



**AGRICULTURAL CROPPING PATTERN AMONG THE
ETHNIC PEOPLE AND ITS EFFECT ON THEIR LIFE STYLE
HEALTH AND NUTRITION**

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CERTIFICATE

This is to certify that the thesis entitled “Agricultural Cropping Pattern among the Ethnic People and its Effect on their Life Style, Health and Nutrition” has been completed sincerely and satisfactorily by Joti Lal Barua for the partial fulfillment of the requirements of the degree of Master of Philosophy (M .Phil) in Nutrition and Food Science from the Institute of Nutrition and Food Science, University of Dhaka, Dhaka-1000, Bangladesh.

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Dedicated

to

My beloved parents and sisters

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Abstract

Agricultural cropping pattern has a great influence on consumption pattern and has significant role to play in food and nutrition security. In order to increase the agricultural production of any country/part of country, it is necessary to intensify the uses of existing cultivated lands by adopting some of the modern methods like growing high yielding varieties, improved irrigation facilities and adopting multi cropping practices. The existing cropping pattern in the hilly areas of Bangladesh needs to be changed through the adoption of new pattern in order to increase production to meet the requirements of various crops and also to give more economic return to the household (Farmer) through increased income. Increased income usually turns into increased purchasing capacity which leads to adequate consumption of required food. Thus the agricultural cropping pattern has significant affects on food consumption, nutrition, health, life style and food security of the farmers.

The objective of the study is to assess the existing agricultural cropping pattern among the ethnic people and its effect on their life style, health and nutrition as well as to develop a comprehensive strategic framework for improving life style, health and nutritional status in that particular population.

To study the existing agricultural cropping pattern and to investigate the present status of health and nutrition of the ethnic people of the Chittagong Hill Tracts of Bangladesh, a multistage cluster sampling was designed for selecting the households from the uplands of the Chittagong Hill Tracts. The sampling frameworks were consisting of primary sampling unit of district, secondary sampling unit of upazila, pre-ultimate sampling unit of village and ultimate sampling unit of household for the data collection. Selection of area was quite critical as there are three districts in the CHT consisting of 25 sub-districts (Upazila) in total. Out of these 25, there were 10 Upazila in Rangamati, 8 in Khagrachari, and 7 in Bandarban District. Considering the available time, budget, accessibility of interviewees and all other aspects, two Upazilas from each district and five villages from each Upazila were randomly selected. A total of 810 households were randomly selected from these three districts.

The present study provides a brief representation on agricultural cropping pattern among the ethnic people of Chittagong Hill Tracts. It also provides an insight into their life style, food security, health and nutrition. As regards education, it is notable that illiteracy rate remain to be in a range of 27-78 % with the Marma having the highest (78.9 %) and the Tripura having the lowest (27%) illiteracy rate. Main occupation of different tribal people such as Chakma, Marma, Shaontal, tanchanga was found to be agriculture. None among the Marma was found to be engaged in service. It may be due to their lower education level as marked by highest rate of illiteracy. As regards age, most of the respondents among ethnic people were found belong to age group 30-45 years, which indicates that majority of the study population was relatively young, giving rise to a demographically favorable situation for development to take place in the future. Most of the tribal people's monthly income is quite meager, which is below Tk. 500 followed by lower proportion of people having monthly income Tk. 5001-8000 and above. Family expenditure is highest among Tripura followed by Chakma, Tanchanga, Marma and Shaontal. Higher family expenditure among Tripura may be attributed to the higher level of their involvement in service, which provides a sort of cash income. Food preparation technique of the ethnic people was not found scientific. They are unaware of the fact that there is greater loss of vitamins when the vegetables are cut and then washed. In present study, it has been revealed that 4.6% family members did not ever receive balanced diet, while 37.8% family members did always receive balanced diet and about 57.7% family members received balanced diet only occasionally. Gastric problem is the most common disease in CHT. The other non-communicable diseases such as asthma, diabetic, heart disease and kidney disease cause most of the deaths in the study areas. The housing condition of the ethnic people was found to be very poor. Most of the ethnic people (38.5%) own straw shed with bamboo/straw- fench house. It was also observed that majority of the ethnic people did not follow proper sanitary practices. The per capita per day consumption of nutrients was found to be as follows:- 2510 Kcal, protein- 77.2 g, fat- 37.6 g, iron- 28.4 mg and calcium- 864.2 mg. The estimated per capita per day intake of energy, protein, iron and calcium was higher than the recently revised and updated recommended dietary allowances proposed by the ICMR, 2010. About 10.6% children (five years old or less than five years) were found to be severely malnourished and 16.05% were found mild and moderately malnourished. In the study areas, the nutritional status of girls aged 10-19 years is better than the boys of the same age group. In the study areas, out of 810 ethnic households, 217

households (26.9%) were engaged in agriculture. It was also observed that 56% households use to harvest single crop, 26% households use to harvest double crops and 11% households use to harvest triple crops in a year, while only 7% households use to practice traditional jhum cultivation. It was found that 97.2% family members use to eat rice in the morning, followed by 100% in the mid-day and 13% at night. Nobody was found who ate bread at any time of the day.

Life style, food security, health and nutritional status of the ethnic people are greatly influenced by their agricultural cropping pattern. So, further efforts should be continued for the promotion and sustainable crop production in the hilly areas of Bangladesh. The hill farmers have limited knowledge about post harvest processing of fruits and vegetables. For his reason, a number of products get lost before marketing. So, post-harvest technology program for horticultural crops should be introduced in the hilly areas. Jhum farming cannot be suddenly discontinued. In this situation, jhum cultivation should be modernized through replacing jhum crops with modern crop varieties suitable for hill farming.

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ABBREVIATIONS

ADB	:	Asian development Bank.
BARI	:	Bangladesh agricultural Research Institute.
BBS	:	Bangladesh Bureau of Statistics.
BIRTAN	:	Bangladesh Institute of Research and Training on Applied Nutrition.
BMI	:	Body Mass Index.
BRAC	:	Bangladesh Rural Advancement Com.
CFCS	:	Comprehensive Food Consumption Survey.
CHT	:	Chittagong Hill Tracts.
DDP	:	Desirable Dietary Pattern.
DU	:	University Of Dhaka.
FAO	:	Food and Agricultural Organization.
FGDs	:	Focus Group Discussions.
HIES	:	Households Income and Expenditure Survey.
HKI	:	Helen Keller International.
ICMR	:	Indian Council of Medical Research.
INFS	:	Institute of Nutrition and Food Science.
IPHN	:	Institute of Public Health Nutrition.
MoHFW	:	Ministry of Health and Family Welfare.
MSFO	:	Multi Strata Fruit Orchard.

MSL : **Mean Sea Level.**

ABBREVIATIONS (Cont...)

NSP : **Nutritional Surveillance Project.**

RNI : **Recommended Nutrient Intake.**

SALT : **Sloping Agricultural land Technology.**

SPSS : **Statistical Package for Social Science.**

TAT : **Technical Advisory Team.**

UNDP : **United Nations Development Programs.**

CHAPTER 1 : Introduction and Rationale of The Study

1.1 Introduction:

Agriculture is the science and practice of producing crops and agricultural cropping pattern expresses the shares of various crops in the farmers' total cultivated area in an agricultural year. Cropping pattern is an important indicator of a farmer's decision making ability and also influences the consumption pattern as well as health and nutritional status of the people.

Agricultural cropping pattern vary from region to region, country to country and culture to culture. Cropping systems of a region are decided, by and large, by a number of soil and climatic parameters which determine overall agro-ecological setting for nourishment and appropriateness of a crop or set of crops for cultivation. Nevertheless, at farmers' level, potential productivity and monetary benefits act as guiding principles while opting for a particular crop/cropping system. These decisions with respect to choice of crops and cropping systems are further narrowed down under influence of several other forces related to infrastructure facilities, socio-economic factors and technological developments, all operating interactively at micro-level (Das P.). These are:

Infrastructure facilities: These include irrigation, transport, storage, trade and marketing, post-harvest handling and processing etc.

Socio-economic factors: They are financial resource base, land ownership, size and type of land holding, household needs of food, fodder, fuel, fibre and finance, labor availability etc.

Technological factors: These include improved varieties, cultural requirements, mechanization, plant protection, access to information, etc.

The Chittagong Hill Tracts (CHT) of Bangladesh presents unique biophysical characteristics, ethnic diversity and farming practices. The ethnic people of this hilly area of Bangladesh are also following certain pattern of cropping culture in their respective areas. The lives of the indigenous people are centered on the hills and their resources. The wide variety of plants and animals in the hills has taken care of the lives support system of the hill people including dwelling, food, clothing, health care, festivities and other activities (Khisa, 1998). Even in the recent past, the Chakma people living in Bangladesh used to meet their daily needs mostly from natural forest products. For the primary health care, still most of them depend upon surrounding plants and plant products (Roy, S. et al, 2008).

The economy of the region is predominantly agricultural. Because of the nature of the terrain the indigenous people of the CHT developed the system of cultivation called jhum which is also known as "shifting", "rotational", "slash and burn" agriculture. Population growth, settler influx and the loss of land have contributed over time to the decline of production; as a consequence the communities experience moderate to severe food shortages on a seasonal basis fact that reflects the dependence on

agricultural cycles. Households have sufficient quantities of food from their own production for less than half year (MSF-Holland, 2008).

Shifting cultivation (Jhum) in the steep to very steep hill slopes in the major land use system practiced by the indigenous people. Until the early 1960s, this practice was known not to be very detrimental to the hill ecology. Population growth along with rapid deforestation has reduced the fallow period from 10 to 20 years to 2-3 years. The decline of productivity of the existing farming practice is of major concern. Only sustainable production system can reduce poverty by providing adequate food and income and at the same time conserve soil and water resources effectively.

Ethnic people take a lot of food plants from wild states other than major food crops cultivated in farming systems. Usually they gather them from wild states. Most of them are non-timber food crops. Thus there exists a lot of ethno botanical knowledge about food plants among hill people. These food plants can easily be integrated in hill farming systems. Thus the knowledge of ethno botany can be utilized in shifting cultivation (Jhum) and Slope Agriculture Land Technology (SALT) systems for the sustainable development of farming system towards food security.

Agricultural cropping pattern have a great influence on consumption pattern and have significant role in food and nutrition security. In order to increase the agricultural production of any country/ part of country it is necessary to intensify the uses of existing cultivated lands by adopting some of the methods like growing high yielding varieties, improved irrigation facilities and adopting multi cropping practices. The existing cropping pattern in the hilly areas of Bangladesh to be changed for the adoption of better pattern in order to increase production to meet the various required crops and also to give more economic return to the household (Farmer) which leads to increased income. Increased income means increased purchasing capacity which leads to adequate consumption of required food. Thus the agricultural cropping pattern affects on food consumption.

Ensuring food security for all is one of the major challenges that Bangladesh faces today. Malnutrition due to deficiencies of food energy and vitamins and minerals especially among women and under-5 children is a common phenomenon in Bangladesh. Three underlying causes of malnutrition are inadequate household food security, inadequate caring capacity and insufficient health services and an unhealthy environment. Nutrition is one of the major factors that affect the quality of life.

Proper nutrition is the fundamental basic requirement for positive health, functional efficiency and productivity. As the production and supply of food items is directly related to agriculture, therefore agricultural cropping pattern is an integral constituent of food security. Increased attention to nutrition can enable the agricultural sector to better meet of its own needs. The government of Bangladesh has taken special attention for the overall development of tribal.

1.2 Rationale of the Study:

Indigenous people in Bangladesh are, in general, very poor, illiterate, and their livelihood depends on wage earnings and shifting cultivation (Uddin et al, 2000). They receive the highest income from agriculture compared to other sources, but are constrained by limited cash and modern technology for higher agricultural production, which is a threat to the natural resources in the area (Farid and Mujibullah, 1990; Chowdhury, et al, 2004). Livestock and poultry provide additional income. Most households own a single small dwelling with no modern amenities and their main source of drinking water is natural springs (Miah and Islam, 2007). Their food basket contains mainly indigenous vegetables, fruits, and the meat of animals. Understanding the consumption pattern, nutritional status and household level food security of the indigenous households can provide evidence based information that can help the government to enrich formulation and implementation of appropriate policy measures to uplift the livelihoods of indigenous households.

Shifting cultivation causes huge topsoil loss from the hills and reduces productivity of the soil. Soil erosion with nutrient loss and reduced organic matter has been considered responsible for decreasing productivity of food production and other hillside farms. Many research efforts have been undertaken by scientists focusing on the impact of shifting cultivation on land degradation, nutrient depletion, nutrients balance, soil erosion, resilience, and decreased food production (Gafur, 2001; gafur et al, 2003; Al-kaisi, 2001; Ewel et al, 1981; Kyuma et al, 1985; Ramakrishnam, 1992; Miah and Islam, 2006). With this unsustainable land use system, the livelihoods of the hill people are decreasing day by day.

Several agroforestry production techniques designed with various locally adapted trees and crops for different slope conditions optimized the production of agroforestry crops and minimized environmental degradation from hill region (Paul and Hossain, 2001). Many Bengali migrants have set up multi strata fruit orchards (MSFO) on hills to enhance their livelihoods. This MSFO has already been found suitable for preventing soil erosion and in increasing the cropping intensity of the area (Miah and Islam, 2006). But the indigenous people are still reluctant to follow any modern conservation practices. This is largely due to the lack of awareness and knowledge on modern methods which has subsequently led to a situation of inadequate food production that is threatening their food security. Therefore, the possibility of switching the shifting cultivation to alternative farming systems should be investigated.

Based on the above situations, the present study has given much emphasis on focusing the issue of individual household food security, especially in the proper segment of the population like indigenous people who are actually subsistence farmers and forest dwellers, and vulnerable to various natural calamities. This is because under the burden of chronic poverty, this category of the population may use their natural environment in unsustainable ways, leading to further deterioration of their livelihood conditions (FAO, 2005).

A recent paper reveals that the tribal people are lagging behind the mainstream population with respect to economical, political, social and technological standings and still going on with outmoded lifestyle and ideology. There are many acute problems of the tribal peoples in our country that needs immediate attention and early solution. The problems relate to various aspects of tribal peoples viz. social, economical, educational, health, religion, land, law and order situation, self-centered tendency and so on. Many of these problems cannot be well understood due-to lack of necessary and adequate information (Mullah M. A. S., 2007, et al).

In 2003, the Nutritional Surveillance Project (NSP) of Helen Keller International (HKI) and the Institute of Public Health Nutrition (IPHN) expanded its surveillance system into the Chittagong Hill Tracts (CHT) in the southeast of Bangladesh. The people in this unique region of Bangladesh suffered years of civil conflict between 1973 and 1997, which kept development organizations away and prevented access to essential health and social services (Helen Keller International, Nutritional Surveillance Project Bulletin No. 13; May 2003).

Data collected during a special survey of the NSP in May and June 2000, three years after peace was restored, revealed that the prevalence of chronic energy deficiency in mothers was 'serious' and the prevalence of underweight and stunting in children was 'very high' according to international criteria. Household food insecurity, grossly inadequate water and sanitation facilities, and a wide gender disparity in education are also serious concerns. Many development agencies are now working in the CHT, and regular surveillance will allow the NSP to provide policy makers and program planners with the crucial information they need to design interventions to improve health and nutrition and alleviate poverty (Helen Keller International, Nutritional Surveillance Project Bulletin No. 13; May 2003).

Moreover, no such research activities addressing the impact of agricultural cropping pattern on nutritional status and food security of the indigenous people in the hilly areas of Bangladesh has been taken earlier. Agricultural cropping pattern is one of the important issues which can play a vital role in agricultural development.

In spite of economic difficulties major advances in nutrition have been made over the last few decades. But hidden hunger from micro nutrient deficiencies have not yet been reduced significantly in the hilly areas due to lack of awareness regarding nutrition knowledge. We should remember that many improvements in nutrition and food security are possible at low cost. Improving food security it is possible to make rapid advances in reducing malnutrition. The sooner improvements in nutrition are

achieved, the more rapidly these improvements can contribute to a country's broader development such as the health and productivity of its households, the strength and capacity of its labour force and the growth and education of its children, including their capacity and motivation to learn in schools. So, the proposed research activities are very helpful for the tribal in improving their health and nutritional status which enables them to contribute to the development of the country.

The present study was an attempt to collect factual information about the life style of the tribal people in our country. It was obvious that such information was essential before we can discover the needs of the tribal peoples and suggest means of providing practical solution to their problems.

CHAPTER 2: Literature Review:

There has been substantial academic work on ethnic minorities in Viet Nam, carried out both by Vietnamese scholars in the Institute of Sociology and overseas scholars. Some of the research work has been of an ethnographic and descriptive nature, rather than analytical studies that either review in depth the policy framework, or examine in any depth the impact of policies and programs on the development and poverty situation of different ethnic minority groups. Views are sometimes expressed that there have been inadequate studies on policies related to ethnic minorities in Viet Nam (Dang Nghiem Van, 1992).

Nevertheless, such studies have a long history, beginning with research carried out by French scholars during the colonial period. Between the 1960s and the 1980s, the State paid special attention to promoting research on ethnic minorities with regard to national development programs and highland plans. The 1990s marked a new development stage in these research activities with the increasing involvement of international organizations and scholars. Many recent studies have included an in-depth and comprehensive analysis of the state of poverty as well as its causes in mountainous and indigenous communities (Dang Nghiem Van et al; 2000).

Of the various ADB interventions either under way or in preparation, and which have at least some impact on ethnic minorities, this project is the most useful to examine for the lessons that can be learned. The project has generated considerable information concerning ethnic minorities and their socioeconomic situation as a result of fieldwork during the preparatory phase. In accordance with ADB procedures, an indigenous people's development plan was prepared, drawing on data collected during consultations with target communities. These included focus-group meetings and discussions with local officials in several communes. A socioeconomic survey was undertaken in four representative communes, covering 120 households and 636 individuals. Participatory rural and poverty appraisals were carried out in the same communities (Institute of ethnography, 1996).

The overall objective of the project is to help the Government ensuring that the poor in upland communes of four provinces (Kon Tum, Quang Binh, Quang Tri and Thua Thein Hue) achieve sustainable livelihoods with an improving quality of life. Target beneficiaries are some 3,48,000 people living in 65000 households in 139 communes, spread through 10 districts of the 4 provinces. Approximately 70% of the primary target beneficiaries will be indigenous peoples to participate more fully in the market economy (Khong Dien, 1995).

The objectives are to be achieved through improving and sustainable household food security, generating household incomes through improved farm productivity, infrastructure development, and off-farm income generating opportunities, developing community capacity to utilize and manage scarce resources through an expanded social development plan and strengthening the capacity of support services to respond to grassroots initiatives to ensure the delivery of improved feature of the project is its focus on the development of innovative resource management strategies linked to social development objectives.

Underpinning the project has been its community development component, aiming to strengthen the technical and organizational capacity of rural upland communities' plan and manage their own development activities and to assist target communities to form community organizations and strengthen the community planning process. Thus, the design of the project has taken into consideration the importance of confidence building beneficiaries, particularly the indigenous populations and among them, especially women.

The extent of indigenous/ethnic minority poverty within the project area was identified in an initial social assessment. It was found that 87% of indigenous people households were well below the overall poverty line. Moreover, indigenous peoples within the project areas were facing an influx of better-educated and richer kin. Intended beneficiaries' are predominantly subsistence and upland farming families, of which 60% are ethnic minorities. They were found to depend mainly on subsistence agriculture, partly relying also on shifting cultivation (Nguyen et al; 1998).

Political scientists Joshi and Rose broadly classify the Nepalese population into three major ethnic groups in terms of their origin: Indo-Nepalese, Tibeto-Nepalese and Indigenous-Nepalese. In the case of the first two groups the direction of their migration and Nepal's landscapes appeared to have led to their vertical distribution; most ethnic groups were found at particular altitudes. The first group, comprising those of Indo-Nepalese origin, inhabited the more fertile lower hills, river valleys and Tarai plains. The second major group consisted of communities of Tibeto-Mongol origin occupying the higher hills from the west to the east. The third and much smaller group comprised a number of tribal communities, such as the Tharus and the Dhimals of the Tarai; they may be remnants of indigenous communities whose habitation predates the advent of Indo-Nepalese and Tibeto-Mongol elements.

Most of the Indo-Nepalese peoples—both Paharis and Tarai dwellers (commonly known among the Paharis as madhesis, meaning midlanders) were primarily agriculturists, although a majority of them also relied on other activities to produce supplementary income. They generally raised some farm

animals, particularly water buffalo, cows, goats and sheep, for domestic purposes. The Paharis traditionally have occupied the vast majority of civil service positions. As a result, they have managed to dominate and to control Nepal's bureaucracy to their advantage. It was not until the 1980s that a prime minister came from the non-Pahari segment of the population. Despite some loosening of the total Pahari domination of the bureaucracy in recent years, a 1991 newspaper report, summarized in the Nepal Press Digest, revealed that 80 percent of the posts in the civil service, the army and the police still were held by the Brahmans and Chhetris of the hill, who comprised less than 50 percent of the population; 13 percent were held by Kathmandu valley Newars, whose share of the total population was merely 3 percent. The report added that even in 1991, the eleven members Council of Ministries in 1991 had six Brahmans and three Newars. Furthermore, six of the nine members Constitution Recommendation Commission, which drafted the new constitution in 1990, were hill Brahmans. In spite of the increasing number of Newars holding government jobs, they traditionally were recognized as a commercial merchant and handicraft class. It was no exaggeration that they historically have been the prime agents of Nepalese culture and art. A significant number of them were engaged in farming. In that sense, they can be described as agro-commercialists (ICIMOD, 1994).

Most of the Tibeto-Nepalese groups traditionally could be considered agro-pastoralists. Because their physical environment offered only limited land and agricultural possibilities the Tibeto-Nepalese groups who occupied the high mountainous areas, such as the Bhote and particularly the Sherpa were almost forced to rely more on herding and pastoral activities than on crop farming. They also participated in seasonal trading activity to supplement their income and food supply. However, those peoples inhabiting the medium and low hills south of the high mountains—particularly the Gurung, Magar, Tamang, Rai and Limbu groups—depended on farming and herding in relatively equal amounts because their environment was relatively more suitable for agriculture. Among these groups, the Gurung, Magar and Rai historically have supplied the bulk of the famous Gurkha contingents to the British and Indian armies, although their ranks have been augmented from the Thakuri and Chhetri castes of the Indo-nepalese Paharis. The term Gurkha was derived from the name of the former principality of Gorkha, about seventy kilometers west of Kathmandu, and was not an ethnic designation.

Until the early sixties, land use in the CHT was considered appropriate for the hill ecology. Most of its land was covered and protected by forests. To the ethnic communities, land was their common property. The village community and the kinship groups were the ultimate owner of the land. The villagers did not wish to possess formal land document or 'lease deeds as many were ignorant about the concept of private property or the commercial value of land (Khisa, 1998). Land for jhum cultivation was available in abundance, which the farmers would manage for a maximum period of 3-4 years until they shifted to

a new site. Due to the cross-cultural contacts and a sharp increase in population, the basic structure and functions of the ethnic communities have changed in the last few decades. Since land for shifting cultivation was not easily available any more, the system of private ownership of land emerged. Since the 1960s, they could own the lands specially which were under their de-facto control through ‘ lease deeds ‘ with the government . On an average each farmer in the study area now possess a total jhum land of 3.3 ha , which they manage on a 5 year cycle of continuous use (Millat –e- Mustafa et al , 1998) . Apart from jhum, plough – cultivation at the bottom of the valleys is also practiced , where enough suitable land is available for terracing and irrigation . The main crops are rice and vegetables.

Different ethnic groups of Bangladesh and their colorful lifestyles have significantly enriched the entire culture of Bangladesh. For centuries, Bangladesh has been the dwelling place of different ethnic groups. In fact, 35 smaller groups of indigenous people covering about two percent of the total population have been living in different pockets of the hilly zones and some areas of the plain lands of the country. Their historical background, economic activities, social structure, religious beliefs and festivals make them distinctive.

In terms of geographical distribution within Bangladesh, ethnic population can be grouped into two broad categories as (a) those living within or close to forest areas in the plains and (b) those living in hills, predominantly in the CHT.

The Chittagong Hill Tracts (CHT) is situated in the southeastern part of Bangladesh, covered with lush green hills, innumerable scattered fountains (*jharnas*) and hundreds of mountain streamlets (*choras*); and is surrounded by Myanmar and Mizoram (India) in the east, Tripura (India) in the north, districts of Chittagong and Cox's Bazar in the west and south respectively. It has a total land area of about 13,294 square km (about 10% of land area in Bangladesh) and have a population of about 1.3 millions.

Administratively, CHT comprises three hill districts: Banadarban, Khagrachari and Rangamati. There are twelve ethnicities (11 indigenous and Bangalees) living in CHT. Three major ethnic groups are the Chakma, Marma and Tripura. They constitute more than 88 percent of the total number of ethnic population in the CHT. Other ethnic multi-lingual minorities are: Tanchangya, Mro, Bawm, Pankhua, Chak, Kheyang, Lushai and Khumi.

The beauty of the hilly zones (CHT) as well as the plain areas has been enhanced by the colourful culture and traditional practices of different ethnic groups and almost all tribal languages have rich folk literatures, consisting of poems, songs, fairy tales and legends relating to their past nomadic life. The

people of different tribes have distinct type of songs, dances and musical instruments which are all closely linked with their feelings and emotions, customs and beliefs, lifestyle, economy and, above all, their philosophy and earthly and spiritual aspirations.

The region experiences a tropical monsoon climate. Annual temperatures vary from 10⁰ to 35⁰ C . A mean minimum temperature of 24⁰C is experienced during the months of December to January and a maximum temperature of 34⁰ C during March to May. The dry and cool season is from November to March, the pre-monsoon season (April – May) is hot and sunny and the monsoon season (June to October) is warm, cloudy and wet. The annual rainfall varies from 2200 mm to 3000 mm. approximately 80 % rainfall takes place in May – September and the rest months of the year remain nearly dry.

The total population of the CHT according to 2001 census was 1.34 million, which consisted of only 1.1% of the population of the country. The CHT is sparsely populated in contrast to the rest of the country due to the heterogeneous topographic characteristics and difference in economic backgrounds, religious customs, cultivation, food habits and other social customs. The population growth rate of the CHT is 3.23, which is more than double of the country's current rate (1.54). Migration is the main cause of the high population growth rate in the area. The distributions of populations by district are: Bandarban 22.4 %, Khagrachari 38.5% and Rangamati 39.1% (LGED, 2006). The population density per square kilometer in the CHT region is very low compared to the rest of the country. The most densely populated upazilla is Khagrachari Sadar (305 per km²) of Khagrachari district (191 per km²) and the lowest is Thanchi upazilla (16 per km) of the bandarban district (67 per km²), in contrast to the average density of the country (839 per km²).

The CHT has been traditionally the homeland of eleven ethnic groups who are ethnically more similar to the people living across the border of Myanmar and the Indian state of Mizoram and Tripura. Only century ago the hill people accounted for more than 90% of the total CHT population. Today the population sizes of the hill people and the Bengalis are nearly the same. Among the ethnic groups, the three largest groups are the Chakma (24.6%), the Marma (14.6%) and the Tripura (6.3%).

The land forms of the CHT are mainly composed of hills and valleys. The height of the hills influences the local rainfall and temperature. The average temperature decreases with height. The physical and chemical characteristics of the soil change with the elevation of hills and consequently determine the suitability of crops. The hills can be subdivided into high, medium high and low based on their height from mean sea level (MSL).The high hills are 300 m above MSL.

The medium high hills range from 150-300 m and low hills below 150 m. Twenty eight per cent of the CHT comprises high hills, 22% medium high hills and 31% low hills. Bandarban and Rangamati mostly have high and medium high hills. Only 7% of Khagrachari comprises high hill areas, 45 % medium high and low hills and 45% valleys.

The land use in the whole of the CHT has been broadly categorized into four classes non – agricultural, agricultural, forest and fallow land. At present 38% of the CHT region comprises forest area, 36% fallow land, 20% agricultural land and 6% non-agricultural land. Land under agriculture is limited due to undulating surfaces, steep slopes and forest. With increasing pressure on land, the natural balance between soil forming and soil degradation processes has shifted in favor of accelerated erosion and fertility depletion. Soil erosion is now recognized as a key factor in declining crop productivity (Uddin,1997).

Shifting cultivation in the steep to very steep hills slopes is the major agricultural land use system practiced by the indigenous people. Until early 1960s, this practice was not known to be very detrimental to the hill ecology (Khisa,1998). Population growth along with rapid deforestation has reduced the fallow period, from 15-20 years to 3-4 years . Recently introduced mono-cropping of aroids, turmeric and ginger in hill slopes with deep spading without proper soil and water conservation measures has made the system unsustainable. Bangladesh Agricultural Research Institute (BARI) is trying to identify suitable crops , crop combinations , method and practices that will be productive and simultaneously maintain soil erosion at a tolerable range and conserve soil moisture . In hilly areas, the goal of BARI is to shift from slash and burn shifting cultivation to sustainable settled hill farming for socioeconomic development.

Soil erosion is the most serious form of land degradation and recognized as a key factor in declining crop productivity in CHT region (Uddin, 1997). Erosion is slight from soil well covered by dense grasses or forests but is enormous from steep , poorly covered soil that are exposed to heavy rainfall. The natural progress of soil erosion can be increased by human activities like earth-cutting, over-cultivating, cultivating steep slopes, overgrazing etc.The situation further aggravated due the construction of Kaptai Hydro-power dam. Land for Jhuming has been immensely reduced and as a consequence soil degradation and marginalization of the jhumias (Anon, 1929; Dewan, 1990; Mey, 1984). Moreover, the population in CHT region is increasing rapidly that exerts extra pressure on available land for additional food.With increasing pressure on land, faulty agricultural practices, deforestation etc. The natural balance between soil formation and soil degradation processes has shifted in favor of accelerated erosion and fertility depletion.

The application of legislative measure for controlling Jhum cultivation has not met with much success in other countries, for example, in India, Philippines and Malaysia. Therefore, for all practical purposes, we should focus on improving the system of Jhum cultivation.

The economy of the indigenous people is land-based. Traditionally, nearly all the hill people were engaged in subsistence swidden cultivation known locally as *jum* (also referred to as “slash and burn” or “shifting cultivation”). According to a 1901 estimate, out of a total CHT population of 124,762 persons, 109,360 existed entirely by *juming*. Today, only some of them, in particular the Pankho and Khumi, remain predominantly dependent on subsistence *jum* agriculture (Roy, Raja D.1995).

In earlier times, the CHT was largely self-sufficient in food with imports from the plains markets remaining limited to salt, dried fish, kerosene, iron, clay tools and utensils. Although the indigenous people were formerly swidden cultivators, the plough was introduced in the first quarter of the 19th century in the Hill Tracts.

Agricultural systems of Chittagong Hill Tracts are classified as extensive, semi-intensive, intensive and mixed. The major problems of the agricultural systems of the uplands of the Hill Tracts of Chittagong are conflict over land use for shifting agriculture, horticultural crops, teak plantation, soil erosion due to shifting cultivation and existence of extreme poverty. Large scale plantations of teak have created a concern among the tribal people for food because of the fact that about 32 years are needed to get any return and nothing can be grown under the tree. Horticultural plantations with vegetables and spices under trees appear to be a probable solution. Also recent large scale cultivation of tobacco which demands huge amount of fuel wood for curing is a threat to the forest ecosystems in the Hill Tracts of Chittagong.

Consumption oriented products like rice, maize, different types of vegetables, ginger, turmeric, pepper, hilly potato, local varieties of cotton and oilseeds are mainly produced in this areas. The tribes cultivate mainly the following rice varieties in Jhum land: *Galongdhan*, *Pattikidhan*, *Vatiadhan*, *Kobrokdhan*, *Buppoidhan*, *Hamarangdhan*, *Turkidhan*. In jhum cultivation, inorganic fertilizers are rarely used. Hence, for maintaining soil fertility, the farmers have to find a new *jhum* land every year depending on its availability.

Banana cultivation is remarkable in this agricultural system, because of having a tradition of the farmers to plant banana after jhum cultivation. There are various types of banana in hilly areas: Toinna Kola, Kattoli kola, Zet kola, Thunne kola, Adbori kola, chompakola etc. Fruits and horticultural crops are grown mainly for household's consumption. Livestock products are used to mitigate household's requirements. There is a scarcity of off-farm income in some of these villages due to poor road conditions and long distances from the roads, markets and upazilas.

Due to the traditional agriculture system in this region, the tribal populations are suffering from food insecurity in terms of food production, income, total expenditure, food expenditure, share of expenditure of food, calorie consumption and nutritional status etc (MSF-Holland.2008).

Almost one-third (30%) of households in the CHT had taken a loan for food in the previous month, more than double the percentage in rural Bangladesh, which suggests that household food insecurity was more common in the region.⁶ About 62% households in the region irrespective of ethnicities are living below absolute poverty line (below 2,122 kcal), while 36% are hardcore poor (below 1,805 K.cal) (Barkat Abul et al. (2008)).

The severe scarcity of food at the household level forced people into adopting different coping mechanisms: cutting the number and the size of the meals, prioritizing some family members in terms of food access (children and male adults able to work), shifting the majority of the food intake towards jungle food, borrowing money, selling livestock and other valuables.

The information about nutritional situation in CHT is not sufficient to trace out the real picture. The Bangladesh Bureau of statistics mentions 2 % of the children < 5 yrs are severely malnourished which is lower than the national average. However, a BRAC-study found that 13.6% male and 16.9% female < 5 yrs fall into this group, which is almost twice as high as the national average for rural areas (Socioeconomic and Health Profile of Chittagong Hill Tracts, August 1999, by BARC).

Data collected during a special survey of the NSP of Helen Keller International (HKI) and the Institute of Public Health Nutrition (IPHN) in May and June 2000, three years after peace was restored, revealed that the prevalence of chronic energy deficiency in mothers was 'serious' and the prevalence of underweight and stunting in children was 'very high' according to international criteria (Helen Keller International, Nutritional Surveillance Project Bulletin No. 13; May 2003).

Due to chronic malfunctions of the health system, absence of any health facility in the remote areas as well as poverty and lack of awareness, getting proper treatment for a disease was always found to be a challenge. About 34% of the families prefer to go to the traditional healers while 53% buy drugs from the medicine shops.

Lifestyle, food security, health and nutritional status of the ethnic people are greatly influenced by their agriculture and cropping pattern. There is a lack of information on the current health and nutrition situation in the CHT and on the overall impact of recent development activities on health and nutrition in the region.

CHAPTER 3: Objective and Methodology

3.1 Objectives:

The goal of the present study is to chalk out the agricultural cropping pattern among ethnic people and to investigate its effects on their life style, health and nutrition.

3.1.1 General Objective:

To assess the existing agricultural cropping pattern among the ethnic people and its effects on their life style, health and nutrition; as well as to develop a comprehensive strategic framework for improving life style, health and nutrition status among that particular population.

3.1.2 Specific Objectives:

The specific objectives of the study are:

1. To find out the socio-demographic condition of the ethnic people of the Chittagong Hill Tracts of Bangladesh.
2. To identify the agricultural cropping pattern and determinants of agricultural systems in the Chittagong Hill Tracts among the ethnic people .
3. To describe the life style and food intake pattern of the ethnic people of this area.
4. To investigate the food security condition (both in individual and household level) of the people.
5. To measure the health and nutritional status of the ethnic people .
6. To draw the policy recommendations on the basis of findings in the study and to develop a comprehensive strategic framework for improving their health and nutritional status.

3.2 Methodology:

3.2.1 The Study Area:

To study the agricultural cropping patterns and to investigate the present status of food security, nutrition and health of the ethnic people of the Chittagong Hill Tracts of Bangladesh, a multistage cluster sampling was designed for selecting the farm households from the up lands of the Hill Tracts of Chittagong.

The sampling frameworks consist of primary sampling unit of district, secondary sampling unit of upazila, pre-ultimate sampling unit of village and ultimate sampling of household for the data collection.

Out of these 25, there were 10 Upazila in Rangamati, 8 in Khagrachari, and 7 in Bandarban District. Considering the available time, budget, accessibility of interviewees and all other aspects two Upazila from each district and five villages from each Upazila were randomly selected. A total of 810 households those who were engaged in agriculture were randomly selected from these three districts.

3.2.2 The Study Population:

A total of 810 households were surveyed in selected villages for this study. Households were randomly selected for interviews.

A comprehensive food consumption survey (CFCS) was conducted. The purpose of the CFCS was to get the idea about the diversity of foods as well as food items those are most frequently consumed by indigenous and ethnic people living in Bangladesh and then to come up with a short list of food items those are most commonly consumed by both groups of people.

In the study household are considered as the sampling unit as in most of the cases food is first purchased in the household and then consumed by the member of the household. To determine the minimum sample size required the following statistical formula was used.

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Where,

N = Minimum sample size

P = Expected proportion of the household consuming the diversified food items.

Z = Standard error corresponding to a given confidence level

d = Precision of the estimate which is considered to be 0.05 at 95% confidence level

Considering the prevalence of diversity in the food consumption of different food items by households and thus the individuals at 0.15 and the standard scores of the estimate at 95% confidence level with precision of 0.05 the above equation gives a value of sample size of 196 say 200 households is required to be the minimum sample size from each of the six divisions of Bangladesh which will comprise a total of 1200 indigenous households of Bangladesh and 810 ethnic households were selected to get the percent of household consuming each of the specific food items through out the year by both the indigenous and ethnic people of Bangladesh.

3.2.3 Selection of ethnic households:

Twenty eight tribes comprising 2,33,417 number of households have been living in Bangladesh (BBS survey, 1991). Among them, the tribes which have at least 1.5% representation in the total ethnic households living in Bangladesh were taken into the study. This stood at 11 tribes that had $\geq 5\%$ representation in the total tribal population living in Bangladesh. These included *Marma*, *Chakma*, *Tanchanga*, *Tripura*, *Bam*, *Murang*, *Monipuri*, *Khashia*, *Shaotal*, *Garo* and *Hajong*, which comprise 1,64,667 households representing 70.54% of total ethnic households living in Bangladesh. Ethnic people of the 11 tribes live in the four divisions of Bangladesh namely Dhaka (Durgapur Upazilla under Netrokona districts), Sylhet (Kamalganj Upazilla under Moulavi Bazar district), Chittagong (Khagrachari, Rangamati and Bandarban Sadar Upazilla) and Rajshahi (Godagari Upazilla under Rajshahi district). On the basis of probability proportions (PPS) to the size, a total of 810 households were selected randomly from the 11 representative tribes.

3.2.4 Questionnaire design, enumerator training and pre-testing:

3.2.4.1 Questionnaire design:

The major components included in the questionnaire were- types of food consumed by the households throughout the year, socioeconomic profile, family food security, nutritional knowledge, knowledge on nutritional deficiency diseases etc of the projected households. A semi pre-code formatted questionnaire was used as the basic data collection tool to get the household information. Considering the importance of the study in the national context and its objectives, information on the variable collected were meticulously included in the questionnaire, discussed with the Technical Advisory Team (TAT) members and carefully examined so that all the relevant information were taken and recorded during the comprehensive consumption survey.

The questionnaire was designed in the light of experience achieved from the National Nutrition Survey and various other large scale surveys conducted in Bangladesh focusing on the required variables to answer the objectives as well as purpose of the study. The questionnaire was field tested prior to actual use and was modified on the basis of the feed-back received from the field tests.

The questionnaire and selection of survey site were finalized and approved in consultation with Technical Advisory Team (TAT) members of this Programme.

3.2.4.2 Enumerator recruitment and training:

A team consisting of four enumerators with one supervisor were recruited and trained to conduct the field survey. All the enumerators recruited were university graduates and postgraduates. In the five member's team, two enumerators belonged to general community and three were ethnic who were fluent in speaking and understanding the general people's language as well as the tribal people's language. More ethnic members were recruited because they were familiar with the difficulties in tribal locations where the ethnic people are mostly concentrated as well as to facilitate the data collection within the stipulated time. Initially, all field staffs received 7 days' orientation training consisting of familiarization of the questionnaire through guided readings and field trials.

3.2.4.3 Pretesting questionnaire:

The enumerator team spent a considerable time in the office and at the field-testing sites in practicing the techniques of recording types of food consumed by the household throughout the year and the other related variables included in the questionnaire as well as the related data collection activity. Fifty households comprising general and ethnic people were interviewed in pre-testing the questionnaire.

3.2.5 Study Design:

The study was a descriptive cross-sectional which were followed a mixed method approach, combining both quantitative and qualitative analysis. The exercise of mixed methods involves the collection, analysis and mixing of both quantitative and qualitative data in a single study (Barkat Abul et al. (2008)).

Several methodological tools were thus used including observation, individual interviews and group discussions. Observation and group discussions were used to accumulate data and to gain an accurate idea of the life style of ethnic people in the study area. These methods were selected particularly, to gain a comprehensive understanding of impact of agricultural cropping pattern on lifestyle, nutritional status and food security among the ethnic population, which constitutes the core objective of the study.

To fulfill the study objectives data were collected in the following major sectors:

1. Socioeconomic profile:

It includes age, education, monthly family income, monthly expenditure, housing condition etc.

2. Identification of agricultural cropping pattern and determinants of agriculture system in CHT:

Major crops, type of cultivation system, seasonality, access to agricultural inputs and training, use of modern technology in agriculture.

3. Measurement of food security status:

It was measured by both the household and individual intakes either directly measured or by 24-hour recall, household caloric acquisition, dietary diversity and indices of household coping capacity during emergency (Riely, F. et al. 1999).

4. Measurement of health and nutrition status:

It was carried out by recording dietary intake, food frequency, intra-household food distribution and child care, anthropometry (age, height, weight) disease frequency, malnutrition (BMI).

In order to assess the nutrition status of children (aged < 5 years), adolescents (aged 10-19 years) and people of reproductive age (aged 15 to <49 years) data was collected on anthropometric measurements (age, height and weight mainly).

The US National Center for Health Statistics (NCHS) standard is one of the most commonly used reference population and it is recommended for use by the WHO. This reference has been employed in present study. Three standard indices of physical growth that describe the nutritional status of children are height for age (stunting), weight for height (wasting) and weight for age (underweight). Indicators for nutritional status can be expressed in Z-score or standard deviation unit (SD), which shows how the children differ from the mean. A child who is below -2 SD from the median of the NCHS reference population in terms of height for age is considered short for his/her age or stunted. It is a condition

reflecting the cumulative effect of chronic malnutrition. If the child is below -3SD from the reference median, then the child is considered to be severely stunted. A child between -2 SD and -3 SD is considered to be moderately stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and may also be caused by recurrent and chronic illness. Height for age, therefore, represents a measure of the long term effects of malnutrition in a population.

In the present study, nutritional status of under5 children is measured by anthropometric indicator that is weight for height (wasting). Wasting or thinness is usually the result of a recent illness or acute nutritional deficiency. Children with weight for height more than -2SD unit and below the mean weight for height of the reference population are classified as wasted, while those with weight for height more than -3SD unit and below the average of the reference standard are considered severely wasted. Adolescent girls and boys (aged 10-19 years) are measured by anthropometric indicator that is height for age (stunting). Height for age represents a measure of the long term effects of malnutrition in a group of population. The nutritional status of the household members of both sexes aged 15 to 49 years was calculated by Body Mass Index (BMI). It is a measure of body fat based on height and weight. BMI is calculated on the following formula:

BMI= body weight in Kilogram/Height in meter squared

3.2.6 Data collection, management and analysis:

3.2.6.1 Data collection:

Data were collected from the selected locations and households through home visits. To get the information related to food purchase, consumption and other variables, the household head (male) and the spouse were interviewed. Every day, the collected information/data was checked, coded and cross checked by the interviewers and finally by the supervisor at the field sites in order to avoid any misreporting. Any confusion arising out of this matter was settled on the following day during subsequent home visits. This process of scrutinizing the data was performed during the entire period of CFCS.

3.2.6.2 Data management and analysis:

The questionnaire was edited and entered into SPSS program. Data entry was done by the computer data entry personnel of INFS, DU and this was followed by an extensive period of logical checking to identify any error in data entry, which were then corrected by consulting the original questionnaires.

3.2.7 Focus group discussions (FGDs):

The focus group is a type of group interview (<http://www.extension.iastate.edu/publications/pm1969b.pdf>). It provides qualitative approaches to research aiming to obtain in-depth information on concepts, perceptions and ideas of a group on certain specific topic in short time at relatively low cost. The FGD supplements the survey data. In case of health and nutrition, it is primarily done to get information regarding the lifestyle, food consumption, food security, health and nutrition knowledge of a community. The activities of conducting a focus group include- identification of the objectives of the focus group discussions, preparation of questions, selection of participants, selection of location and facilitator, note-taker and planning of session. It produces high quality data if it is employed for the right purposes using the right procedures.

The FGD comprises a group of approximately 8-10 participants with key informants such as community leaders and a critique, and the discussion may last for one hour to one and half hour. It is an important tool for acquiring feedback regarding the topic, and it facilitates the enumerators to talk to the people in a more natural setting than a one-to-one interview. In presence of the critique, the participants and key informants are directly asked about their perceptions, opinions, beliefs and attitudes towards a particular topic. Their responses are discussed, criticized and recorded.

It has a high apparent validity - since it is easy to understand, and the results are believable. FGD is relatively easy to assemble, good for getting rich data in participants' own words and developing deeper insights, good for obtaining data from children and/or people with low levels of literacy, identifying factual errors or extreme views. Its limitations are -the responses of each participant are not independent, a few dominant focus group members can skew the session. Focus groups require a skilled and experienced moderator and the data requires skill and experience to analyze.

In the present study, FGD was conducted among the ethnic communities of *Marma*, *Chakma*, *Tripura* and *Tangchaga* living in Khagrachari and Rangamati during March and April, 2010. It was carried out to get information on their food consumption pattern.

CHAPTER 4: Results and Discussion

4.1 Socioeconomic Profile of ethnic households:

This section deals with the socioeconomic characteristics of the households. Socioeconomic characteristics of the households are important factors which influence production planning. People differ from one another in many respects. There are numerous interrelated and constituent attributes that characterize an individual and profoundly influence development of his/her behavior and personality. It was, therefore, assumed that enterprise combination, consumption pattern, employment pattern and education level of different households would be influenced by these various characteristics. Finally, socioeconomic characteristics of the farmers influence their decision making about farm. A number of socioeconomic aspects of the sample households were examined. These are education level, occupation, age distribution, monthly income and monthly expenditure of the ethnic households under the study area.

Distribution of people by Tribe by number.

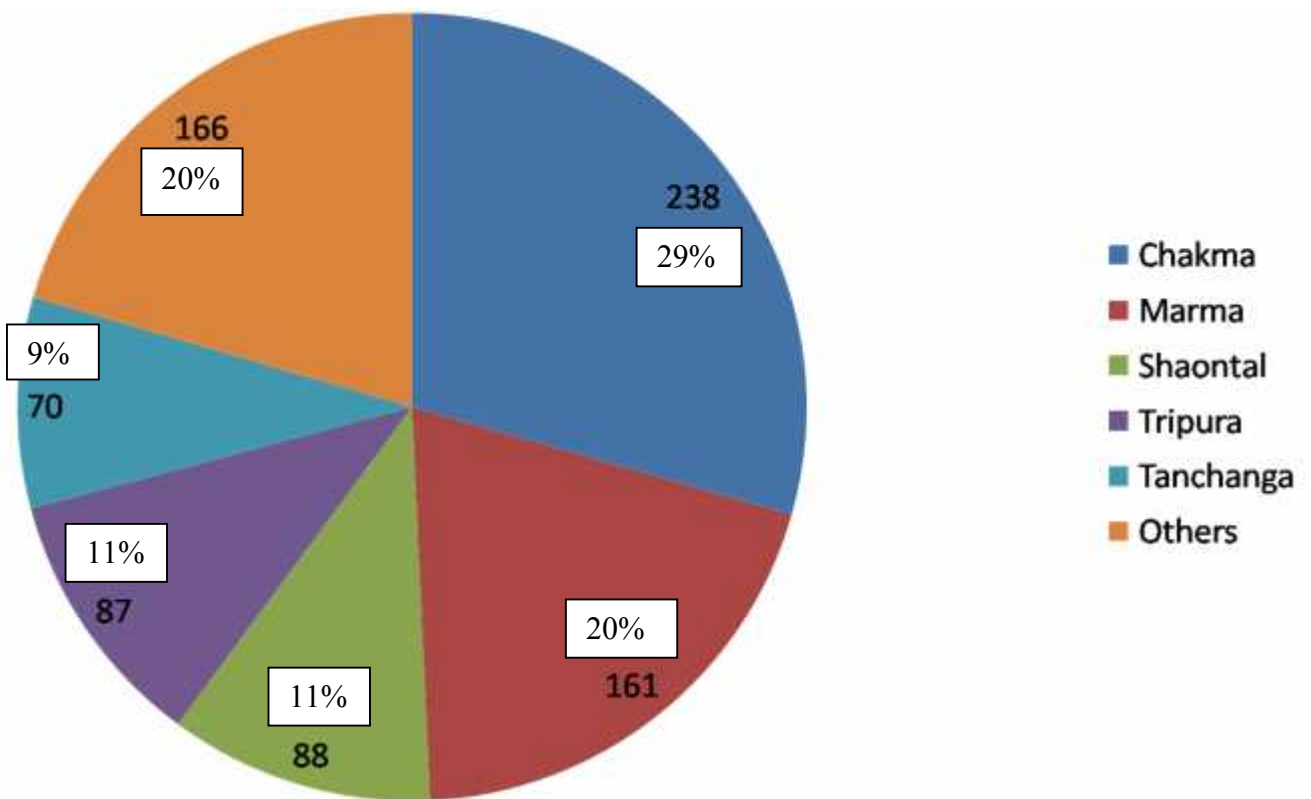


Fig 2: Percent Distribution of Ethnic People by Tribe

4.1.1 Education of the households Head:

As depicted in table-1, the sample households were classified into seven categories based on their education level. It was found that 34.3% Chakma, 78.9% Marma, 56.8% Shaontal, 27% Tripura, and 46.7% Tanchanga had no education. Among the tribal population in the study area 8.3%, 5.6%, 2.3%, 3.3% were Chakma, Marma, Shaontal, and Tanchanga respectively. It was also revealed that 20.4% Chakma, 10.2% Shaontal, 21.6% Tripura and 26.7% Tanchanga were below SSC. It was found that 11.1% Chakma, 11.3% Marma, 4.5% Shaontal, 37.8% Tripura, and 6.7% Tanchanga were below HSC. Moreover, about 21.3% Chakma, 1.1% Shaontal, and 10.8% Tripura were HSC and above. Among the tribal people, Marma were found to have highest rate of illiteracy followed by Shaontal, Tanchanga, Chakma, and Tripura. Among tribal people Tripura were not found to be below Primary level in the study area.

4.1.2 Occupation of the households Head:

As depicted in table-2, the occupational status of the household heads in the study area was found to be diverse. The main occupation of different tribal people like Chakma, Marma, Shaontal, Tripura, and Tanchanga was agriculture. The percentage of agriculture and service were found to be equal among Chakma in the study area. There was found no service holder among the Marma, because of their low education level.

4.1.3 Age distribution of Household Head:

Age is an important factor that influences household production- decision and efficiency to adopt improve technologies. As table -3 reveals, most household respondents belong to thirty to forty five years age group, followed by forty five to sixtyyears, fifteen to thirty years and sixty to seventy five years. This indicates that household respondents were younger (thirty to forty five years) in the study area, giving rise to a demographically favourable condition for development to take place in future.

4.1.4 Family monthly income:

The household income, expenditure and savings of the sample households play an important role in attaining household food security level in study areas. Table-4 depicts the source of household income, nature of expenditure, savings and liabilities situation of the sample households. The income of the respondent households comes from different sources. These sources were farm income, livestock income, non-farm income and income from selling bamboo, fire wood, timber and sweeping materials. Farm income includes income from crops, vegetable and fruit produced in household homestead areas,

plain land area, hilly area, under their occupation. Livestock income comprises income from sale of cow, goat, pig, chicken, and milk. The non-farm income comes from labor wages, service and petty business. The household were categorized into five groups based on their monthly income. The monthly income of the most tribal people such as Chakma, Marma, Shaontal, Tripura Tanchanga and others were found to be below Taka 5000 followed by taka 5001-8000. The Marmas were not found in monthly income group of tk. 8000-11,000. Among ethnic people, only Chakma, Tripura and Tanchanga were found to be in monthly income group of tk. 11000-14000 followed by monthly income greater than taka 14000.

Table – 1. Distribution of household heads in the study area by level of education.

Parameters	CHAKMA		MARMA		SHAONTAL		TRIPURA		TANCHANGA		OTHERS	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Below primary	20	8.3	9	5.6	2	2.3	-	-	2	3.3	14	8.1
Below SSC	48	20.4	-	-	27	10.2	19	21.6	19	26.7	34	20.3
Below HSC	26	11.1	18	11.3	4	4.5	33	37.8	5	6.7	15	9.3
HSC and above	51	21.3	-	-	1	1.1	9	10.8	-	-	11	6.4
Illiterate	82	34.3	127	78.9	50	56.8	24	27.0	33	46.7	70	41.9
Can sign only	9	3.7	7	4.2	4	4.5	2	2.7	12	16.7	23	14.0
Can read and sign	2	0.9	-	-	-	-	-	-	-	-	-	-
Total	238	100.0	161	100.0	88	100.0	87	100.0	70	100.0	166	100.0

Table – 2. Distribution of household heads in the study area by occupation.

Parameters	CHAKMA		MARMA		SHAONTAL		TRIPURA		TANCHANGA		OTHERS	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Agri (work)	79	33.3	63	39.4	38	43.2	-	-	19	26.7	46	27.9
Earth cutting	2	0.9	-	-	-	-	-	-	-	-	-	-
Rickshaw / van driver	7	2.8	7	3.2	4	4.5	-	-	2	3.3	4	2.3
Business	11	4.6	11	7.0	-	-	7	8.1	9	13.3	8	4.7
Jobless	-	-	9	5.6	5	5.7	-	-	-	-	2	1.2
Service	79	33.3	-	-	12	13.6	71	81.1	2	3.3	20	12.2
Others	60	25.0	70	43.7	29	33.0	9	10.8	37	53.3	86	51.7
Total	238	100.0	161	100.0	88	100.0	87	100.0	70	100.0	166	100.0

Table – 3. Distribution of study people by age.

Parameters	CHAKMA		MARMA		SHAONTAL		TRIPURA		TANCHANGA		OTHERS	
	N	Mean±sd	N	Mean±sd	n	Mean±sd	N	Mean±sd	n	Mean±sd	n	Mean±sd
Age (in years)												
15-30	31	26.5±3.01	20	28.1±2.52	14	27.6±2.41	12	27.4±4.22	14	28.2±1.94	18	27.8±2.07
30-45	145	38.3±3.82	63	38.5±3.96	42	37.2±4.27	49	39.7±3.88	33	38.4±4.07	78	38.1±4.30
45-60	53	53.1±4.57	57	53.5±4.27	28	52.8±3.50	16	51.6±3.69	19	52.8±4.98	58	52.8±4.25
60-75	9	69.5±4.20	20	66.4±3.09	4	66.0±4.24	9	66.3±2.99	5	70.0±1.09	13	66.5±4.29
Total	238	41.2±10.50	161	46.2±12.4	88	42.0±11.1	87	43.1±11.3	70	42.3±12.1	166	44.3±11.3

Table – 4. Family monthly income and expenditure of the study people:

Parameters	CHAKMA		MARMA		SHAONTAL		TRIPURA		TANCHANGA		OTHERS	
	<i>N</i>	<i>Mean±sd</i>	<i>N</i>	<i>Mean±sd</i>	<i>N</i>	<i>Mean±sd</i>	<i>N</i>	<i>Mean±sd</i>	<i>N</i>	<i>Mean±sd</i>	<i>N</i>	<i>Mean±sd</i>
Family monthly income(in taka)												
<5000	145	3090±949	138	2780±1088	82	2343±1268	24	3640±1418	-	-	-	-
5001 – 8000	57	6965±884	20	6444±846	5	6100±548	19	6875±991	56	2739±1066	130	3055±1182
8000 – 11000	18	9375±694	-	-	1	10000.0	24	9500±667	7	7000±1000	25	6301±832
11000 – 14000	11	12600±894	-	-	-	-	9	12375±478	5	9500±707	9	9709±923
>14000	7	1667±2887	-	-	-	-	12	23200±11344	2	14000±210	2	12000±304
Total	238	5306±3462	161	3265±1635	88	2643±1704	87	9510±7292	70	4034±2997	166	4004±2286
Family monthly expenditure (in taka)	238	6574±4392	161	3768±1754	88	3125±998	87	10512±1189	70	5345±1979	166	5478±2137

Family monthly expenditure:

Table- 4 shows the monthly household expenditure for food and non-food items. The expenditures were for crop production, food, clothes, medication, housing, children's education, social/religious functions, livestock rearing, chicken rearing, and also expenditures for biri, cigarettes, tobacco, betel leaf, and tea. It was revealed that family monthly expenditure is higher among the Tripura followed by Chakma, Tanchanga, Marma and Shaontal.

4.1.5 Preparation Techniques and Use of Food :

Preparation techniques and use of food play an important role in conserving the nutrient value of food. **Table-5** shows how and at what extent the household members usually followed food preparation techniques. Three indicators on food hygiene and preparation practices such as use of starch of boiled rice, cutting, washing and cooking procedures of leafy vegetables and use of oil during cooking were taken into consideration. As shown in table-5, about 35.3% households used to wash leafy vegetables after cutting into small pieces. Most of the households (59%) did not use oil during cooking and only 33% households use cooking oil during cooking. Most of the households (56.7%) threw away rice gruel after cooking, only 3.3% households fed it to their children and 40% households kept starch/gruel with rice while they cooked rice. It was noted that indigenous households often cut the vegetables first and then wash, because it has been their customary preference. They are unaware of the fact that there is greater loss of vitamins when the vegetables are cut and then washed.

Table 5. Food preparation techniques habitually followed by ethnic hill people:

Preparation techniques	No. of respondents	% of responded
1.Cutting procedure of leafy vegetables before cooking		
Wash with water after cutting in smallll pieces	286	35.3
After washing cut into small pieces	37	4.6
Practice both of above processes	487	60.2
Total	810	100.0
2. Use of oil during cooking		
Yes	270	33.2
No	478	59.3
Some times	62	7.5
Total	810	100.0
3.Use of starch (Gruel) after boiling rice		
Feed to child	28	3.3
Through away	458	56.7
Never discard gruel	324	40.0
Total	810	100.0

4.1.6 Assessment of food security at household level:

Food security can be defined as access at all times by all people to sufficient, safe and nutritious food which meet their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996). There is, however, no easy way of measuring food security. It is a complex problem determined by the interaction of a broad range of agro-ecological, environmental, socio-economic, political and biological factors. In simple, food security can be defined as the combination of three components as (i) availability of food, (ii) access to food, (iii) utilization of food.

a) Availability of Food:

Food availability refers to the physical presence of food at various levels from household to national level, be that from own production or through markets (FANTA, 2006).

b) Access to Food:

Food access refers to the ability to obtain an appropriate and nutritious diet and is in particular linked to resources at the household level.

c) Utilization of food:

Food utilization refers to the proper use of food, which includes the existence of proper food processing, adequate knowledge and application of nutrition, adequate health and sanitation services.

The concept of food security is a broader horizon encompassing a large number of aspects like agro-economic, infrastructural and social along with health and nutrition. Food security refers to physical and social access by all people at all times to enough food for a healthy productive life (FAO 2000). Conversely, food insecurity exists when people lack transiently or persistently, access to sufficient quantities of safe and nutritious food required for normal growth and development and for an active and healthy life.

As per Millennium Development Goals one (MDG -1) Bangladesh by the year 2015 has to eradicate hunger, chronic food insecurity and extreme destitution. The essential elements of the concept of food security are availability of food, ability to acquire it from the market and the ability to utilize the consumed food in the body system.

In order to get a measure of a household food security, all respondents were asked whether they ever face any type of food shortage at any time of the year.

As presented in Table-6, most of the respondents (71.8%) never experienced food shortage during the year and only 25.7% respondents sometimes experienced food shortage during the year. It was observed that 75% respondents faced food shortage in the month of January, followed by 19% in the month of February and 6% respondents facing food shortage throughout the year. Intra family mal-distribution of food was also observed among the ethnic people. When food shortage persists, 81% adult women use to eat less food, followed by 15.9% adult men and 3.1% others within the family eating less food. The study revealed that 4.6% family members had never ever received balanced food, while 37.8% family members always receive balanced food. It was also found that 57.7% family members receive balanced food only occasionally.

From the study, it was found that most ethnic people in the CHT are not secured in respect to food availability. Depending on the severity of the food shortage, households adopt a range of coping strategies. Households change their eating patterns through eating smaller and inadequate meals regularly and moving gradually from nutritious food, such as rice, to less nutritious forest foods, some of which are unfit for human consumption (Alom et al; 2010).

Table-6. Household food security of the hilly ethnic people under study:

Items	No. of respondents	% of responded
Did any member of the household experience food shortage		
Never ever	581	71.8
Some times	208	25.7
Often/always	21	2.5
Total	810	100.0
Period of year facing food shortage		
January	608	75.0
February	154	19.1
Whole year	48	5.9
Total	810	100.0
When food shortage persist who of the family eat less		
Adult women	657	81.0
Adult men	128	15.9
Others	25	3.1
Total	810	100.0
Did any member of the house lose weight due to starvation		
Yes	3	0.4
No	390	48.1
Did not verify	417	51.5
Total	810	100.0
Every family members having balance food		
Always	306	37.8
Never ever	37	4.6
Sometimes	467	57.7
Total	810	100.0

4.1.7 Morbidity Vs Mortality:

Morbidity refers to the disease state of an individual or the incidence of illness in a population. Mortality refers to the state of being mortal or the incidence of death (number of deaths) in a population.

The general definition of morbidity is the state of being unhealthy or diseased. The definition of mortality refers to the incidence of death or the number of deaths within a population. One could separate the difference in definition by replacing one word for each. Mortality is one with death and morbidity is one with illness. Therefore, if one were to refer to the infant mortality rate, one would be referring to the mathematical equation of dividing the number of infant deaths by the number of live births. If one refers to someones as being morbidly obese, one is stating that they have an unhealthy weight which could lead to death.

Non –communicable diseases (NCD).

In order to collect information about the prevalence of NCDs, the household respondents were asked whether any member of his/her family suffering from gastric/asthma/diabetic/heart diseases / kidney diseases or not.

Table -7 are revealed that 51% of the households have at least one person suffering from gastric complications as per other NCDs, the percentage is 3.1 % for asthma, 3.9 % for diabetic, 3.7% for heart diseases and 3.5 % for kidney diseases among the surveyed households .

Prevalence of all most all NCDs are positively associated with household income- expenditure and level of education of the respondents. It is higher in households of high income, expenditure and higher education (Akhtaruzzaman et al; 2013).

Gastric is the most common diseases in Chittagong Hill Tracts (CHT), as is depicted in Table-7. The other non-communicable diseases such as asthma, diabetic, heart disease and kidney disease cause most of the deaths in the area, though over the course of time a number of initiatives have been taken for prevention and treatment of these diseases. In areas where access to health facility is more than three hours walking distance away, communities diagnose the diseases themselves and resort to traditional healers and/or untrained personnel. In some cases where community based workers have been trained properly, they are able to diagnose and provide treatment. Currently only a limited package of curative health care is offered at the union level by MOHFW in CHT. Due to staffing problem, lack of diagnostic equipments etc. facilities at the Union level are unable to provide curative services to the extent desirable (Surgeons' Office, CHT, 2010).

Table-7. Prevalence of Non communicable diseases (NCDs)among the studied Ethnic people under study:

Type of NDCs	No. of individuals suffering	Percent of individual suffering
Gastric	2238	51
Asthma	136	3.1
Diabetic	171	3.9
Heart Disease	160	3.7
Kidney disease	154	3.5

Table-8: Distribution of ethnic people under study by their housing status.

House type	No. of respondents	% respondents
1. Pacca dalan	21	2.5
2. Pacca dalan with tin shed	68	8.4
3. All tins with pacca floor	84	10.5
4. All tins with katcha floor	152	18.8
5. Tin shed with mud wall	78	9.6
6. Straw shed with mud wall	95	11.7
7. Straw shed with bamboo/straw fench	312	38.5
8. Total	810	100.0

4.1.8 Housing status of the ethnic people:

Table-8 presents the housing status of the hill people. Their housing condition was found to be very poor. Most of the ethnic people under study (38.5%) own Straw shed with bamboo/straw fence house followed by 11.7% Straw shed with mud wall, 9.6% Tin shed with mud wall, 18.8% All tins with katcha floor, 10.5% All tins with pacca floor, 8.4% Pacca dalan with tin shed and 2.5% Pacca dalan. The type of material used for floor is an indicator of economic standing of the household as well as an indicator potential exposure to disease causing agent.

4.1.9 Sanitary Practices by the Ethnic People:

As Bangladesh is one of the world's highest population densities, sanitation is a crucial issue here. The government of Bangladesh considers a hygienic latrine to be one which confines faeces, has an intact water-seal or other tight pit closure and is shared by not more than two households (Government National Sanitation Strategy, 2005).

In the present study, this national definition is adopted and term as hygienic Latrine. Though questions were asked the respondents about the sanitation facilities of the households, it was ensured by direct observation as and when possible.

Table-9 shows that on average 41.4 % households have hygienic / sanitary latrine facilities. The remaining households use either definite ditch (40.2%) or open place (14.4%). It has also been seen in **table -9** that disposal of child waste / excreta in latrine is an important indicator of household sanitation status. Regarding disposal of child waste / excreta, about 50.4 % household use sanitary latrine, while 29.1 % use definite ditch and children of 19.1 % households defecate in the open place. The study reveals that majority of the ethnic people do not follow the proper sanitary practices.

The use of sanitation facilities by the households vary significantly for the variation of household income expenditure and education level. Household income expenditure and level of education were found to be positively associated with having sanitary latrine and negatively associated with sharing the latrine with others. Households of highest income expenditure and highest education level have their own / personal latrine. Percentage of households using open space as place of defecation of children decreases with the increase of household income expenditure and level of education. Households from the highest income expenditure group and higher level of education are more likely to use sanitary latrine and disposal of child waste / excreta at definite or sanitary latrine.

So, it can be concluded from the survey findings that sanitation and hygiene practices are directly related with household income and expenditure, level of education.

Table-9. Sanitary practices followed by the ethnic people in the study area.

Items	No. of respondents	% of responded
Type of latrine used		
Ditch	31	3.8
Open place	119	14.6
Definite ditch	326	40.2
Sanitary latrine	334	41.4
Total	810	100.0
Child waste disposal Practices		
Ditch	11	1.3
Open place	155	19.1
Definite ditch	236	29.1
Sanitary latrine	408	50.4
Total	810	100.0

4.1.10 Nutrition knowledge of the ethnic people:

Table-10 presents the nutrition knowledge of the ethnic people. It shows that 95% respondents were aware that balanced food is needed for good health. Out of the total respondents, 97% were found to have knowledge about the importance of giving vegetables and fruits to the child in daily meal. About 86.6% respondents felt that excess or less eating of vegetables and fruits create problem on nutrition. Some 45% respondents thought that eating rice, fish, egg and milk would not cause shortage of blood. Some 32% respondents thought that eating vegetables and fruits would not cause shortage of blood, while the percent is 23 in favour of costly food. In terms of knowledge regarding what type of food need to be eaten for increase of blood, about 62.7% respondents answered in the affirmative and about 26.3% answered in the negative. About 51.9% respondents knew the reason of goiter and about 42.7% respondents did not know the reason of goiter. Most of the respondents knew that eating iodized salt, fruits, vegetables and sea fish don't cause goiter but 44.6% respondents were not aware of this. Out of the to In the NHDSBD – 2011 revealed that nationally 94.4 % household use tubewell / tap water as drinking purpose and 75.9% household use tubewell / tap water as cooking washing purpose (Akhtaruzzaman et al; 2013).

tal respondents, 99.2% used iodized salt. About 56.4% respondents were found to have idea regarding night blindness disease, while 43.6% were found to have no idea regarding night blindness. About 98.6% respondents answered that none of their family members ever experienced night blindness disease. Fifty eight percent respondents were found to know that eating green vegetables/yellow vegetables do not cause night blindness, while 42% were found to have this

knowledge but not clearly. As regards giving vitamin A capsules to their child in last six months, 44% respondents answered in the affirmative and about 16.6% respondents answered in the negative. As regards the knowledge about the cause of diarrhoea, 52.3% answered rightly and 30.3% answered partly right. As regards their under -5 children's incidence of diarrhoea in the last one month, 58.3% did not experience any episode but 28.9% and experience 6 months ago. In relation to diarrhoea treatment, 50% respondents fed packet saline, 21.7% medicine and 28.3% fed oral saline and medicine.

Table 10: Nutritional knowledge of the ethnic people under study.

Items	No. of respondents	% of responded
Do you know that for good health we need balance food		
Yes	769	95.0
No	7	0.8
Don't understand	34	4.1
Total	810	100.0
Is there any importance of giving child vegetables and fruits in daily meal		
Yes	786	97.1
Don't understand	24	2.9
Total	810	100.0
Do you feel excess and less eating of vegetables and fruits create problem of nutrition		
Yes	40	5.0
No	702	86.6
Don't understand	68	8.4
Total	810	100.0
Eating what type of food will not cause shortage of blood		
Costly food	186	23.1
Vegetable & fruits	260	32.0
Eating rice, fish, egg & milk	364	45.0
Total	810	100.0
Do you know what type of food need to be eaten for increase of blood		
Yes	508	62.7
No	213	26.3
Don't understand	89	11.0
Total	810	100.0
Do you know the reason of goiter		
Yes	420	51.9
No	346	42.7

Nutritional knowledge of the ethnic people (Continued)

Don't understand	44	5.4
Total	810	100.0
Eating what food don't cause goiter		
Iodized salt, fruits & vegetables , Sea fish	427	52.8
Know a little	21	2.6
Don't know	362	44.6
Total	810	100.0
Do you use iodized salt		
Yes	804	99.2
No	6	0.8
Total	810	100.0

Nutritional Knowledge of Ethnic people (Contd.)

Do you know what is night blindness disease	No. of respondents	% of responded
Yes	458	56.4
No	352	43.6
Total	810	100.0
Does any member of your family experience night blindness disease		
Yes	4	0.5
No	797	98.6
Can not remember	9	0.9
Total	810	100.0
Do you know eating what type of food do not cause night blindness		
Green vegetables/yellow vegetables	470	58.1
Know but not clearly	340	41.9
Total	810	100.0
Did you give vitamin A capsules to your child in last six months		
Cannot remember	319	39.4
Yes	356	44.0
No	135	16.6
Total	810	100.0

Nutritional Knowledge of Ethnic people (Contd.)

Do you know the reasons of diarrhoea	No. of respondents	Percentage
Yes	57	7.1
Answered rightly	424	52.3
Answer partly right	245	30.3
Answered wrongly	84	10.4
Total	810	100.0
Did your children of less than 5 yrs experience diarrhoea in last one month		
Did not experience	472	58.3
Last week	10	1.1
One month ago	14	1.7
Three months ago	58	7.2
Six months ago	234	28.9
Cannot remember	22	2.8
Total	810	100.0
What measure did you take for diarrhoea treatment		
Fed packet saline	405	50.0
Medicine	176	21.7
Medicine and oral saline	229	28.3
Total	810	100.0

4.1.11 Source of Water of the Ethnic people:

Tubewells /tap water is the most common source of drinking water. Distribution of ethnic people by their source of drinking water is presentend in Table-11. It has been observed that 70.5% ethnic people receive drinking water from Tube well/tape and 29.5% from Well. Out of the total ethnic people, 17.4% people were found to have own source of drinking water, 37.3% receive from Govt/NGO, 29.0% from other sources and 16.3% from natural falls. It was also revealed that 61.7% respondents use Tube well/Tap water for cooking and washing purpose, while 21.6% use water from Wells, 8.8% from Pond/ditch and 7.95 from River/cannel for the same purposes. In the NHDSBD – 2011, revealed that nationally 94.4 % household use tubewell / tap water as drinking purpose and 75.9% household use tubewell / tap water as cooking and washing purposes. In the NHDSBD – 2011 revealed that nationally 94.4 % household use tubewell / tap water as drinking purpose and 75.9% household use tubewell / tap water as cooking washing purpose .

Table 11: Distribution of ethnic households of study area by their sources of water.

Items	No. of respondents	% of responded
Where do you get drinking water		
Tube well/tape	571	70.5
Well	239	29.5
Total	810	100.0
Who is the owner of drinking water source		
Own	141	17.4
Govt./NGO	302	37.3
From others	235	29.0
Natural falls	132	16.2
Total	810	100.0
What source of water do you use for cooking and washing		
Tube well / tap	500	61.7
Well	176	21.7
Pond/ditch	71	8.8
River/canel	63	7.9
Total	810	100.0

4.1.12 Weekly Food Intake Pattern:

Table-12 describes the weekly food intake pattern of the ethnic households. It was found that 95.3% family members use to eat rice in the morning, followed by 100% in the midday and 13% at night. None was found to eat bread at any time of the day. Ninety seven percent households consume leafy vegetables at least once in a week in the morning followed by 85.3% in 1-3 days in a week, 11% in 4-5 days in a week in the morning. Sixty eight percent households consume leafy vegetables at least once in a week in the mid day, 46% in 1-3 days in a week and 50% in 4-5 days in a week. Hundred percent households consume fruits, pulses, fish, milk, eggs and meat 1-3 days in a week.

Table 12: Weekly food intake pattern of Ethnic people by food groups (N=810):

Food time/ Food Groups	Consume at least once in a week		Consume number of days in a week					
			1 – 3 days in a week		4 – 5 days in a week		6-7 days in a week	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Morning								
Rice	794	98.02	11	1.4	11	1.4	772	95.3
Wheat/Bread	-	-	-	-	-	-	-	-
Leafy vegetables	783	97.2	691	85.3	90	11.11	-	-
Other vegetables	794	98.6	193	24.3	352	44.3	249	31.4
Fruits	170	21.1	170	100	-	-	-	-
Pulses	306	38	306	100	-	-	-	-
Fish	385	47.9	385	100	-	-	-	-
Meat	170	21.1	170	100	-	-	-	-
Egg	273	33.8	273	100	-	-	-	-
Milk	11	1.4	11	100	-	-	--	-
Milk Prod.	-	-	-	-	-	-	-	-
Mid day								
Rice	501	98.6	-	-	-	-	794	100
Wheat/Bread	-	-	-	-	-	-	-	-
Leafy vegetables	343	67.6	157	45.8	273	50.0	22	4.2
Other vegetables	794	98.6	115	22.9	363	45.7	249	31.4
Fruits	328	40.8	200	96.6	11	3.4	-	-
Pulses	261	32.4	165	100	-	-	-	-
Fish	567	70.4	358	100	-	-	-	-
Meat	147	18.3	93	100	-	-	-	-
Egg	284	35.2	179	100	-	-	-	-
Milk	-	-	-	-	-	-	-	-
Milk Prod.	-	-	-	-	-	-	-	-
Night							0	
Rice	702	87.3	32	51.6	249	35.4	92	13.0
Wheat/Bread	-	-	-	-	-	-	-	-
Leafy vegetables	783	42.61	40	58.0	238	30.4	89	11.6
Other vegetables	805	100	18	25.3	442	54.9	160	19.8
Fruits	249	31	22	100	-	-	-	-
Pulses	261	32.4	23	100	-	-	-	-
Fish	691	85.9	61	100	-	-	-	-
Meat	352	43.7	31	100	-	-	-	-
Egg	90	11.3	8	100	-	-	-	-
Milk	-	-	-	-	-	-	-	-
Milk Prod.	-	-	-	-	-	-	-	-

Table-13 depicts the per capita per day intake of some important nutrients by the ethnic people under study. It has been observed that the households in the study areas had a nutrient intake higher than the recommended intake per capita per day. The per capita per day consumption of nutrients was estimated as: energy 2510 Kcal, protein 77.2 g, fat 37.55 g, iron 28.4 mg and calcium 864.15 mg. It was found that the estimated per capita intake of energy, protein, iron and calcium is higher than the recently revised and updated recommended dietary allowances proposed by the ICMR, 2010. In HIES 2010, the average calorie intake was estimated to be 2318.3 kcal per capita per day. In the NHDSBD – 2011, per capita per day calorie consumption is the highest in CHT for both sexes (male 2654.6 kcal per capita per day and female 2414.0 kcal per capita per day).

In the NHDSBD-2011, per capita per day protein, fat, iron and calcium intake in CHT is estimated as 85.5 g, 39.2 g, 30.6 mg and 873.5 mg respectively (Akhtaruzzaman et al; 2013).

4.1.13 Per capita per day calorie and other important nutrients intake:

Table 13: Per capita per day calorie and other important nutrients intake by the study people:

Nutrients	Male	Female	Total
Energy (Kcal)	2640	2380	2510
Protein (g)	78.1	76.3	77.2
Fat (g)	36.2	38.9	37.55
Iron (mg)	31.5	25.3	28.4
Calcium (mg)	881.2	847.1	864.15

4.1.14 Nutrition Status of U5 Children:

The Nutrition status of Children (aged <5 years) is the reflection of their health status. Well-nourished children perform better in school, grow into healthier adults and are able to give their own children a better start in life. Malnourished children are at high risk of morbidity & mortality. Malnutrition during early childhood impacts on mental development and learning ability later in life.

Table-14 shows that the nutritional status of children aged (< 5 yrs) by wasting (weight for height) indicators and sex. The prevalence of mild and moderate wasting is about 16.05 % in both boys and girls and the prevalence is higher (16.2%) in boys than the girls (15.9%). Overall 11% children are found severely wasted, whereas percentage of severity prevails among the girls than the boys of the same age. About 73.35 % children are found normal.

Table 14: Percent Distribution of malnourished children (aged ≤ 5 years) by anthropometric indicators (Z-scores) :

Z-score cut off point	Boys	Girls	Total
Severe ($Z < -3sd$)	9.9	11.3	10.6
Mild and Moderate ($-3sd \leq Z < -2sd$)	16.2	15.9	16.05
Normal ($-2sd \leq Z \leq +2sd$)	73.9	72.8	73.35
Total	100	100	100

4.1.15 Nutritional Status of adolescents:

Who identifies adolescence as the period in human growth and development that occurs after childhood and before adulthood that is from ages of 10 -19 years. It represents one of the critical transitions in the life span and is characterized by a tremendous pace in growth and change. Total nutrient needs are higher during adolescence than any other time in the life cycle. In the present study, nutritional status of adolescent girls and boys are measured by anthropometric indicator that is height for age (stunting). Height for age represents a measure of the long term effects of malnutrition in a group of population. It does not vary significantly with the change of the season of data collection.

Table-15 shows the distribution of malnourished adolescent (aged 10 – 19 years) by anthropometric indicators (Z-scores). It has been found that adolescent boys aged 10-19 years were more severely malnourished than the girls of the same age. But the ranges of mild and moderate malnutrition among the girls were a little bit higher than the boys. About 55.7% boys were found normal and while the value was 58% for the girls. So, in the study area, it was found that the nutritional status of girls aged 10-19 years are better than the boys of the same age.

Table 15: Percent Distribution of malnourished adolescent (aged 10 – 19 years) by anthropometric indicators (Z-scores)

Z-score cut off point	Boys	Girls	Total
Severe ($Z < -3sd$)	16.2	12.3	14.26
Mild and Moderate ($-3sd \leq Z < -2sd$)	28.1	29.7	28.9
Normal ($-2sd \leq Z \leq +2sd$)	55.7	58.0	56.85
Total	100	100	100

4.1.16 Nutritional Status of Adults :

Age range 15 to 49 years is commonly considered as reproductive age (WHO , 2006). **Table -16** shows the nutritional status of the household members of both sexes aged 15 to 49 years. It was found that the nutritional status of female (based on BMI) is better than the male of the same age. The percentage of normal BMI was found to be higher among the female as compare to that among the males. About 32.5 % male and 23. 9 % female are suffering from chronic energy deficiency or thinness (BMI <18.5), while 17.7% male and 10.9% female are overweight or obese (BMI > 25).

Nutritional status of this age group varies significantly due to the difference in sex. Male are more likely to be under- nourished or thin than the female. The percentage of overweight and / or obese is significantly higher in male compare to the female.

Table-16 depicts the percent distribution of malnourished people aged 15 to ≤ 49 years) by anthropometric indicators (BMI Z-scores). Percent of male (32.5 %) having low BMI-less than 18.5 (thin) was higher than that of female (23.9%). Percent of female (64.2%) having normal BMI (18.5 – 24.99) was found to be higher than that male (49.8%). Percent of over weight (BMI ≥ 25) was found to be higher among the male (17.7%) compared to that among the female (10.9%). It is, therefore, indicated that nutritional status of female (aged 15 to ≤ 49 years) is better than that of the male of the same age group.

Table 16: Percent Distribution of malnourished people (aged 15 to ≤49 years) by anthropometric indicators (Z-scores):

BMI Cut off point	Male	Female	All
Thin (< 18.5)	32.5	23.9	28.2
Normal (18.5 – 24.99)	49.8	64.2	57.4
Over weight (≥ 25)	17.7	10.9	14.4
Total	100	100	100

4.1.17 Cultivable land use pattern among the Ethnic people:

Bangladesh is mainly called an agricultural country. Most of the people of this country are directly or indirectly involved in agriculture. This sector has significant role to play in employment generation, poverty alleviation, human resources development and nutrition and food security. The Gross Domestic Product (GDP), share of agriculture is around 22% and this section employs 48 % of labor force (BBS, 2010). The major products are various types of cereals, pulses, oilseeds, vegetables, fruits, cash-crops and spices.

Compared to the rest of Bangladesh there is huge diversity in type of land, ownership of land, unit of measurement and management of land in the CHT. Almost all household in CHT (93%) irrespective of their ethnic identity own land (2009 UNDP report on Socio-economic Base line survey of the Chittagong Hill Tracts). There are three major type of land ownership a) Individual registered ownership, b) traditional ownership (recorded or non-recorded with Headmen) under usufruct rights and c) usufruct rights to ownership of Common Property Resources. When looking into land ownership in CHT it has to be noted that both registered ownership and traditional customary ownership (recorded and non recorded ownership) has to be taken into account. In Bangladesh an average rural household owns 235 decimals of land (Inclusive of Common Property Resources) and in CHT tribal/ethnic people, on average, own 318 decimals of land and Bangalees own 132 decimals of land on average. Essentially, there are two major types of crop agriculture land in CHT: a) Plough and b) Jhum land.

It is estimated that tribal/ethnic people owned more jhum land than Bangalees. UNDP report (2009) indicates that there is roughly 364,000 acres of land available for cultivation out of which 73,000 acres (20%) are under plough cultivation. 99,000 acres (27%) is available for jhum and

66,000 acres (18%) of land is used as homestead. In case of tribal/ethnic communities most of the land falls under traditional customary property; however most of the properties are owned by Bangalees and a small proportion 21% of tribal/ethnic people have, in the modern sense, registered their property (Alom et al; 2010).

Table - 17 shows the cultivated land use pattern among the ethnic people under study in the CHT of BD. In the study areas, out of 810 ethnic households, 217 households (26.9%) were engaged in agriculture. It was also observed that 56% households use to harvest single crop, 26% households use to harvest double crops and 11% households use to harvest triple crops in a year, while 7% households use to practice traditional jhum cultivation.

According to Social Economic Baseline Survey commissioned by UNDP, 2009, nearly two thirds of rural households in CHT rely on farming as their primary income. Of these, 55% are involved exclusively in field cropping, 30% are involved in Jum and 15% are involved in both field and Jum agriculture. More than 35 different crops are cultivated in the CHT. However the major crops in the region are limited to 7 types which include rice, turmeric, ginger, chilli, yam, upland rice and banana. Of the major crops, over 60% of rural households produce rice, 19% households produce turmeric and 11% produce ginger.

Table 17: Cultivable land use pattern among the Ethnic people who are involved in cultivation.

No. of crop harvested in a year	No. of households	Percent of households
Single cropped	120	56
Double cropped	57	26
Triple cropped	24	11
Jhum cultivation	16	7
Total	217	100

4.1.18 Food items consumed by both general and ethnic people:

Food items consumed by only ethnic people and also by both general and ethnic people are depicted in Tables-18 to 19. In the Comprehensive Food Consumption Survey (CFCS) it is indicated that ethnic people consume about 46 food items, most of which are also consumed by the general people; therefore, these foods are not absolutely ethnic in nature. To explore the true ethnic foods, the Focus Group Discussion (FGDs) was conducted among the ethnic communities. FGDs has revealed that aboutt 47 foods comprising leafy vegetables, non-leafy vegetables, fruits, fishes and meats of wild origin are consumed by the ethnic people such as shaontal, Tanchanga, Chakma and Tripura.

Table 18: Food items consumed by only ethnic households

Sl. no	English name	Bengali/Local name	Scientific name
CEREALS			
1	Rice parboiled (Bri29)	Sidhoy chal	<i>Oryza sativa</i>
2	Lentil (deshi)	Masur dal	<i>Lens culinaris</i>
LEAFY VEGETABLES			
3	Joseph's Coat	Lalshak	<i>Amaranthus gangeticus</i>
4	Bottle Gourd	Lau shak	<i>Lagenaria siceraria</i>
5	Indian spinach	Pui shak	<i>Basella alba</i>
6	Radish	Mula shak	<i>Raphanus sativus</i>
7	Spinach	Palong sag	<i>Spinacea oleracea</i>
8	Coco-yam	Sobuj kochu shak	<i>Colocasia esculenta</i>
9	Bathua	Pigweed	<i>Chenopodium album</i>
ROOTS & TUBERS			
10	Potato	Gol Alu	<i>Solanum tuberosum</i>
11	Radish	Mula	<i>Raphanus sativus</i>
12	Coco-yam	Sobuj kochu	<i>Colocasia esculenta</i>
NON-LEAFY VEGETABLES			
13	Egg plant	Begun	<i>Solanum melongena</i>
14	Bean	Shim	<i>Dolichos lablab</i>
15	Cabbage	Badha Kopi	<i>Brassica oleracea var. Capitata</i>
16	Cauliflower	Foolkopi	<i>Brassica oleracea var. Botrytis</i>
17	Cow pea	Borboti	<i>Vigna catjang</i>
18	Cucumber	Shasha	<i>Cucumis sativus</i>
19	Folwal	Potol	<i>Trichosanthes dioica</i>
20	Gourd (Ash)	Chal kumra	<i>Benincasa cerifera</i>
21	Bitter Gourd	Karola	<i>Momordica charantia</i>
22	Sweet pumpkin	Misti kumra	<i>Cucurbita maxima</i>
23	Kakrol	Kakrol	<i>Momordica cochinchinensis</i>
24	Ladies finger	Dherosh	<i>Abelmoschus esculentus</i>
25	Bottle gourd	Lau	<i>Lagenaria siceraria</i>
26	Snake gourd	Chichinga	<i>Trichosanthes anguina</i>
27	Jackfruit (immature)	Kacha kathal	<i>Artocarpus heterophyllus</i>
28	Green papaya	Kacha papay	<i>Carica papaya</i>
29	Plantain (green)	Kacha kola	<i>Musa paradisiacal</i>
30	Tomato (green)	Kacha tomato	<i>Lycopersicon lycopersicum</i>
31	Yam Stem	Kachur data/loti	<i>Colocasia esculenta</i>
FRUITS			
32	Mango ripe(deshe)	Paka Am	<i>Mangifera indica</i>
33	Black berry (deshe)	Kalojam	<i>Syzygium cumini</i>
34	Jackfruit (ripe)	Paka Kathal	<i>Artocarpus heterophyllus</i>
35	Banana (ripe)	Paka kala	<i>Musa sapientum</i>
36	Bitter Plum	Boroi	<i>Zizyphus mauritiana</i>
37	Pine Apple (Jaldugi)	Anarash (Jaldugi)	<i>Ananas comosus</i>
38	Tomato (ripe)	Tomato paka	<i>Lycopersicon lycopersicum</i>
FISH			
39	Carp	Katol mach	<i>Labeo rohita</i>
40	Tilapia	Tilapia mach	<i>Anabus testudineus</i>
41	Dragon Fish	Pangash	<i>Pangasius pangasius</i>
42	Fry (very small)	Choto puti	<i>Puntius ticho</i>
43	Sunfish	Mola mach	<i>Mola mola</i>
44	Shrimp(dry)	Chingri (shukna)	<i>Heterocarpus ensifer</i>
45	Rohu	Rui	<i>Labeo ruhita</i>
46	Shrimp	Chingri	<i>Heterocarpus ensifer</i>

Table 19: FGD outcome: Food consumption pattern of the *Marma, Chakma, Tanchanga and Tripura*

Sl no	English name	Bengali name	Scientific name	Sl no	English name	Bengali name	Scientific name
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communities

	LEAFY VEGETABLE			25	Na	Banchalta*	Na
1	Rashun Leaves	Rashun shak	Na	26	Na	Fakong	Na
2	Dheki leaves	Dheki shak	Na	27	Na	Hahnagulu	Na
3	Jarul	Khambang	Na	28	Yam	Pan/jhum alu*	Na
4	Dumurshomi Leaves	Dumurshumi shak	Na		FRUITS		
5	Seneya Leaves	Seneha shak	Na	29	Pamelo (red)	Jambura (Lal)	Na
6	Lelom Leaves	Lelom shak	Na	30	Pineapple (wild)	Anarash (bonno)	Na
7	Na	Sabarang*	<i>Ajuga macrosperma</i>	31	Wild Melon	Sindera*	<i>Cumis melo</i>
8	Roselle	Amila pata*	<i>Hibiscus sabdariffa</i>	32	Na	Roshko*	<i>Syzygium balsameum</i>
9	Na	Lalam pata*	<i>Premna obtusifolia</i>	33	Bead tree	kusumgulu*	<i>Elaeocarpus angustifolius</i>
10	Indian Ivy-rue	Baruna Shak*	<i>Xanthoxylum rhetsa</i>		FISH AND MEAT		
11	Na	Ojan shak*	<i>Spilanthes calva</i>	34	Lota Fish	Lota mach	Na
12	Na	Ghanda batali*	<i>Paederia foetida</i>	35	Churi Fish (Dried)	Churi mach	Na
13	Na	Orai balai	<i>Premna esculenta</i>	36	Nappi paste	Nappi	Na
14	Purslane	Bat slai*	<i>Portulaca oleracea</i>	37	Zhinuk	Shell	<i>Mollusk shell</i>
15	Yellow saraca	Maytraba	<i>Saraca thaipingensis</i>	38	Crabs	Kakra	<i>Liocarcinus vernalis</i>
16	Yellow Flower	Holud fool	Na	39	Shark	Hangar	<i>Carcharhinus amblyrhynchos</i>
17	Ginger Flower	Ada shak	Na	40	Shark (dried)	Hangar shutki	<i>Carcharhinus amblyrhynchos</i>
18	Sime Flower	Sime fool	Na	41	Kuchia fish	Kuchia	<i>Monopterus cuchia</i>
	NON –LEAFY VEGETABLES			42	Snails (small)	Shamuk (choto)	<i>Helix pomatia</i>
19	Pea eggplant	Mistti begun*	<i>Solanum spinosa</i>	43	Snails (large)	Shamuk (Boro)	<i>Helix pomati</i>
20	Solanum	Tak begun*	<i>Solanum virginianum</i>	44	Rat	Idur	<i>Rattus norvegicus</i>
21	Sigon data	Sigon data*	<i>Lasia spinosa</i>	45	Frog	Beng	<i>Litoria caerulea</i>
22	Tara (Like Kochu data)	Tara data	Na	46	Na	Gobar poka	Na
23	Basher Korol	Basher korol	Na	47	Pork	Shukurer mangsha	<i>Sus scrofa domestica</i>
24	Wild mushroom	Edur kan	Na				

CHAPTER 5: Conclusion and Suggested Policy Recommendations.

The present study provides a brief representation on agricultural cropping pattern among the ethnic people of Chittagong Hill Tracts. It also provides an insight into their life style, food security, health and nutrition.

Education has not yet reached every household member in the study area. It is notable that illiteracy rate remain to be in a range of 27-78 % with the Marma having the highest (78.9 %) and the Tripura having the lowest (27%) illiteracy rate. Therefore, illiteracy among the ethnic people is seemings one of the barriers of socio economic and other aspects of development.

Main occupation of different tribal people such as Chakma, Marma, Shaontal, Tanchanga was found to be agriculture. Moreover none among the Marma was found to be engaged in service. It may be due to their lower education level as marked by their highest rate of illiteracy.

As regards age, most of the respondents among ethnic people were found to belong to age group 30-45 years, which indicates that majority of the study population was relatively young, giving rise to a demographically favourable condition for development to take place in future.

Most of the tribal people's monthly income is quite meagre, which is below Tk. 5000 followed by lower proportion of people having monthly income Tk. 5001-8000 and above. Family expenditure was highest among Tripura followed by Chakma, Tanchanga, Marma and Shaontal. Higher family expenditure among Tripura may be attributed to the higher level of their involvement in service, which provides a sort of cash income.

Food preparation technique of the ethnic people was not found scientific. Most of the households (59%) did not use oil during cooking. Most of the households (56.7%) threw away rice gruel after cooking, only 3.3% households fed it to their children and 40% households kept starch/gruel with rice while they cooked rice. It was noted that indigenous households often cut the vegetables first and then wash. This is due to their long practiced customary preference. They are unaware of the fact that there is greater loss of vitamins when the vegetables are cut and then washed.

In present study, it has been revealed that 4.6% family members did not ever receive balanced diet, while 37.8% family members did always receive balanced diet and about 57.7% family members received balanced diet only occasionally. Gastric problem is the most common diseases in CHT.

The other non- communicable diseases such as asthma, diabetic, heart disease and kidney disease cause most of the deaths in the study areas.

The housing condition of the ethnic people was found to be very poor. Most of the ethnic people (38.5%) own straw-shed with bamboo/straw fence house. It was also observed that majority of the ethnic people did not follow proper sanitary practices. Moreover, it was found that 70.5% ethnic people receive drinking water from Tube well/tape and 29.5% from Well.

It is quite encouraging to observe that the nutrient intake of households in the study areas is higher than the recommended intake per capita per day. The per capita per day consumption of nutrients was found to be energy- 2510 Kcal, protein- 77.2 g, fat- 37.6 g, iron- 28.4 mg and calcium- 864.2 mg. The estimated per capita per day intake of energy, protein, iron and calcium was higher than the recently revised and updated recommended dietary allowances proposed by the ICMR, 2010.

About 10.6% children (five years old or less than five years) were found to be severely malnourished and 16.05% were found mild and moderately malnourished and 73.35% children were found normal. It was also found that percentage of severe malnutrition among adolescent boys aged 10-19 years was higher than that of the adolescent girls of same age. But the percentage of mild and moderate malnutrition was a little bit higher among girls than the boys.. About 55.7% boys were found normal, while the figure is 58% for girls. So, in the study areas, the nutritional status of girls aged 10-19 years is better than the boys of the same age group..

In the study areas, out of 810 ethnic households, 217 households (26.9%) were engaged in agriculture. It was also observed that 56% households use to harvest single crop, 26% households use to harvest double crops and 11% households use to harvest triple crops in a year, while only 7% households use to practice traditional jhum cultivation.

The study revealed that indigenous households generally use upland, plain land and homestead area for crop production. The cultivation practice in upland is locally called jhum cultivation. Upland is mainly used for producing seasonal indigenous crops, vegetables, fruits and different forest trees. T. Aman and Boro rice are grown mainly on plain land or valley land. Homestead areas are also used for producing different types of vegetables, fruits and timber trees. It has been observed that different types of crops are grown as mixed under jhum cultivation. The other sources of household incomes are non-farm activities, livestock rearing, and other sales like bamboo, wood, timber, sweeping material, etc. Both income and expenditure are higher than the national average.

Farm supplied foods are limited for household consumption because they are sold immediately after harvest. The households are largely dependent on purchased food. Assistance from government or other source is limited. Households have to depend largely on indigenous vegetables and wild animals which are not generally transacted in the market. The purchasing power of the ethnic households is in general poor. They have limited options and alternatives for income generation. They are compelled to go under imperfect market situation and prices of output are distorted. In many events they have to comply with complicated procedure in marketing their timber products. Especially in marketing fruits they have to pay taxes and levies to different authorities and places. They also have to pay bribe in transferring farm products from one place to another. These entire situations lead to a lower price in the product market and higher price in the consumer market, further reducing their real income and purchasing power.

Indigenous households' consumption behavior revealed that household members generally eat 46 items of foods such as rice, fresh fish, dry fish, meat, vegetables, potato, fruits, spices, egg, milk, and gur or mollases etc. In the CFCS it is indicated that ethnic people consume about 46 food items, most of which are also consumed by the general people; therefore, these foods are not absolutely ethnic in nature. To explore the true ethnic foods, the FGDs were conducted among the ethnic communities. FGDs revealed that about 47 items of foods comprising leafy vegetables, non-leafy vegetables, fruits, fishes and meats of wild origin are consumed by the ethnic peoples. It was found that 97.2% family members use to eat rice in the morning, followed by 100% in the mid-day and 13% at night. Nobody was found who ate bread at any time of the day. Ninety seven percent households consume leafy vegetables at least once in a week in the morning, followed by 88% eating 1-3 days in a week, 12% eating 4-5 days in a week in the morning. Sixty eight percent households consume leafy vegetables at least once in a week in the mid day, 46% consumed 1-3 days in a week and 50% consumed 4-5 days in a week. Hundred percent households consumed fruits, pulses, fish, milk, eggs and meat 1-3 days in a week.

Based on caloric intake, the ethnic households can be regard as food secure since their per capita per day caloric intake is 2510 Kcal which is much higher than the minimum per capita requirement of 2400 Kcal (ICMR, 2010) and also higher than the average per capita per day calorie intake estimated as 2318.3 Kcal (HIES, 2010, BBS). However, food insecurity among the study people was persisted due to poverty and due to low production of crop. The reason for this assertion is that the food insecure households sold more of their crop output to meet their essential household requirements.

It has also been observed that both food secure and insecure households derived the lion share of their calorie, protein and iron from rice followed by vegetables, fresh fish and dry fish.

The hilly people faced several risk factors and constraints in improving their livelihood. These factors include lack of modern technology, high price of inputs, lack of organized output market, undefined land ownership, crop damage by wild pig and rat reduction of land productivity and natural calamities. They identified some other problems related to their livelihood. These problems are low price of their output, scarcity of cultivable hillocks, scarcity of inputs and quarrel among the villagers for the possession of hillocks .

Households in the hilly areas usually meet the stress situation in their own way. They sell labour during various kinds of stress situation which is followed by use of previous savings, borrowed money, selling of livestock, poultry and fruits and bamboo/ fuel/ wood/ timber. They have little option to face the emergency situation with little savings.

Life style, food security, health and nutritional status of the ethnic people are greatly influenced by their agricultural cropping pattern. So, further efforts should be continued for the promotion and sustainable crop production in the hilly areas of Bangladesh. The hill farmers have limited knowledge about post harvest processing of fruits and vegetables. For his reason, a number of products get lost before marketing. So, post-harvest technology program for horticultural crops should be introduced in the hilly areas. The government should take necessary initiatives to set up agro- processing industries in Rangamati Sador which is the middle place of CHT. Jhum farming cannot be suddenly discontinued. In this situation, jhum cultivation should be modernized through replacing jhum crops with modern crop varieties suitable for hill farming.

Suggested Policy Recommendations :

Based on the findings under study, the following policy recommendations are being made to improve crop production system, food consumption level, livelihood pattern and coping strategies of ethnic households in various stress situations.

- The soil conservation technology named Multy Strata Fruit Orchard (MSFO) has been found profitable and could have the potential to improve livelihood of the hill people. The adoption of this technology is capital intensive. So, the government would need to make provisions for adequate capital aid and monitoring mechanisms for successful implementation of this technology
- The availability of production inputs like seed, fertilizers, irrigation and insecticides are important for higher production. Therefore, the government should provide HYV seed to the hill farmers through its agencies.
- Fertilizer use has significant positive impact on crop production as well as in reducing food insecurity among ethnic households. Therefore, fertilizer use should be encouraged among jhum farmers.
- Modern storage facilities should be developed at grass root levels to ensure their product prices and food security.
- Adequate transport facilities should be developed to market their agriculture products in distant markets.
- In different stress situations, indigenous hill people remained helpless and survive on their small savings, livestock, and other irregular non-farm and off-farm activities. Therefore, the government should establish cottage industries for the indigenous people.
- The wise management of soil, water and nutrient is vital for increasing food production and ameliorating the land degradation, leading to a sustainable production system. The management of soil organic matter is very important aspect for sustainable agriculture. So, wise management of soil, water and nutrient should be ensured.
- Establishment of hill farming technologies developed by Hill Agricultural Research Stations should be encouraged.

- The people of Panchari Upazila under Khagrachari District benefitted in many ways after construction of rubber dam at Panchari. So, integrated hill farming model should be adopted in the study areas

- The climate and environment of the CHT make it suitable for production of a variety of vegetables, fruits, spices and bamboo/timber products, which have a ready and attractive market potential in Bangladesh. So, co-operative marketing system should be developed

- Most of the farm communities / farm villages are far away from the main roads and in the interior of the hills , where there is no well developed communication system These communities have little access to researchers, extension workers and information sources. Farmers in those remote villages have difficulty in accessing markets, health and educational facilities as well as sustainable agricultural technologies. So, communication and transportation facilities should be developed.

- The hill farmers have limited knowledge about post harvest processing of fruits and vegetables. For his reason a number of products get lost before marketing . So, post-harvest technology program for horticulture crops should be introduced in hilly areas. BIRTAN(Bangladesh Institute of Research and Training on Applied Nutrition) should take initiatives to train the tribal people through the training program on quality processing and preservation of agro-products.

- The Hill Farming Systems has no coordinated database. A number of organizations have put together their own databases using a variety of sources but these lists are not comprehensive. However, databases need to be kept up to date and an actively managed database would be helpful for the purpose of communicating with hill farmers. Therefore, database of hill farms must be ensured.

- Government should take necessary steps to gradually reduce jhum cultivation through replacing alternative technology suitable for upland cultivation .

- Jhum farming cannot br suddenly discontinued. In this situation jhum cultivation should be modernized through replacing jhum crops with modern crop varieties suitable for hill farming .

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