal households found also higher in carbohydrates, calcium, iron, thiamine, niacin and vitamin-C than the mean intake of landless households. Again per capita per day mean of energy intake by 1 earning member households were lower (1986.09kcal) than 2+ earning member households (2062.59kcal). Results found that when the number of earning members of the households increases, then per capita per day energy as well as overall nutrient intake (gm) will also get increase.

v) Relationship between socio-economic variables with food & nutrients intake:

Relationship between the socio-economic variables of the HHs with foods & nutrients intake pattern was examined by correlation analysis. Socio-economic variables such as monthly income of the household (Tk.), monthly expenditure from food, age and education of HH head, mother's education, total cultivated land of the households etc. were considered in order to find out relationships with intake of foods and nutrients.

We found that household heads education, mother's education, monthly income of the household (Tk.) and monthly expenditure from food item have positive correlation with total food intake, sugar, milk product, fats & oil intake. Household heads and mothers education have found significant negative correlation for cereal intake. That means, when parents education increase then cereal intake by the HHs decreases. With the increases of household heads & mother's education the protein and fat intake by the HHs increases but decreases carbohydrate intake. Results found that the increase in total cultivated land of the family gives the result of increase in intake of energy. Positive relationship is found with economic status of the HHs with protein, fat, and calcium intake by the family members

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5.2. Recommendations

Food and nutrient intake pattern of the landless and marginal households indicated that these people are comparatively low fed than other rural population. Their low intake was due to low food availability because of low food production and poor economic access due to low income. Various factors directly or indirectly contribute to low food availability and in turn low intake resulting chronic malnutrition and ill health among the family members especially for the children of the landless and marginal households. The following important measures are recommended:

i. Education level of the household head and mother's education should be increased to overcome food and nutrients deficiency of HH members and health consciousness for children.

ii. Kitchen gardening, fruit trees plantation; poultry raising and cattle rearing to be encouraged for regular supply of vegetables, fruits and animal protein in the family diet.

iii. Selling of produced food should be strongly discouraged to increase food availability for household consumption.

iv. To increase income, appropriate income generating activities are needed to be introduced. The landless and marginal HHs thus will not think to sell a portion of the food produced to meet other household costs.

v. Market prices of essential food stuffs should be kept within the purchasing capacity of the farmers. The open market sale, vulnerable group feeding centers during seasons of food scarcity are to be introduced. Health and nutrient training needed to be imparted. Respective authority of the Government and Non-Governmental Organization should come forward to do these.

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h) What was the age of child's mother in marriage? _ _ _ _ _ _ _ _ _

i) What was the age of child's mother in first child born? _ _ _ _ _ _ _ _ _

2. How Many Earning Members Present in Your Household? _ _ _ _ _ _ _ _ _ person.

3. Others Wealth Report:

a) Total Land Area of the Family/ Household Head (Decimal):

Homestead	Cultivable Land	Fellow Land	Pond	Garden	Other	Total Land

b) Amount of Cultivable Land at this Moment (Decimal):

Cultivated Own Land +	Land Share Cropping in +	Land Leased in +	Land Mortgage in +	Land Share Cropping out -	Land Leased out -	Land Mortgage out -	Total Land +

4. Household Information and Household Related Wealth Information:

a) Household's Information: | 1 | Own House | 2 | Father's House that yet not in my

| 3 | Making House in Others Ownership Land

| 4 | Other House without Rent

| 5 | House with Rent

b) Type of Household: | 1 | Building | 2 | Tin-Shed with Semi-Building

| 3 | All Tin + *Pacca* Floor | 4 | All Tin + *Kacha* floor

| 5 | Tin Roof + Earthen wall

| 6 | Thest Roof + Earthen wall

| 7 | Thest Roof + Thest/ Bamboo/ Wooden wall

| 8 | Thest and Tin Roof + Thest/ Bamboo/ Wooden wall

| 9 | Others

c) Household Lightening Facilities: $\boxed{1}$ Kerosene Lamp $\boxed{2}$ Electric Light

d) Type of Latrine in the Household: $\boxed{1}$ No Latrine $\boxed{2}$ Open/ Hanging Latrine

$\boxed{3}$ Definite Hole/ Well $\boxed{4}$ Sanitary/ Slab Latrine

$\boxed{5}$ Others

5. Household Food Production and Income Related Information:

a) Previous year land yield and income from that: _ _ _ _ _ _ _ _ _ _ Tk. /=

b) Previous year crop/vegetable production from home and garden and income from that: _ _ _ _ _ Tk. /=

c) Previous year income from salary: _ _ _ _ _ _ _ _ Tk. /=

d) Previous year income from household wealth: _ _ _ _ _ _ _ _ Tk. /=

e) Previous year income from new loan: _ _ _ _ _ _ _ _ Tk. /=

f) Income from other source in previous year: _ _ _ _ _ _ _ _ Tk. /=

g) Total income in previous year: a + b + c + d + e + f

h) Monthly income: g/12=

6. Family Expenditure in Various Sectors in Previous Month:

Expenditure Field	Amount of Food Intake		Present Market Price		Average Monthly Expenditure (Tk./=)
	kg	No.	kg	No.	
a) Food Items:					
Rice					
Wheat/ Floor					
Pulses					
Fish					
Poultry					
Meat/ Beef/ Mutton					
Eggs					
Milk					
Sugar					
Fats & Oil					
Potato					
Leafy vegetables					
Vegetables					
Salt					
Onion					
Other Spices					
Biscuit/ Tea					
Fruits (Mango, Jackfruit, etc.)					
Cigarette					
Beer					
Other					
Total Food Expenditure					
b) Other Purchase:					
Dresses					
Shoe/ Sandal					
Furniture/ Utensils					
Education (Book, tuition fees, etc.)					
Fuel (Kerosene, electricity, etc.)					
Loan Payment					
Tax Payment					
c) Agricultural Cost:					
Weeding					
Seed/ Seedlings					
Fertilizer					
Watering					
Insecticide					
Wage (Harvesting, etc.)					
Agricultural parts in rent					
d) Total Expenditure					

Net Income in Previous Month (5h-6d) =

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7. Household Food Intake in Last 24 Hours (Recall Method) for the Day before of Survey:

Meal Time	Menu & Description	Cooked/ Uncooked food			Conversion factor to raw weight	Food Code	Raw weight of edible portion (gm)
		Ingredients	Family Measures	Total Weight (gm)			
Leftover food from previous day (cooked)							
Breakfast Number eaten ☐							
Number not eaten ☐							
Member Code ☐							
Guest ☐							
Age | Sex							
Lunch Number eaten ☐							
Number not eaten ☐							
Member Code ☐							
Guest ☐							
Age | Sex							

Meal Time		Menu & Description	Cooked/ Uncooked food			Conversion factor to raw weight	Food Code	Raw weight of edible portion (gm)
			Ingredients	Family Measures	Total Weight (gm)			
Dinner								
Number eaten								
Number not eaten								
Member Code								
Guest								
Age	Sex							
Food Coming from Other Places								
Food Given to Others								
Leftover food for Next Day								