

Identifying Livelihood Patterns of Ethnic Minorities and their Coping Strategies Different Vulnerabilities Situation in Chittagong Hill Tracts Region, Bangladesh

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Abbreviations and Acronyms

| | |
|--------|--|
| ADB | Asian Development Bank |
| BARI | Bangladesh Agricultural Research Institute |
| BRRI | Bangladesh Rice Research Institute |
| BBS | Bangladesh Bureau of Statistics |
| CHT | Chittagong Hill Tracts |
| CI | Corrugated Iron |
| CSI | Consumption Coping Strategies |
| DAE | Department of Agricultural Extension |
| FAO | Food and Agricultural Organization |
| GO | Government Organization |
| gm | Gram |
| Govt. | Government |
| ha | Hectare |
| hh | Household |
| HEIS | Household Income and Expenditure Survey |
| ILO | International Labour Organizations |
| K. cal | Kilo Calorie |
| ml | Milliliters |
| NARS | National Agricultural Research System |
| NGO | Non-Government Organization |
| NA | Not Applicable |
| SSNP | Social Safety Net Program |
| Stdev | Standard Deviation |
| SSAO | Sub-Assistant Agriculture Officer |
| VGD | Vulnerable Group Development |
| VGf | Vulnerable Group Feeding |
| WB | World Bank |

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Executive Summary

Introduction: Chittagong Hill Tracts is the home of 13 ethnic minorities possessing distinct cultures and life styles. The ethnic communities are *Chakma, Marma, Tripura, Tangchangya, Bawm, Murong (Mro), Khumi, Chhak, Pankhoa, Kuki, Khyang, Lushai and Sautal*. They are ethnically different from the settled populace in Bangladesh. The highest population belong to the Chakma (43.35%), followed by the Marma (25.77%) and the Tripura (13.58%). They are generally very poor and illiterate and suffering from food insecurity. Therefore, assessing livelihood pattern, household level food security and coping strategies during vulnerable situations are important for policy formulation. The study covered detailed information on livelihood pattern, food security, nutritional status, vulnerabilities and coping strategies during stress situations of the rural ethnic and non-ethnic households in CHT. The study also examined the effect of key factors on household food security in hilly areas.

Methodology: The study included three hill districts namely Bandarban, Khagrachri and Rangamati. A multi-stage sampling technique was followed for selecting the study areas. After selecting three hill districts, one Upazila from each district was selected purposively considering the type of ethnic minorities and their livelihood systems. A total of 25 villages/paras were randomly selected taking 16 villages/paras from Bandarban, 5 villages/paras from Khagrachari, and the remaining 4 villages/paras from Rangamati for this study. Out of 13 ethnic groups, six dominant ethnic minorities namely Chakma, Marma, Tanchangya, Tripura, Murong and Bawm were selected for this study. From Bandarban all these six types of ethnic minorities were selected for primary data collection. As all ethnic groups were not living in all hill districts, the selected type of ethnic groups varied among districts. Besides, non-ethnic settlers (Bengali) were also selected to have an idea about their livelihood pattern in all hill districts. Fisher's measure of skewness was used for determining the number of samples in each district. Proportionate random sampling technique was adopted for selecting sample size in each ethnic group under different districts. The proportionate sampling was done considering the minimum number 30 samples which are needed for any statistical analysis in each ethnic group. The randomization was done to select individual households using UNICEF Pencil Spin method. For non-ethnic group 30 samples from each district was chosen randomly. In this process a total of 517 rural households were selected for the study where 427 households were ethnic and 90 were non-ethnic. Descriptive statistics such as mean, percent and standard deviation were used to analyze data as per requirement. In order to justify the mean differences among and between the groups and location, one way ANOVA and t-statistics was used. A livelihood frame work analysis was done for assessing vulnerabilities in the study areas. Coping Strategies Index (CSI) was used to measure the food insecurity of the ethnic families. In order to examine the key factors on calorie security, Cobb-Douglas calorie intake model was employed.

Livelihood pattern: The highest percent of ethnic households (28.5%) belonged to 1.0–1.99 ha farm size followed by 0–0.49 ha farm size. The highest percent of non-ethnic households (72.22%) belonged to 0–0.49 ha farm size group followed by 0.5–0.99 ha farm size. It was also revealed that most of the non-ethnic households were landless in Bandarban and Rangamati hill district. Absentee land owner, owner cultivator, sharecropper, tenant and landless households were found in the study areas. The highest percent of ethnic households (78.2%) was owner cultivator while most of the non-ethnic (72.2%) settlers were landless. In the landless category of ethnic households, the highest percent of landless was found in Rangamati with Marma (88.6%) followed by Tanchanga (25.7%) in Bandarban. Among the non-ethnic settlers, 96.7% at Rangamati and 20.0% at Khagrachari were landless. On the basis of cereal sufficiency, the ethnic households were classified as upper, medium and lower sufficiency groups. It was found that the highest percent of households (56.5%) belonged to lower cereal sufficiency groups followed by medium cereal sufficiency groups. In the case of non-ethnic settlers 81.1% households belonged to lower cereal sufficiency group. The highest percentage of households depends on *Jhum* cultivation for livelihood in Bandarban, plain

land agriculture in Khagrachari and poultry rearing in Rangamati. Livestock and fruit gardening were also important on-farm activities for the farmers in all the three districts. In the case of off-farm activities, the highest percentages of households were dependent on wage earnings for their livelihood. Weaving and selling of fuel wood were found to be important sources of livelihood in the CHT. It is observed that on an average household size were 5.10 persons for ethnic and 5.39 persons for non-ethnic group. The household size was much higher in Bandarban district and lower in Rangamati for both ethnic and non-ethnic community. The differences in household size between ethnic and non-ethnic groups were not significant but significant differences was found among the ethnic groups in all locations. About 22% of the ethnic household family members received agriculture related training during the last three years, while it was only 3% for non-ethnic households. The differences in training received between the ethnic groups and the ethnic and non-ethnic settlers were found statistically highly significant in the CHT. The average land size for ethnic and non-ethnic households were estimated at 1.34 and 0.44 ha per household respectively. The differences in farm size between ethnic groups were found statistically highly significant in Bandarban and Rangamati but not significant in Khagrachari. On the other hand, this difference in between the ethnic and non-ethnic groups in Rangamati was found statistically highly significant but in other two districts these were not statistically significant. Most of the ethnic minorities were found to live in *Jhupri* type house (58.8%) followed by *Kacha* house (33.7%). For non-ethnic settlers 64.4% households live in *Jhupri* type house and 30.0% households in *Kacha* houses. But these differences were not found statistically significant in between ethnic and non-ethnic in the CHT.

Livelihood capitals: Ethnic minorities have four types of livelihood capitals: human, natural, physical and financial. The average number of pig, goats, cows, hen and duck per farm was found to be 0.8, 0.7, 0.9, 6.9 and 0.5 for ethnic households and the corresponding figures for non-ethnic households were 0, 0.5, 1.3, 3.8 and 0.2 respectively. The number of poultry was significantly higher for ethnics compared to non-ethnics. The reverse situation was observed for cows. It was found that 31.14% ethnic and 38.89% non-ethnic households had mobile phone; 29.87% ethnic and 26.66% non-ethnic had television set; and 14.47% ethnic and 6.66% non-ethnic households had radio set. The differences in owning radio between the ethnic and non-ethnic groups were found statistically significant ($p < .008$) but other modern amenities owned by the households did not vary significantly among the groups and locations. The average number of fruit trees per farm for ethnic minorities was recorded as 40 for mango, 16 for jackfruit, 95 for banana, 2 for pomelo, 15 for papaya, 8 for orange, 7 for litchi and 3 for guava. For non-ethnic households it was less in all the study areas compared to ethnic households. The average number of timber trees per farm for ethnic households was recorded as 215 for segun, 67 for gamar/koroi and 10 for mahogany. Number of garjan trees was very few and non-ethnic settlers generally owned very low number of timber trees. It was revealed that average annual income of the ethnic households in Bandarban was Tk.50,464 which came from different sources like *Jhum* farming, fruit gardening, day labourer, livestock rearing, weaving, service etc. On the other hand, average annual income of the ethnic households in Khagrachari was Tk.53306 which came from different sources like plain land agriculture, day labourer, and agriculture in plain land. In Rangamati, the average annual income of the ethnic households was Tk.45309 which came from different sources like day labour, petty business, service, fruit gardening, livestock rearing, weaving etc. On average, a major part of the income of ethnic households came from three main sources like day labour, service and petty business. In Khagrachari non-ethnic households mainly depend on plain land agriculture and other day labourer was the main source of income in other two districts. The average monthly per capita per household income was estimated at taka 814 for all ethnic which was higher than non-ethnic (tk.757). Both the figures were lower than national average (tk.1246). It was estimated that 47.4% ethnic households received micro credit amounting Tk.3699 for agriculture purposes, while 40%

non-ethnic household received micro credit amounting Tk.2988 in the last year. The differences in credit received by different ethnic groups were statistically significant in Bandarban and Rangamati may be due to more NGOs work in some areas than in others, but this was insignificant in Khagrachari district. The study revealed that ethnic households received VGD (13.5%), VGF (28.6%), old age allowances (4.5%), widow allowances (2.0%) and relief (21.7%), while corresponding percentages for non-ethnic households were 27.7%, 41.1%, 5.5%, 0% and 15.5% respectively. The rate of family planning used was higher for non-ethnic (51.1%) than ethnic (37.3%) families. The use of sanitary latrine was slightly higher for non-ethnic households (56.7%) than for ethnic households. It was observed that 73.33% non-ethnic and 50% ethnic respondents reported that their family members suffered from malaria in the last 12 months which statistically significantly varied between ethnic and non-ethnic groups in the CHT. The study revealed that 70% non-ethnic and 46.7% ethnic households used tube-well for drinking water. Majority of the ethnic and non-ethnic households used kerosene oil for lighting.

Level of food security: Annual per household rice requirement was estimated at 1.26 ton for ethnic and 1.01 ton for non-ethnic households. Food availability was recorded to be 0.79 ton for ethnic and 0.14 ton for non-ethnic households which constitutes 54.1 and 15.4% of total requirements, respectively. As a result, rice shortage was found higher (0.87 ton) for non-ethnic and lower for ethnic households (0.49 ton) which constitutes 84.5 and 45.9% of shortage respectively.

The average calorie intake was estimated at 2037 k.cal for ethnic and 1978 k.cal for non-ethnic people. Average calorie intake was found higher at Khagrachari (2173 k.cal/capita/day) followed by Bandarban (1964 k.cal/capita/day) for ethnic. On the other hand, Chakmas were found to intake higher calorie (2102 k.cal/capita/day) followed by Marma (2081 k.cal/capita/day). The lowest calorie intake was recorded for *Tanchanga* (1901 k.cal/capita/day) which was significantly lower than national average. The differences in calorie intake among ethnic groups were found statistically significant in Bandarban and Rangamati district but insignificant in Khagrachari. In all location, the average rice yield under *Jhum* cultivation was 1.15 t/ha which significantly varied among the ethnic groups and locations. The highest yield of rice was estimated at 1.54 t/ha in Bandarban followed by Khagrachari (1.11 t/ha). The highest number of ethnic (32.8%) and non-ethnic (28.9%) respondents opined that they '*sometimes*' worried about their next meal where coming from. About 24.0% and 12.5% of ethnic respondents told that they '*often*' and '*always*' worried about their next meal, respectively. In all areas, 61.5% ethnic and 70.0% non-ethnic respondents reported that they '*never*' could afford to take balanced meals.

A large portion of the respondents (ethnic 35.9% and non-ethnic 62.2%) opined that they had '*never*' enough money to buy required food. Among the locations, the respondents in Rangamati and Bandarban had less capability of purchasing food compared to Khagrachari. Among the ethnic groups, *Chakma* and *Marma* in both Bandarban and Rangamati had less capability of purchasing required food. In all ethnic groups, 24.5%, 36.7% and 38.9% households possessed high, moderate and low level of food insecurity respectively, while 46.7%, 27.8% and 25.6% non-ethnic households fell in high, moderate and low food insecurity level, respectively. Low yield in *Jhum* crops was the major cause of food insecurity reported by 51.6% of ethnic respondents. In the study areas crops were damaged mainly due to drought, attack of wild animals, water stagnation and flash flood. Majority of the ethnic respondents (62.9%) reported crop damage as the major physical risk to livelihoods followed by theft of garden fruit (17.9%) and loan receive (14.6%). Majority of the ethnic respondents reported rodent threat/rat flood (47.2%) as the major natural risk followed by drought (26.4%)

Coping strategies: It was found that 30.5% and 50.4% of the ethnic respondents relied on less expensive foods for '*everyday*' and '*sometimes*', respectively as consumption coping

strategy during food shortage period. Other coping strategies were borrowing food (16.5% everyday and 49.3% sometimes); purchase food on credit (15.9% everyday and 42.8% sometimes); harvest immature crop (5.8% everyday and 29.1% sometimes); consume seed stock (16.5% everyday and 49.3% sometimes); cut quantity of food per meal (12.8% everyday and 37.2% sometimes); adult took less food (17.6% everyday and 37.5% sometimes); reduce number of meals eaten in a day (8.6% everyday and 34.4% sometimes) etc. The highest percent of non-ethnic (45.6%) and ethnic (35.9%) respondents mentioned taking loan (35.9%) as the non-consumption coping strategy followed by selling fuel wood (31.1%) for non-ethnic and (28.4%) for non-ethnic. Other important non-consumption coping strategies were selling bamboo 29.2% for ethnic and 27.8% for non-ethnic in all locations.

Effects of key factors on household food security: In the aggregate level the coefficients of average food price and age of household head were positive and significant, while that of household size was negative and significant for all ethnic households in Bandarban. It indicated that food price and age had significant and positive impact on household food security and household size had significant and negative impact on household food security for the ethnic households in Bandarban. The aggregate output and dummy for extension contact were positive and significant, while that of dummy for credit was negative and significant for non-ethnic households in Khagrachari. It indicated that aggregate output and extension contact had significant and positive impact on household food security for the non-ethnic households. On the other hand, dummy for credit had significant and negative impact on household food security for the non-ethnic households in Khagrachari. The farm size, education of the respondents, training and extension contact had significant and positive impact on household food security and farming experience had significant and negative impact on household food security for the ethnic households in Rangamati.

Policy recommendations: Shifting cultivation in the remote areas needs to be modernized by introducing modern agricultural practices. In peri-urban areas where road communication and marketing facilities are mostly available, settle farming (mixed fruit) orchard may be suitable as an alternative to *Jhum* but their requirement of cereal (rice) and other short-term vegetables could be able to cultivate in the fruit orchard in first three years since the canopy size of fruit trees are small. Settle farming (fruit orchard) would be able to generate more income in the long run. The establishment of fruit orchard will require proper management i.e. fertilization, weeding and watering after plantation. Due to lack of cash money the poor farmers cannot ensure proper management to the fruit orchard. Therefore, concerned department can create irrigation facility by making small-scale creek dam and provide other necessary agricultural inputs (fertilizer, insecticide, sprayer etc.) with low cost.

Rodent threat in *Jhum* crops is a current problem in the study areas affecting food security and livelihood. To overcome this problem, a special program should be undertaken by the concerned department. In order to minimize the crop damage due to drought, drought tolerant crop variety should be developed. Some *Jhum* crops have already been found to be drought resistant but it needs more management oriented package of technology which can be provided by the Department of Agricultural Extension (DAE) and on-farm research division of BARI. Limited land per household is one of the important bottlenecks of food shortages. To overcome this problem, a reasonable size of land per households could be provided through spot settlement of land to the landless and marginal households. These may lead to encourage them to create settle farming.

Livestock and poultry is one of the most important sectors which can generate not only income but also supply food and nutrition. Concerned departments should come forward with new incentives (i.e. easy loan, free or low cost input supply and providing extension service etc.) to the most vulnerable ethnic and non-ethnic households. Government should take necessary steps to reduce household size and minimize dependency ratio by creating new jobs and income generating activities. Family planning programme should also be

strengthening in this regard. The level of education of the family members was not satisfactory in the study areas. To overcome this problem, at least one primary school should be established in each village or within one kilometers of area. Sound health influence taking household production and consumption decision. Therefore, much emphasis should be given on health care. Various social safety net programs such as VGF, VGD, old age allowances, widow allowances, disabled allowances implemented by the government are reported to be very much helpful to the vulnerable ethnic and non-ethnic households. Therefore, these programmes should be extended in remote areas where lower level of household cereal sufficiency exists.

In addition, food production in the CHT should be enriched through applied modern agricultural technologies by the concerned department. Access to food at all times to all households' especially poor households should be ensured. Moreover, nutritionally food intake could be ensured by motivational awareness program. Increased real income, education and health status can be ensured for sustainable food and livelihood security in the Chittagong Hill Tract region.

CHAPTER I

INTRODUCTION

1.1 Background

The Chittagong Hill Tract (CHT) region comprises about one tenth of the total area of Bangladesh. The area covers 13,295 sq. km consisting of about 77% up land (hill), 20% undulating bumpy land and 3% plain, with high potential for agriculture development. The region consists of three hill districts namely Bandarban, Khagrachari and Rangamati, located in the south-eastern part of Chittagong Division. The three hill districts are bound on the North by the Indian State of Tripura; on the west by the Chittagong district; on the South by Myanmar and on the East by the Burmese Arakan Hill Tracts and the Lushai Hills. The Chittagong Hill Tracts lie between the extreme east and the southeast of Bangladesh within 21.11 to 23.45° N latitude and 91.42 to 92.42° E longitudes. The district wise contextual information is presented in the Table 1.1.

Table 1.1 Contextual information of the Chittagong hill districts

| Sl. No. | Particulars | Districts | | | |
|---------|-------------------------------|-----------|-------------|-----------|---------|
| | | Bandarban | Khagrachari | Rangamati | All |
| 1. | Area (sq. km) | 4479 | 2700 | 6116 | 13295 |
| 2. | Population (No.) | 298120 | 525664 | 508182 | 1331966 |
| 3. | Agricultural households (No.) | 43246 | 76793 | 61993 | 182032 |
| 4. | Upazila (No.) | 7 | 8 | 10 | 25 |
| 5. | Union (No.) | 29 | 34 | 49 | 112 |
| 6. | Village/Para (No.) | 1037 | 1188 | 1396 | 3621 |
| 7. | Cultivated land (ha) | 43433 | 73311 | 35216 | 15160 |
| 8. | Single cropped area (ha) | 25826 | 16191 | 24511 | 66528 |
| 9. | Double cropped area (ha) | 13897 | 19806 | 8976 | 42679 |
| 10. | Triple cropped area (ha) | 3710 | 5836 | 1729 | 11275 |
| 11. | Rice area (ha) | 20639 | 44516 | 20235 | 81748 |
| 12. | Rice production (MT) | 46000 | 99000 | 49000 | 194000 |
| 13. | Cultivable fallow land (ha) | 95254 | 4609 | 34496 | 134359 |
| 14. | Gross cropped area (ha) | 64750 | 41833 | 47650 | 154233 |
| 15. | Cropping intensity (%) | 149 | 175 | 135 | 153 |
| 16. | Forest area (ha) | 163010 | 146058 | 502640 | 811708 |

Source: DAE (2009); BBS (2008)

Among the three hill districts, Rangamati is the largest on the basis of area, but the most populated district is Khagrachari. The highest number of agriculture households exists in Khagrachari and the lowest in Bandarban. The highest number of Upazila, Union and villages/para has been found in Rangamati and the lowest in Bandarban. The largest cultivated land was found in Khagrachari while it is half for other two districts. Triple cropped area was found highest in Khagrachari resulting in highest cropping intensity compared to other two districts. The area of cultivable fallow land is higher in Bandarban than other two districts. It is not a good sign but it may be due to the existence of steep sloped hill land which is unfavorable for cultivation.

1.2 Key Features of Ethnic Minorities

Chittagong Hill Tracts is the home of 13 different ethnic minorities possessing distinct cultures and life styles. Table 1.2 shows that among the ethnic communities, the highest population belong to the Chakma community (43.35%), followed by the Marma (25.77%) and the Tripura (13.58%) (Shelley,1992). They are ethnically different from the settled populace in Bangladesh. The distinct features of major ethnic groups are discussed below

Chakma: Most of the Chakmas live in the Rangamati district. The Chakmas generally live in an agrarian self-reliant society. They do all their day to day work by themselves from agriculture to weaving clothes.

Marma: The Marmas sometimes referred to as Moghs live mostly in and around Bandarban. They also belong to the Mongoloid group. They engaged in shifting cultivation which locally called *jhum* farming. *Jhum* is a cultivation system usually practiced by the tribal people in the hill areas of Bangladesh. In this system a number of crop seeds (8-12) are sown together as mixed cropping with the help of a hoe after slash and burn of hill vegetation and initiation of first rain. The crops are harvested in different times based on crop maturity.

Tripura: The Tripuras or Tipra live in the most part of the CHT in a scattered manner. The name ‘Tipra’ originated from the word ‘Top’ which means ‘river’ and ‘Pra’ which means the confluence. Together ‘Topra’ means the people who used to live in confluence of rivers. Their way of life is different in many ways from others. These differences are apparent in socio-religious festivals.

Tanchangya: The Tanchangyas are the original sect of the Chakma. They migrated from Arakan in 1881 during the period of Chief Dharam Baksh Khan and took up their abode on hill tops.

Bawm: The Bawm tribesmen live in Bandarban. The word Bawm is believed to have originated from ‘Kem Jau’ – which means ‘united nation’. The Bawms mainly depend on fruit gardening.

Mro: The Murong’s who came over from Arakan in Burma a few hundred years ago; they concentrate in and around the Bandarban district of CHT. The Murongs depend on *Jhum* cultivation. They eat wild animals such as dogs, tigers, pigs, goats, deer, cow, poultry birds etc. They live on the tops of hills, in houses erected on ‘machangs’ platforms.

Table 1.2 Distribution of ethnic population in CHT region

| Sl. No. | Ethnic group | Total population | % of total |
|---------|--------------|------------------|--------------|
| 1. | Chakma | 239417 | 43.4 |
| 2. | Marma | 142334 | 25.8 |
| 3. | Tripura | 75000 | 13.6 |
| 4. | Tangchangya | 50000 | 9.1 |
| 5. | Bawm | 8000 | 1.5 |
| 6. | Murong (Mro) | 25000 | 4.5 |
| 7. | Khumi | 1241* | 0.2 |
| 8. | Chhak | 2500 | 0.5 |
| 9. | Pankhoa | 4000 | 0.7 |
| 10 | Kuki | 1734 | 0.3 |
| 11 | Khyang | 2000 | 0.4 |
| 12 | Lushai | 1098 | 0.2 |
| | Total | 552324 | 100.0 |

Source: Das (2009); *ADB (2000)

1.3 Food Availability and Shortage in CHT

Understanding of food availability is important for the analysis of food security. The district wise food information during the last three years has been presented in the table 1.3. It was observed that both Khagrachari and Bandarban were in food deficit during 2007-08. The food surplus observed in Khagrachari may be due to utilization of available plain land for rice cultivation. Among the three districts, Rangamati was found to be more food deficit due perhaps to declining the productivity of *Jhum* cultivation and limited land for cultivation. *Jhum* crops have also been damaged by water stagnation around Kaptai lake area before harvesting.

Table 1.3 Food production and requirement in CHT region

| Sl No. | District | Year | Population | Food production (mt) | Food requirement * (mt) | Surplus/ deficit (mt) |
|--------|-------------|---------|------------|----------------------|-------------------------|-----------------------|
| 1. | Bandarban | 2005-06 | 297893 | 53327 | 49363 | 3964 |
| | | 2006-07 | 302331 | 51327 | 50055 | 1272 |
| | | 2007-08 | 355357 | 54926 | 58834 | (-) 3908 |
| 2. | Khagrachari | 2005-06 | 556811 | 116323 | 92188 | 24135 |
| | | 2006-07 | 566833 | 116543 | 93847 | 22696 |
| | | 2007-08 | 579304 | 104631 | 95585 | 9046 |
| 3. | Rangamati | 2005-06 | 543245 | 61129 | 96565 | (-) 35436 |
| | | 2006-07 | 553372 | 57718 | 102227 | (-) 44509 |
| | | 2007-08 | 552039 | 54087 | 98128 | (-) 44041 |
| 4. | All | 2005-06 | 1397949 | 230779 | 238116 | (-) 7337 |
| | | 2006-07 | 1422536 | 225588 | 246129 | (-) 20541 |
| | | 2007-08 | 1486700 | 213644 | 252547 | (-) 38903 |

* Food requirement is calculated by per capita food requirement (gm) multiplied by population

Source: DAE (2009)

Food security is an important concern throughout the world. For the well-being of human life, food security as well as livelihood security is a matter of concern. The livelihood security refers to the adequate and sustainable access to income and other resources to enable households to meet basic needs (Frankenberger, 1996). Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996).

Rasul (2003) reported that poverty is widespread in the CHT particularly in rural areas. Many rural families suffer from chronic food shortages. ADB (2000) reported that on an average, shifting or *Jhum* cultivation cannot support a family for more than six months. Rasul (2005) showed that for the rest of the year farmers have to harvest bamboo, trees and non-timber forest products for survival. Without alternative livelihood opportunities, the sustainable use of resources is unlikely to occur. He also reported that, during the early 1980s the government gave two hectares of sloping land, along with permanent title deeds to people who had settled near the Bandarban-Chimbuk road.

The study mainly focuses on searching alternative opportunities for sustainable livelihood security of ethnic minorities and their coping strategies during the period of food crisis, natural calamities and damages of food production. No in-depth research on these issues has been done yet. A new policy or policy adjustment is needed for the sustainable livelihood security as well as food security of rural poor households in CHT. Nath *et al.* (2005) reported that despite the trend of dwindling productivity, tribal people of the CHT still practice shifting cultivation as a dominant hill farming to support their livelihood. Le-Van-An (2006) found that the livelihood of upland ethnic minorities in Vietnam was traditionally dependent on shifting cultivation and harvesting of non-timber forest product. In Vietnam, due to decline of forest cover, government has banned shifting cultivation and migrated farmers from plain land to upland areas which led to dramatic pressures on upland communities to scope new livelihoods. Uddin *et al.* (2000) observed that hill people are in general, very poor, illiterate, and their livelihood depends on wage earning and shifting cultivation. Miah and Islam (2007) reported that on average a tribal household in Khagrachari district owned 2.80 ha of hilly land for cultivation. Livestock and poultry provide additional income. Most households own only one dwelling house with no modern amenities and their main source of drinking water is natural springs.

Household livelihood security assessments provide comprehensive socio-cultural, economic and ecological assessments of a given area for planning and project implementation (Molnar 1989). CARE (2002) defines household livelihood security as an adequate and sustainable access to income and resource to meet basic needs (including adequate access to food,

potable water, health facilities, educational opportunities, housing and time for community participation and social integration). Livelihoods can be made up of a range of on-farm and off-farm activities that together provide a variety of entitlements which constitute livelihood. Entitlements include the rights, privileges and assets that household has and its position in the legal, political, and social fabric of society.

‘The risk of livelihood failure determines the level of vulnerability of a household to income, food, health and nutritional insecurity. The greater the share of resources devoted to food and health service acquisition, the higher the vulnerability have secure ownership of, or access to, resources (both tangible and intangible) and income earning activities. Households have secure livelihood when they are able to acquire, protect, develop, utilize, exchange, and benefit from assets and resource’ (CARE, 2002).

The Food and Agriculture Organization (FAO) and the International Labour Organization (ILO) (2008) reported that a livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide net benefits to other livelihoods locally and more widely, both now and in the future, while not undermining the natural resource base. The extent to which a livelihood is sustainable is determined by the interaction of several forces and elements. Sheikh (2007) analyzed the effect of key exogenous variables (i.e. real income, food prices, and women specific variables such as age, health, education and time allocation etc.) on household food security. The study revealed that the women-specific variables tend to indicate a slightly more significant impact than food prices. He suggested that no single policy can be employed to effectively improve food security at rural households.

1.4 Rationale of the Study

The ethnic households live in the Chittagong Hill Tract (CHT) region are generally very poor, illiterate and their livelihood mostly depends on shifting cultivation and wage earnings (Uddin *et al.*, 2000). Selling of firewood, bamboo, timber, fruits, indigenous vegetables, livestock and poultry also provide additional income for their livelihood (Miah and Islam, 2007). Most households have few assets other than family labor (unskilled) and some land. Their food basket contains mainly indigenous vegetables, fruits and the meat of wild animals. Although a major share of their income come from agriculture, but this sector is highly constrained by limited cash and modern technology for higher production (Chowdhury *et al.* 2004). Steep slopes, low soil fertility, low moisture-holding capacity are also the major constraints of agriculture development in the CHT region (Brammer, 1997).

A large part of population in the CHT region still lacks access to sufficient, safe and nutritious food. The main reasons of this short-fall are low yield of *Jhum* crops and low purchasing power due to limited income. The low yield of *Jhum* crops is mainly attributed to low soil fertility, use of traditional crop variety, and crop damage by rats and wild pig. Many studies (Gafur, 2001; Al-Kaisi, 2001; Gafur *et al.* 2003; Miah and Islam, 2007) found that *Jhum* cultivation causes huge topsoil loss from the hills and reduces productivity of the soil which is responsible for decreasing the productivity of food production and other hillside farms. With this unsustainable land use system, the livelihoods of the hill people are decreasing day by day.

Proper utilization of hilly lands and human assets can contribute a lot to reduce household food insecurity in this region. Therefore, it is important to investigate the livelihood pattern, household level food security, vulnerability, and coping strategies with vulnerable situations of the poor indigenous households. This research work will be helpful for policy makers for strengthening national food policy programs. The study will also help the researchers and development workers to formulate appropriate policy measures for uplifting the livelihoods of the poor indigenous households for this region.

1.5 Objectives of the Study

The overall goal of the present study is to find out ways and means for the livelihood development of ethnic minorities in CHT region by analyzing their livelihood pattern, food security, vulnerabilities and the coping strategies during stressed situation. The specific objectives of the study are:

- i) to assess the livelihood pattern and food security status of rural ethnic households in CHT region;
- ii) to examine the effect of key factors on household food security of rural ethnic minorities in CHT region; and
- iii) to explore vulnerabilities and coping strategies of rural ethnic minorities in CHT region;
- iv) to suggest some policy guidelines for improving livelihood security of ethnic minorities in CHT region.

CHAPTER II

METHODOLOGY

2.1 Selection of the Study Area and Ethnic Group

The selection of specific study area is a pre-requisite for any in-depth study. The area in which a farm survey is to be conducted relies on the particular purpose of the survey and possible cooperation from the respondents. For this study, three hill districts namely Bandarban, Khagrachari, and Rangamati were selected purposively. After selecting three hill districts, one Upazila from each district was also selected purposively considering the type of ethnic minorities and their livelihood systems. From these three hill districts, a total of 25 villages/paras were randomly selected taking 16 villages/paras from Bandarban, 5 villages/paras from Khagrachari, and the remaining 4 villages/paras from Rangamati. The villages/paras were selected considering easy road communication and less risk for data collection. In the hilly areas, most of the ethnic minorities live in isolated para/villages. Therefore, for getting more representation of the location and ethnic groups, higher number of para/villages was chosen especially in Bandarban. Details are shown in Table 2.1.

Out of the 13 ethnic groups present in the CHT region, six dominant ethnic minorities namely Chakma, Marma, Tanchangya, Tripura, Murong and Bawm were selected purposively for this study. All these six ethnic minorities were selected from Bandarban, but three minorities namely Chakma, Marma and Tanchangya were selected from Rangamati and three minorities namely Chakma, Marma, and Tripura from Khagrachari for collection of primary data. Indeed, as all ethnic groups were not living in all the hill districts, the selected types of ethnic groups varied among districts. A number of non-ethnic settlers (Bengali) were also selected so as to be able to compare ethnic minorities' characteristics to that of non ethnic groups in the area.

In Bandarban hill district, 244 households were selected from 780 households. Usually one ethnic group lives in one para but in some areas more than one ethnic or non-ethnic family were found to reside. For ensuring proper representation of location and ethnic group, higher numbers (16) of villages/paras were selected in Bandarban. The villages were located 8-16 km away from district town. In Khagrachari hill district 136 households were selected from 1354 households in 5 villages. These villages were located 7- 13 km away from district town. In the case of Rangamati hill district, 137 households were selected from 326 households in four villages/paras. These villages were located 13-15 km away from district town.

Table 2.1 Contextual information of specific location in the study

| District | Upazila (no.) | Union (no.) | Village/ Para (no.) | Households (no.) | Population (no.) | Distance to town (km) | NGO's working (no.) | Ethnic groups (no.) |
|-------------|---------------|-------------|---------------------|------------------|------------------|-----------------------|---------------------|---------------------|
| Bandarban | 1 | 3 | 16 | 780 | 4212 | 8-16 | 45 | 6 |
| Khagrachari | 1 | 1 | 5 | 1354 | 7246 | 7-13 | 16 | 3 |
| Rangamati | 1 | 2 | 4 | 326 | 1511 | 12-15 | 13 | 3 |
| All | 3 | 6 | 25 | 2460 | 12969 | 7-16 | 74 | 6 |

2.2 Sampling Techniques

A sampling frame was constructed in consultation with local Agricultural Officers, Headmen (Chief of the tribal village), Karbari (mouza chief), union council members and other relevant persons before final sample selection. Stratified random sampling was used for selecting the sample. It has already been mentioned that there are 13 ethnic minorities living in the CHT region. Some ethnic households live in remote areas where access of plain land people is almost impossible. Besides, those ethnic people consider plain land people as stranger since they usually have no interactions with plain land people. Therefore, easy accessibility, ethnic

differences and less risky areas were taken into considerations for conducting this study. Each ethnic group was treated as a stratum and sample was drawn from each stratum randomly. For determining the sample size the variability of land holding of the farmers in the selected areas was also considered. It was however, ideal to choose samples from normal distribution. There is no safe general rule as to how large sample size must be for use of the normal approximation in computing confidence limit (Cochran, 1999). In order to normalize the data the following Fisher's measure of skewness was used and by applying this technique an optimum number of samples were chosen for each location of this study (Fisher, 1958; Karim, 1996).

Sample size, $n \geq 25 G_1^2$ (which says 95% confidence probability)

$$\text{Where, Fisher's measure of skewness, } G_1 = \frac{E(y_i - \bar{Y})^3}{\sigma^3} = \frac{1}{N\sigma^3} \sum_{i=1}^N (y_i - \bar{Y})^3$$

N = Population size; $y_i = i^{\text{th}}$ member of the population; \bar{Y} = Population mean and σ = Standard deviation.

Proportionate random sampling technique was adopted for selecting sample size in each ethnic group in different locations. In this process, after obtaining the sample size at Bandarban (214), Khagrachari (106) and Rangamati (107) from the above equation, sample size of each ethnic group was determined by proportionate sampling. For Bandarban 17-60%, for Khagrachari 24-30% and for Rangamati 38-65% households of the sampling frame was taken as sample for different ethnic groups. The proportionate sampling was done considering the minimum number of 30 households required for statistical analysis in each ethnic group. The UNICEF Pencil Spin method (CARE, 2002) was used to select households randomly. For non-ethnic group, 30 samples from each district were chosen. By applying this technique, a total of 427 ethnic and 90 non-ethnic sample households were selected for the study. The distribution of samples according to location and ethnic groups are presented in table 2.2.

Table 2.2 Distribution of samples according to location and ethnic groups

| Tribe groups | Study area | | | All |
|----------------------|------------|-------------|------------|------------|
| | Bandarban | Khagrachari | Rangamati | |
| <i>Ethnic group:</i> | | | | |
| Chakma | 33 (55) | 37 (149) | 36 (75) | 106 (279) |
| Marma | 36 (209) | 36 (120) | 35 (67) | 107 (396) |
| Tanchangya | 35 (118) | - | 36 (55) | 71 (173) |
| Tripura | 36 (78) | 33 (130) | - | 69 (208) |
| Murong | 38 (65) | - | - | 38 (65) |
| Bawm | 36 (165) | - | - | 36 (165) |
| All ethnic | 214 (690) | 106 (399) | 107 (197) | 427 (1286) |
| Non-ethnic | 30 | 30 | 30 | 90 |
| Total | 244 | 136 | 137 | 517 |

Figures within parentheses are sampling frame (households).

2.3 Data Collection Procedure

Primary data were collected from sample households using pre-tested semi-structured questionnaire. Three educated enumerators from tribal communities were employed for data collection for easy understanding of their own language. The primary data were collected from February to July 2009. The quantities of crops and animal products consumed by sample households in the last three days were collected through household survey and were converted to calories and divided by household size to obtain the calorie intake per capita per day. It is important to note that both indigenous and non-indigenous foods that were consumed in the last three days were taken into account. Average food price was obtained by summing up unit price of all consumed food items divided by number of food items.

In the case of calculating yearly household income (January-December 2008), all sorts of income earned by the household members were taken into consideration. Income from *Jhum*, fringe/plain land and fruit trees was calculated considering the production of all crops and fruits grown in the year. The income coming from the sale of livestock and livestock products were summed up for the period. The actual number of working days was multiplied by wage rate and per day income in calculating income from day laborer and rickshaw pulling respectively. Income from service, weaving, remittance and petty business was calculated by actual income earned in the said year.

Monthly per capita income per household was derived from total annual household income divided by their household size and divided by 12.

2.4 Analytical Techniques

Descriptive statistics i.e. mean, standard deviation, percentage, etc. were used to analyze data as per requirement. A livelihood framework analysis was used for assessing vulnerabilities of the ethnic minorities in the study areas. Food security was measured using a Coping Strategy Index (CSI). The CSI is widely used in different African countries for measuring food security (Maxwell *et al.*, 2003). The CSI is an indicator of household food security that is relatively simple and quick to use and straightforward to understand. A series of questions about how households cope with the shortfall of food consumption were asked to get a simple numeric score. The CSI score shows whether a household food security status is declining or improving. A number of questions on coping behaviors were also developed and asked to the sample households to know how often these strategies were used during various stress situations. In this case, four relative frequency such as ‘every day’, ‘sometimes’, ‘rarely’ and ‘never’ were used.

The respondents who answered ‘everyday’ for any of the questions was assigned a numeric score 7. Similarly 4.5, 1.5 and 0 score were assigned for ‘sometimes’, ‘rarely’ and ‘never’ respectively. The CSI score was calculated by the following formula:

$$\text{CSI} = \text{Relative Frequency} \times \text{Weight (severity)}$$

Severity was measured as the perception of the people interviewed. Severity was grouped into four categories these are: 1= the least severe; 4= the most severe and 2 and 3 are intermediate severe. For example, borrowing food considered as least severe and eating seed stock considered as most severe and rest of others are intermediate. The higher the score the greater the food insecurity exist in the respective households (Maxwell *et al.*, 2003). In other words, CSI score lying between 0 and 40 indicates higher level of food insecurity; the score lying between 41 and 60 indicates moderate food insecurity and the score lying between 61 and above indicates higher level of food insecurity existing in the household. The upper limit of the CSI score depended on the relative frequency and its severity.

In order to know the intensity of food insecurity at household levels of the respondents, three questions were asked for responses as done in Alabaraca (2000). The questions were: i) How often do you worry about where your next meal is coming from? ii) Do you afford to eat balanced meals for your family? and iii) Do you have enough money to buy required food?

For estimating calorie intake model a number of independent variables were chosen. The variables which could have directly or indirectly influence on calorie intake were taken into consideration based on previous experience. The average food price in this model was obtained by summing up unit price of all consumed food items divided by number of food items.

2.5 Empirical Cobb-Douglas calorie intake model

In order to examine the effect of key factors on food security especially on calorie intake, the Cobb-Douglas type calorie intake model was employed. Cobb- Douglas production function is homogenous function that provides a scale factor enabling one to measure the return to scale and to interpret the elasticity coefficients with relative ease. It is also relatively easy to estimate because in logarithmic form it is linear and parsimonious (Beattie and Taylor, 1985).

The empirical Cobb-Douglas calorie intake function model with double log form can be expressed as:

$$\begin{aligned} \ln Y_i = & \beta_0 + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + \beta_4 \ln X_{4i} + \beta_5 \ln X_{5i} + \beta_6 \ln X_{6i} + \beta_7 \ln X_{7i} \\ & + \beta_8 \ln X_{8i} + \beta_9 \ln X_{9i} + \eta_1 D_{1i} + \eta_2 D_{2i} + \eta_3 D_{3i} + \eta_4 D_{4i} + \eta_5 D_{5i} + \eta_6 D_{6i} + u_i \end{aligned}$$

Where,

Y_i = Total calorie intake by the i^{th} household (Kcal/capita/day)

X_{1i} = Aggregate output of the i^{th} household (kg/hh)

X_{2i} = Household size of the i^{th} household (person/hh)

X_{3i} = Income of the i^{th} household (Tk./hh/year)

X_{4i} = Average food price (Tk./kg)

X_{5i} = Farming experience of the i^{th} household head (year)

X_{6i} = Education of the i^{th} household head (year of schooling)

X_{7i} = Farm size of the i^{th} household (ha)

X_{8i} = Age of the i^{th} household head (year)

X_{9i} = Education of spouse of the i^{th} household head (year of schooling)

D_{1i} = Dummy for training received on agriculture by the i^{th} household head (1= yes, 0= otherwise)

D_{2i} = Dummy for credit received by the i^{th} household (1= yes, 0= otherwise)

D_{3i} = Dummy for extension contact of i^{th} household (1= yes, 0= otherwise)

D_{4i} = Dummy for health of the i^{th} household head (1= Good, 0 = otherwise)

D_{5i} = Dummy for time spent by the household head (1= More in jhum farming, 0 = otherwise)

β 's and η 's are unknown parameters to be estimated

u_i = Disturbance term

Chapter III

RESULTS AND DISCUSSION

3.1 Livelihood Pattern of Ethnic Minorities

3.1.1 Households category

Households were classified into five groups according to land ownership following FAO and ILO (2008) definition. It can be seen from the Table 3.1 that in the CHT region, more than 72 percent non-ethnic households was found landless while it was for only 24 percent for ethnic households. On the other hand, more than 28 percent ethnic household occupied 1-1.99 ha of land but it was only 8.9 percent for the non-ethnic in the CHT. In the districts, cent percent non-ethnic household in Bandarban was found landless followed by Rangamati. Among the ethnic groups, more than 94 percent Marma's household in Rangamati was found landless but the Tripura's and Bawm in Bandarban was occupied highest amount of land (2.0-5.0ha). The land holdings among the groups and location varied significantly.

Table 3.1 Distribution of sample households according to land holdings

| Location/ Respondent type | In % of respondents of each ethnic group | | | | |
|------------------------------|--|----------------------|-------------------|--------------------------------|--------------|
| | Landlord (renting out land) | Owner- cultivator | Share- cropper | Tenant (renting in land) | Landless |
| Bandarban: | | | | | |
| Chakma (33) | 3.0 | 81.8 | - | 30.3 | 18.2 |
| Marma (36) | - | 94.4 | - | 52.8 | 2.8 |
| Tanchanga (35) | - | 74.3 | - | 28.6 | 25.7 |
| Tripura (36) | 2.8 | 88.6 | - | 30.6 | 8.3 |
| Mro (38) | - | 100.0 | - | 23.7 | 5.3 |
| Bawm (36) | 2.8 | 83.3 | - | 36.1 | 2.8 |
| <i>All ethnic (214)</i> | <i>1.4</i> | <i>87.1</i> | <i>-</i> | <i>33.7</i> | <i>10.5</i> |
| <i>Non-ethnic (30)</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>100.0</i> |
| Khagrachari: | | | | | |
| Chakma (37) | 2.7 | 78.4 | 2.7 | 56.8 | 13.5 |
| Marma (36) | 22.2 | 88.9 | 30.6 | 27.8 | 8.3 |
| Tripura (33) | 18.2 | 93.9 | 30.3 | 57.6 | 15.1 |
| <i>All ethnic (106)</i> | <i>14.4</i> | <i>87.1</i> | <i>21.2</i> | <i>47.4</i> | <i>12.3</i> |
| <i>Non-ethnic (30)</i> | <i>13.3</i> | <i>93.3</i> | <i>16.7</i> | <i>53.3</i> | <i>20.0</i> |
| Rangamati: | | | | | |
| Chakma (36) | 22.2 | 88.9 | 58.3 | 16.7 | 13.9 |
| Marma (36) | 2.9 | 17.1 | 8.6 | 5.7 | 88.6 |
| Tanchanga (35) | 13.9 | 75.0 | 38.9 | 44.4 | 16.7 |
| <i>All ethnic (107)</i> | <i>13.0</i> | <i>60.3</i> | <i>35.3</i> | <i>22.3</i> | <i>39.7</i> |
| <i>Non-ethnic (30)</i> | <i>-</i> | <i>46.7</i> | <i>3.3</i> | <i>20.0</i> | <i>96.7</i> |
| All: | | | | | |
| <i>All ethnic (427)</i> | <i>9.6</i> | <i>78.2</i> | <i>18.8</i> | <i>34.4</i> | <i>20.8</i> |
| <i>Non-ethnic (90)</i> | <i>4.4</i> | <i>46.6</i> | <i>6.7</i> | <i>24.4</i> | <i>72.2</i> |

Figures in the parenthesis indicates sample size

3.1.2 Land tenure system

Absentee land owners, owner cultivators, sharecroppers, tenants and landless households were found in the study area. Table 3.2 shows that more than 78 percent ethnic household was found as owner cultivator but it was 46 per cent for non-ethnic in the CHT. In the

districts, more than 93 per cent non-ethnic household in Khagrachari was identified as owner cultivator followed by ethnic in same district and also in Bandarban but it was non for non-ethnic in Bandarban due to all are earlier settlers from neighbor districts. In the groups, cent percent of the Mro's household in Bandarban was found as owner cultivator. In a nutshell, most of the ethnic household in all districts was observed as owner cultivators followed by tenant and landless.

Table 3.2 Farmers responses regarding land tenure systems in CHT region

| Location/ Respondent type | In % of respondents of each ethnic group | | | | |
|------------------------------|--|----------------------|-------------------|--------------------------------|--------------|
| | Landlord (renting out land) | Owner- cultivator | Share- cropper | Tenant (renting in land) | Landless |
| Bandarban: | | | | | |
| Chakma (33) | 3.0 | 81.8 | - | 30.3 | 18.2 |
| Marma (36) | - | 94.4 | - | 52.8 | 2.8 |
| Tanchanga (35) | - | 74.3 | - | 28.6 | 25.7 |
| Tripura (36) | 2.8 | 88.6 | - | 30.6 | 8.3 |
| Mro (38) | - | 100.0 | - | 23.7 | 5.3 |
| Bawm (36) | 2.8 | 83.3 | - | 36.1 | 2.8 |
| <i>All ethnic (214)</i> | <i>1.4</i> | <i>87.1</i> | <i>-</i> | <i>33.7</i> | <i>10.5</i> |
| <i>Non-ethnic (30)</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>-</i> | <i>100.0</i> |
| Khagrachari: | | | | | |
| Chakma (37) | 2.7 | 78.4 | 2.7 | 56.8 | 13.5 |
| Marma (36) | 22.2 | 88.9 | 30.6 | 27.8 | 8.3 |
| Tripura (33) | 18.2 | 93.9 | 30.3 | 57.6 | 15.1 |
| <i>All ethnic (106)</i> | <i>14.4</i> | <i>87.1</i> | <i>21.2</i> | <i>47.4</i> | <i>12.3</i> |
| <i>Non-ethnic (30)</i> | <i>13.3</i> | <i>93.3</i> | <i>16.7</i> | <i>53.3</i> | <i>20.0</i> |
| Rangamati: | | | | | |
| Chakma (36) | 22.2 | 88.9 | 58.3 | 16.7 | 13.9 |
| Marma (36) | 2.9 | 17.1 | 8.6 | 5.7 | 88.6 |
| Tanchanga (35) | 13.9 | 75.0 | 38.9 | 44.4 | 16.7 |
| <i>All ethnic (107)</i> | <i>13.0</i> | <i>60.3</i> | <i>35.3</i> | <i>22.3</i> | <i>39.7</i> |
| <i>Non-ethnic (30)</i> | <i>-</i> | <i>46.7</i> | <i>3.3</i> | <i>20.0</i> | <i>96.7</i> |
| All: | | | | | |
| <i>All ethnic (427)</i> | <i>9.6</i> | <i>78.2</i> | <i>18.8</i> | <i>34.4</i> | <i>20.8</i> |
| <i>Non-ethnic (90)</i> | <i>4.4</i> | <i>46.6</i> | <i>6.7</i> | <i>24.4</i> | <i>72.2</i> |

Note: Same households were involved in more than one system so that the summation of all systems does not necessarily equal 100.

3.1.3 Cereal sufficiency level

On the basis of cereal sufficiency, the ethnic households were classified as upper, medium and lower cereal sufficient (Ullah, 1996). They can be defined as follows-

- (i) **The upper cereal sufficiency** - The households who can meet their cereal (rice) requirement from their own production for 12 months in a year;
- (ii) **The medium cereal sufficiency** - The households who can meet their cereal requirement from their own production for 6 to 12 months in a year, and
- (iii) **The lower cereal sufficiency** - The households who can meet their cereal requirement from their own production for less than 6 months in a year.

Table 3.3 shows that more than 81 percent non-ethnic household was belonged to the lower level of cereal sufficiency while it was above 56 percent for ethnic in the CHT. The highest percent of households belonged to lower cereal sufficiency groups in Rangamati followed by Bandarban for all ethnic and non-ethnic groups. In Khagrachari, most of the households, either ethnic or non-ethnic, belonged to the medium cereal sufficiency group. This might be due to the fact that in this district, plain land is available for rice cultivation. Among the

ethnic groups, the highest percent of household (94.4%) of Bawm community in Bandarban belonged to lower cereal sufficiency groups. This may be due to their dependence on fruit gardening rather than *Jhum* cultivation. However, 50% households of the *Mro* belonging to upper cereal sufficiency group were mostly dependent on *Jhum* cultivation.

Table 3.3 Cereal sufficiency level by different ethnic and non-ethnic groups in CHT

| Location/ Respondent type | Farmer responded about cereal sufficiency (%) | | | |
|----------------------------|---|-------------|--------------|------------|
| | Upper | Medium | Lower | Total |
| <i>Bandarban:</i> | | | | |
| Chakma (33) | - | 57.6 | 42.4 | 100 |
| Marma (36) | 5.6 | 38.9 | 55.6 | 100 |
| Tanchanga (35) | - | 14.3 | 85.7 | 100 |
| Tripura (36) | - | 36.1 | 63.9 | 100 |
| Mro (38) | 50.0 | 39.5 | 10.5 | 100 |
| Bawm (36) | - | 5.6 | 94.4 | 100 |
| <i>All ethnic (214)</i> | <i>9.3</i> | <i>32.0</i> | <i>58.8</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | - | - | <i>100.0</i> | <i>100</i> |
| <i>Khagrachari:</i> | | | | |
| Chakma (37) | 13.5 | 32.4 | 54.1 | 100 |
| Marma (36) | 27.8 | 27.8 | 44.4 | 100 |
| Tripura (33) | 15.1 | 39.4 | 45.4 | 100 |
| <i>All ethnic (106)</i> | <i>18.8</i> | <i>33.2</i> | <i>48.0</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | <i>16.7</i> | <i>40.0</i> | <i>43.3</i> | <i>100</i> |
| <i>Rangamati:</i> | | | | |
| Chakma (36) | 27.8 | 25.0 | 47.2 | 100 |
| Marma (36) | 5.7 | 8.6 | 85.7 | 100 |
| Tanchanga (35) | 8.3 | 36.1 | 55.6 | 100 |
| <i>All ethnic (107)</i> | <i>13.9</i> | <i>23.2</i> | <i>62.8</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | - | - | <i>100.0</i> | <i>100</i> |
| <i>All:</i> | | | | |
| <i>All ethnic (427)</i> | 14.0 | 29.5 | 56.5 | 100 |
| <i>Non-ethnic (90)</i> | 5.6 | 13.3 | 81.1 | 100 |

Source: Field survey, 2009

3.1.4 Livelihood activities

Livelihoods can be made up of a range of on-farm and off-farm activities that together provide a variety of procurement strategies for food and other requirements. Thus, each household can have several possible sources of entitlement which constitute its livelihood. Entitlements include the rights, privileges and assets that a household has, and its position in the legal, political, and social fabric of society (CARE, 2002). The major livelihood activities in the study areas, determined by perceptions of people interviewed are presented in Table 3.4. It is found that the highest percentage of households were dependent on *Jhum* cultivation for livelihood in Bandarban, on plain land agriculture in Khagrachari and on poultry rearing in Rangamati. Livestock and fruit gardening were also important on-farm activities for the farmers in all the three hill districts. In the case of off-farm activities, the highest percentages of households were dependent on wage earnings for their livelihood in all districts. Weaving and selling of fuel wood were found to be important source of livelihoods in the CHT.

Table 3.4 Major livelihood activities of ethnic and non-ethnic households in CHT

| Livelihood activities | % of respondents of each group | | | | | | | |
|-------------------------------------|--------------------------------|------------|-------------|------------|-----------|------------|--------|------------|
| | Bandarban | | Khagrachari | | Rangamati | | All | |
| | Ethnic | Non-ethnic | Ethnic | Non-ethnic | Ethnic | Non-ethnic | Ethnic | Non-ethnic |
| On-Farm activities: | | | | | | | | |
| <i>Jhum</i> cultivation | 93.1 | - | 59.2 | 20.0 | 44.5 | - | 65.6 | 6.7 |
| Fruit gardening | 61.9 | 16.7 | 55.7 | 80.0 | 59.6 | 10.0 | 59.1 | 35.6 |
| Livestock rearing | 55.4 | 10.0 | 38.5 | 46.7 | 40.2 | 23.3 | 44.7 | 26.7 |
| Poultry rearing | 49.2 | 23.3 | 29.8 | 23.3 | 48.8 | 46.7 | 42.6 | 31.1 |
| Farming in plain/valley/fringe land | 5.1 | 16.7 | 82.2 | 46.7 | 44.6 | 16.7 | 44.0 | 26.7 |
| Off-Farm activities: | | | | | | | | |
| Weaving | 60.2 | - | 15.9 | - | 46.7 | 43.3 | 40.9 | 14.4 |
| Small business | 5.0 | 20.0 | 13.4 | 6.7 | 40.4 | 43.3 | 19.6 | 23.3 |
| Govt. service | 1.5 | - | 0.9 | 3.3 | 12.2 | - | 4.9 | 1.1 |
| Private service | 5.6 | 20.0 | 8.8 | - | 13.1 | 10.0 | 9.2 | 10.0 |
| Wage earning | 68.2 | 60.0 | 51.4 | 70.0 | 47.7 | 73.3 | 55.8 | 67.8 |
| Selling fuel wood | 44.7 | 60.0 | 28.0 | 50.0 | 19.4 | - | 30.7 | 36.7 |

Note: As one respondent mentioned more than one activity, the summation of columns do not necessarily equals to 100.

3.1.5 Livelihood capital

Livelihood capital refers to tangible or intangible assets that are held by a person or household for use to produce more wealth. Various forms of capital can be accumulated, exchanged, expended and lost, thereby affecting the level of households' livelihood security, quality of life, and its options for coping strategies (CARE, 2002). The different types of livelihood capitals of the ethnic minorities are discussed below:

Human capital: Human capital is important to the pursuit of livelihood strategies i.e. manpower, education, health, skill development by receiving training etc.

Household size: It was observed that on average, a household consisted of 5.10 persons for ethnic and 5.39 persons for non-ethnic groups (Table 3.5). These household sizes were higher than national average of 4.85 (BBS, 2007). Uddin *et al.* (2000) reported the average family size of 5.53 persons for some selected Thanas of CHT. It was further revealed that the household size was much higher in Bandarban district and lower in Rangamati for both ethnic and non-ethnic community. Among the ethnic groups, the largest household size was found with *Tripuras* followed by *Bawms* in Bandarban and the lowest was found with *Marmas* in Rangamati (4.03 persons). In all households the number of active/working family members ranged from 2 to 4 persons whose ages were found to be 15 to 64 years. The differences in household size between ethnic and non-ethnic groups were not significant but significant differences were found among the ethnic groups.

Table 3.5 Average household size and their working members in the CHT region

| Location | Person (number/hh) | | | | | | | |
|-------------|---|----------------|----------------|----------------|----------------|----------------|------------------------------------|----------------|
| | Chakma | Marma | Tanchanga | Tripura | Mro | Bawm | All Ethnic | Non-Ethnic |
| Bandarban | 4.67 (2.24) | 4.86 (3.50) | 5.03 (3.14) | 6.14 (3.25) | 5.97 (3.74) | 6.11 (3.53) | 5.5 (3.2) | 6.03 (2.87) |
| Khagrachari | 5.43 (3.35) | 4.83 (3.25) | NA | 5.85 (3.82) | NA | NA | 5.37 (3.36) | 5.90 (3.20) |
| Rangamati | 4.36 (2.69) | 4.03 (2.40) | 4.92 (3.72) | NA | NA | NA | 4.44 (2.94) | 4.23 (2.60) |
| All | 4.82 (2.8) | 4.57 (3.1) | 4.97 (3.4) | 5.99 (3.5) | 5.97 (3.74) | 6.11 (3.53) | 5.18 (3.2) | 5.39 (2.9) |
| | F- value between groups in all locations = 12.21*** (p< .000) | | | | | | t = 0.79 ^{ns} (p < 0.433) | |

*** indicate significant at 1% level, ns= not-significant

Figure in the parentheses indicate number of working family member (15-64 years old), NA indicates not applicable for the study.

Education: Education of the family members can contribute to ensuring food security at household level directly or indirectly. An educated person would be much aware about nutrition of food than an illiterate person. Education is considered as a crucial factor for progressive attitude of the peoples towards the adoption of modern technology. Literate peoples can have a better access to the relevant information regarding food and livelihood security. There is also the fact that education is correlated with higher levels of income which is associated with better levels of food insecurity. Educational status of the family members above 6 years was depicted in the Table 3.6. It was found that more than 46 percent both ethnic and non-ethnic households members were found no schooling in the CHT. In the districts, the highest percent of both family members were found no schooling in Bandarban followed by Rangamati. Among the ethnic minorities, the highest percent of *Mro* family members were found no schooling. In the same case it was identical for all districts. On the other hand, more than 34 percent non-ethnic family members had primary education while it was lower rate for ethnic groups (27.4%). More than 16 percent ethnic family members had secondary education while it was slightly lower for non-ethnic in the CHT. No non-ethnic family members was received above secondary education in Bandarban but it was found on an average 2.7 percent in the CHT. *Uddin et al.* (2000) reported that, the percentage of farmers having secondary and above education was found 8% in some areas of CHT.

Table 3.6 Level of education of household members (above 6 years of age) in CHT

| Location/ total family members | Education level as % of each ethnic group) | | | | | Total |
|--------------------------------|--|---------------|------------------|--------------------------|------------------------|-------|
| | No schooling | Primary (I-V) | Secondary (VI-X) | Above secondary (XI-XII) | Above higher secondary | |
| Bandarban: | | | | | | |
| Chakma (154) | 44.9 | 29.2 | 22.7 | 1.8 | 1.2 | 100 |
| Marma (175) | 45.7 | 25.1 | 14.8 | 9.7 | 4.5 | 100 |
| Tanchanga (176) | 46.6 | 33.5 | 9.6 | 7.9 | 2.2 | 100 |
| Tripura (221) | 44.8 | 37.5 | 12.2 | 4.5 | 0.9 | 100 |
| Mro (227) | 65.2 | 29.5 | 2.2 | 1.7 | 1.3 | 100 |
| Bawm (220) | 48.2 | 24.5 | 17.7 | 9.0 | 0.4 | 100 |
| All ethnic (1173) | 49.2 | 29.9 | 13.2 | 5.8 | 1.8 | 100 |
| Non-ethnic (181) | 48. | 40.8 | 11.0 | - | - | 100 |
| Khagrachari: | | | | | | |
| Chakma (201) | 40.3 | 28.8 | 19.9 | 7.9 | 2.9 | 100 |
| Marma (174) | 43.7 | 25.5 | 17.0 | 11.3 | 2.2 | 100 |
| Tripura (193) | 38.3 | 39.3 | 12.9 | 8.2 | 1.0 | 100 |
| All ethnic (568) | 40.8 | 31.2 | 16.6 | 9.2 | 2.0 | 100 |
| Non-ethnic (177) | 47.4 | 31.6 | 16.3 | 3.3 | 1.1 | 100 |
| Rangamati: | | | | | | |
| Chakma (157) | 49.0 | 22.2 | 23.5 | 5.1 | - | 100 |
| Marma (141) | 56.7 | 19.8 | 12.0 | 7.8 | 3.5 | 100 |
| Tanchanga (177) | 40.7 | 21.4 | 23.7 | 8.4 | 5.6 | 100 |
| All ethnic (475) | 48.8 | 21.2 | 19.7 | 7.1 | 3.0 | 100 |
| Non-ethnic (127) | 44.1 | 32.2 | 18.1 | 4.7 | 0.7 | 100 |
| All: | | | | | | |
| All ethnic (2216) | 46.3 | 27.4 | 16.5 | 7.3 | 2.3 | 100 |
| Non-ethnic (485) | 46.5 | 34.9 | 15.1 | 2.7 | 0.6 | 100 |

Figure in parentheses in the first column indicates total family members

Agricultural training: Skilled manpower is essential for ensuring greater food security at household level. Skills can be improved by training and it could have a role to play in the food production process. About 22% of the ethnic households family members received agriculture related training during last 3 years, while it was only 3 % for non-ethnic

households. The highest percent of ethnic respondents (27%) in Rangamati received training. No non-ethnic household members received such kind of training during last 3 years in Bandarban. Only 6.67% of the non-ethnic respondents at Khagrachari received such training. Among the ethnic groups, the highest (78.95%) of the *Mro* family members received agricultural training followed by Chakma in Rangamati and Tripura in Bandarban. The differences in training received between the ethnic groups and the ethnic and non-ethnic settlers were found statistically highly significant in the study areas (Table 3.7).

Table 3.7 Agriculture related training received by sample household members in the last 3 years

| Location | % of respondents | | | | | | | |
|---|------------------|-------|-----------|---------|------|------|------------------------|------------|
| | Chakma | Marma | Tanchanga | Tripura | Mro | Bawm | All Ethnic | Non-ethnic |
| Bandarban | - | 8.3 | 5.7 | 30.6 | 39.4 | 25.0 | 18.2 | - |
| Khagrachari | 24.3 | 19.4 | - | - | - | - | 14.6 | 6.7 |
| Rangamati | 44.4 | 22.9 | 13.9 | - | - | - | 27.1 | 3.3 |
| All | 22.9 | 16.9 | 9.8 | 15.3 | 39.4 | 25.0 | 22.1 | 3.3 |
| F- value between ethnic groups: 13.44*** (p < .000) | | | | | | | t = 7.14*** (p < .000) | |

*** Significant at 1% level of probability

Health and sanitation: Health is one of the most important indicators of livelihood pattern. Health indirectly influences the household food security. Good health can contribute to more production and bad health to less and can create additional costs for the household. Access to health care facilities is a basic right of the citizen of a country. It is an obligatory responsibility of the government to ensure health care facilities for livelihood development. Due to time and budget constraints only limited health-related information was collected which included family planning, sanitation, diseases suffered by family members and sources of drinking water. Health and sanitation information are presented in Tables 3.8 and 3.9.

Family planning: Rate of family planning used was higher for non-ethnic (51.1%) than ethnic (37.3%) families. Comparing the districts, the ethnic respondents of Khagrachari adopted highest level of contraceptive and it was the lowest in Bandarban (Table 3.8). Among the ethnic groups, the *Bawms* were the highest users of family planning may be due to higher education.

Table 3.8 Family planning and sanitation used by ethnic and non-ethnic groups in CHT

| Indicator | % of respondents | | | | | | | |
|-----------------------|------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | Chakma | Marma | Tan-changa | Tripura | Mro | Bawm | All ethnic | Non-ethnic |
| Bandarban | | | | | | | | |
| Family planning used | 12.1 | 5.6 | 5.7 | 11.1 | 68.4 | 77.8 | 30.1 | 26.7 |
| Sanitary latrine used | 54.5 | 69.4 | 5.7 | 80.6 | 7.9 | 72.2 | 48.4 | 30.0 |
| Khagrachari | | | | | | | | |
| Family planning used | 48.7 | 41.7 | - | 42.4 | - | - | 44.2 | 60.0 |
| Sanitary latrine used | 56.8 | 61.1 | - | 72.7 | - | - | 63.5 | 66.7 |
| Rangamati | | | | | | | | |
| Family planning used | 33.3 | 57.1 | 22.2 | - | - | - | 37.6 | 66.7 |
| Sanitary latrine used | 36.1 | 74.3 | 41.7 | - | - | - | 50.7 | 73.3 |
| All: | | | | | | | | |
| Family planning used | 31.4 | 34.8 | 14.0 | 26.8 | 68.4 | 77.8 | 37.3 | 51.1 |
| Sanitary latrine used | 49.1 | 68.3 | 23.7 | 76.7 | 7.9 | 72.2 | 54.2 | 56.7 |

Sanitary latrine: The use of sanitary latrine was slightly higher for non-ethnic households (56.7%) than for ethnic households. The use of sanitary latrine was found highest for non-ethnic households (73.3%) in Rangamati. Among the ethnic groups, the Tripuras were the highest users of sanitary latrine in Bandarban (Table 3.8).

Disease infestation: The study revealed that 73.33% non-ethnic respondent and 50% ethnic respondent reported that their family members suffered from malaria in last 12 months which statistically significantly varied between two groups in the CHT (Table 3.9). The infestation rate of malaria was found higher (90%) for non-ethnic family in Bandarban followed by Rangamati (76.67%). Among the ethnic groups, the highest percentages of Chakma and Mro family members suffered from malaria. The rate of incidence of malaria disease was lower in Khagrachari than in other two hill districts. The incidence of other diseases like chronic dysentery, gastric ulcer and typhoid seemed to be higher in the non-ethnic than in the ethnic group. But the disease of gastric ulcer prevailed severely among the ethnic and non-ethnic family members in the CHT. This difference was found statistically highly significant between two groups. The discussion reveals that the health sector should be given high priority for eradication of diseases like malaria and gastric ulcer in the CHT for sustainable livelihood security of hill people.

Table 3.9 Family members suffered from diseases in the last year in CHT region

| Location/ Respondent type | % of respondents | | | | |
|--|-------------------------------|---|---|-------------------------------|--|
| | Malaria | Arthritis | Dysentery | Gastric | Typhoid |
| Bandarban: | | | | | |
| Chakma (33) | 90.9 | 12.1 | 24.2 | 12.1 | 21.2 |
| Marma (36) | 83.3 | 16.7 | 8.3 | 2.7 | 11.1 |
| Tanchanga (35) | 57.1 | 20.0 | 8.5 | 10.0 | 5.4 |
| Tripura (36) | 55.5 | 7.0 | 11.1 | 13.8 | 13.8 |
| Mro (38) | 84.2 | 13.1 | 23.6 | 34.2 | 2.5 |
| Bawm (36) | 41.6 | 8.9 | 33.3 | 13.8 | 9.1 |
| All ethnic (214) | 68.8 | 12.9 | 18.2 | 14.4 | 10.5 |
| Non-ethnic (30) | 90.0 | - | 6.6 | 56.6 | 20.0 |
| Khagrachari: | | | | | |
| Chakma (37) | 29.7 | 5.4 | 30.0 | 26.2 | 5.4 |
| Marma (36) | 25.0 | 2.7 | 12.1 | 30.0 | 10.0 |
| Tripura (33) | 57.5 | - | 5.0 | 6.0 | 2.0 |
| All ethnic (106) | 37.4 | 2.7 | 15.7 | 20.7 | 5.8 |
| Non-ethnic (30) | 53.3 | 6.6 | 11.3 | 13.3 | 13.3 |
| Rangamati: | | | | | |
| Chakma (36) | 44.4 | 5.5 | 11.1 | 27.7 | 19.4 |
| Marma (36) | 57.1 | 8.5 | 14.2 | 28.5 | 08.5 |
| Tanchanga (35) | 27.7 | - | 6.1 | 18.0 | - |
| All ethnic (107) | 43.1 | 4.7 | 10.5 | 24.7 | 9.3 |
| Non-ethnic (30) | 76.6 | 3.3 | 30.0 | 26.6 | 10.0 |
| All: | | | | | |
| All ethnic (427) | 49.7 | 6.8 | 14.8 | 20.0 | 8.5 |
| Non-ethnic (90) | 73.3 | 2.0 | 15.9 | 32.2 | 14.4 |
| <i>t – statistics between ethnic versus non-ethnic</i> | 3.54*** (<i>p</i> <0.000) | 0.799 ^{ns} (<i>p</i> <0.425) | 0.285 ^{ns} (<i>p</i> <0.775) | 3.14*** (<i>p</i> <0.002) | 1.29 ^{ns} (<i>p</i> <0.197) |

*** Significant at 1% level of probability, ns= Not significant

Natural capital: Natural capital includes land, water, biodiversity, and environmental resources etc. In this study only land holding per household was discussed due to time constraints.

Land holdings: The average land size for ethnic and non-ethnic households were estimated at 1.34 and 0.44 ha per household respectively (Table 3.10). In all areas, Bawm family owned

the highest land followed by Tripura and Tanchanga. The ethnic households of Bandarban owned the highest farm size (1.67 ha) followed by Khagrachari and Rangamati. The differences in farm size between ethnic groups were found statistically highly significant in Bandarban and Rangamati but not significant in Khagrachari. On the other hand, the difference in farm size between the ethnic and non-ethnic groups in Rangamati was found statistically highly significant but for other two districts these were not statistically significant. Uddin *et al.* (2000) recorded highest farm size of 3.46 ha in Bandarban and lowest 1.04 ha in Rangamati. The comparison shows that land size is reducing day by day, may be due to population pressure.

Table 3.10 Average farm size (ha) of different ethnic and non-ethnic groups in CHT

| Location | Groups | | | | | | | |
|-------------|-------------------------------|----------------|-------------------|-----------------|-------------|--------------|-------------------|----------------|
| | Chakma (106) | Marma (107) | Tanchanga (71) | Tripura (70) | Mro (38) | Bawm (36) | All Ethnic | Non- Ethnic |
| Bandarban | 1.11 | 1.50 | 1.92 | 2.20 | 1.34 | 1.93 | 1.67 | 0.08 |
| | F-value: 5.668*** (p < .000) | | | | | | t= 21.37 p<4.25) | |
| Khagrachari | 1.45 | 1.38 | - | 1.38 | - | - | 1.40 | 1.16 |
| | F-value: 0.11 ^{ns} | | | | | | t= 1.34 (p<0.18) | |
| Rangamati | 1.46 | 0.17 | 1.21 | - | - | - | 0.95 | 0.07 |
| | F-value: 522.52*** (p < .000) | | | | | | t= 8.633 (p<.000) | |
| All | 1.34 | 1.01 | 1.56 | 1.79 | 1.34 | 1.93 | 1.34 | 0.44 |

*** Significant at 1% level, ns= Not significant

Physical capital: Physical capital enables people to pursue their livelihoods. It includes infrastructure, production equipment, reproducible goods, energy and other means of livelihoods. A brief description on physical capital has been made in the following sections.

Housing: Housing pattern is one of the important indicators of living standard of human beings. Housing was classified into three types. These are i) *Jhupri*: refers to the house for which wall is made of fence/straw/bamboo, floor is made of bamboo and roof made of straw; ii) *Katcha*: refers to the house for which wall and floor are made of mud and roof is made of straw, tin or CI sheet; and iii) *Katcha-Pucca*: refers to the house for which wall made of brick, cement and floor and roof is made of tin or CI sheet. Most of the ethnic minorities were found to live in *Jhupri* type housing (58.9%) followed by *Kacha* housing (33.7%) (Table 3.11). For non-ethnic settlers 64.4% households live in *Jhupri* type housing and 30.0% households in *Kacha* houses. Results revealed that most of the ethnic and non-ethnic settlers were living in the *Jhupri* house and their living standard was very poor but these differences were not found statistically significant.

Table 3.11 Housing types among groups and locations

| Respondent type | % of households | | | Total |
|--|---|---|-------------------|-------------------|
| | Jhupri | Kancha | Kancha-Pucca | |
| Bandarban: | | | | |
| Chakma (33) | 81.8 | 18.2 | - | 100 |
| Marma (36) | 86.1 | 5.6 | 8.3 | 100 |
| Tanchanga (35) | 94.3 | 5.7 | - | 100 |
| Tripura (36) | 88.9 | 11.1 | - | 100 |
| Mro (38) | 28.9 | 71.1 | - | 100 |
| Bawm (36) | 33.3 | 66.7 | - | 100 |
| <i>All ethnic (214)</i> | <i>68.9</i> | <i>29.7</i> | <i>1.4</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | <i>73.3</i> | <i>20.0</i> | <i>6.7</i> | <i>100</i> |
| Khagrachari: | | | | |
| Chakma (37) | 51.3 | 27.0 | 22.0 | 100 |
| Marma (36) | 63.9 | 30.6 | 5.1 | 100 |
| Tripura (33) | 87.9 | 9.1 | 3.0 | 100 |
| <i>All ethnic (106)</i> | <i>67.7</i> | <i>22.2</i> | <i>9.4</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | <i>73.3</i> | <i>20.0</i> | <i>6.7</i> | <i>100</i> |
| Rangamati: | | | | |
| Chakma (36) | 30.6 | 58.3 | 11.1 | 100 |
| Marma (36) | 38.6 | 42.9 | 18.6 | 100 |
| Tanchanga (35) | 50.0 | 47.2 | 3.8 | 100 |
| <i>All ethnic (107)</i> | <i>40.0</i> | <i>49.3</i> | <i>11.0</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | <i>46.7</i> | <i>50.0</i> | <i>3.3</i> | <i>100</i> |
| All: | | | | |
| <i>All ethnic (427)</i> | <i>58.9</i> | <i>33.7</i> | <i>7.3</i> | <i>100</i> |
| <i>Non-ethnic (90)</i> | <i>64.4</i> | <i>30.0</i> | <i>5.5</i> | <i>100</i> |
| <i>t-statistics (Ethnic Vs Non-ethnic)</i> | <i>0.49^{ns} (p < 0.612)</i> | <i>0.08^{ns} (p < 0.932)</i> | - | - |

ns= not significant

Livestock and poultry: Livestock and poultry are important physical assets for livelihood assessment. They may contribute to enhance food security and provide nutritional security. Table 3.12 shows that more than 65% ethnic household reared hen while it was 46.6 % for non- ethnic in the CHT. In the districts, highest 65.9 % ethnic household in Rangamati reared hen followed by Bandarban (65.4%) and Khagrachari (64.9 Most of the households reared hens and it was the common for both groups and locations. The differences in reared hens between the ethnic and non-ethnic groups were found statistically highly significant ($p < .000$). Besides this, pigs, goats, cows and ducks were reared by the households. In that case, the highest percentage of households reared pig in Bandarban (43.78%), goats (28.04%) in Rangamati and cows (66.67%) in Khagrachari (non-ethnic) districts. Among the ethnic groups, the highest percentage of the Mro household reared pig followed by *the Marma* in Rangamati. The highest percentage of *the Tanchanga* household (36.11%) reared goat in Rangamati and *Marma* households reared cows (63.89%) in Khagrachari. The differences in reared cows and duck between the ethnic and non-ethnic households were tending towards statistically significant: p-value lies 0.05 to 0.10. Uddin *et al.* (2000) reported that per capita number of pig, goats and poultry population was 0.35, 0.20 and 1.52 in CHT.

Table 3.12 Livestock and poultry owned by sample households at CHT region

| Respondent type | Average number per household | | | | |
|--|------------------------------|---|--------------------------------------|---|---------------------------------------|
| | Pig | Goats | Cows | Hen | Duck |
| Bandarban: | | | | | |
| Chakma (33) | - | - | - | 8.3 (51.5) | - |
| Marma (36) | 2.2 (69.4) | 0.6 (22.2) | 2.5 (58.3) | 9.5 (77.7) | - |
| Tanchanga (35) | 0.5 (40.0) | 1.7 (28.6) | 0.1 (5.7) | 14.8 (97.1) | 0.06 (2.8) |
| Tripura (36) | 0.7 (38.8) | 0.9 (25.0) | 0.8 (30.5) | 4.9 (63.8) | - |
| Mro (38) | 5.7 (92.1) | 1.5 (31.6) | 0.5 (18.4) | 8.3 (84.2) | 0.2 (10.5) |
| Bawm (36) | 0.6 (22.2) | 0.1 (2.8) | 0.1 (8.3) | 7.0 (83.3) | - |
| <i>All ethnic (214)</i> | <i>1.6 (43.7)</i> | <i>0.7 (18.4)</i> | <i>0.6 (17.3)</i> | <i>7.5 (65.4)</i> | <i>0.04 (1.9)</i> |
| <i>Non-ethnic (30)</i> | - | <i>0.1 (6.6)</i> | <i>0.3 (13.3)</i> | <i>1.6 (20.0)</i> | - |
| Khagrachari: | | | | | |
| Chakma (37) | 0.08 (8.1) | 0.3 (8.1) | 0.7 (18.9) | 3.5 (35.1) | 0.03 (2.7) |
| Marma (36) | 0.1 (2.7) | 1.3 (33.3) | 2.1 (63.8) | 5.3 (75.0) | 0.3 (25.0) |
| Tripura (33) | 0.3 (33.3) | 0.9 (24.2) | 1.7 (57.5) | 9.7 (84.8) | 2.8 (2.7) |
| <i>All ethnic (106)</i> | <i>0.2 (14.7)</i> | <i>0.8 (21.8)</i> | <i>1.5 (46.7)</i> | <i>6.2 (64.9)</i> | <i>1.0 (1.0)</i> |
| <i>Non-ethnic (30)</i> | - | <i>0.7 (23.3)</i> | <i>2.7 (66.6)</i> | <i>7.1 (63.3)</i> | <i>0.03 (0.03)</i> |
| Rangamati: | | | | | |
| Chakma (36) | 0.7 (41.6) | 0.6 (19.4) | 0.7 (27.7) | 9.4 (69.4) | 0.1 (2.7) |
| Marma (36) | 0.6 (34.2) | 0.6 (28.5) | 0.4 (22.8) | 6.5 (71.4) | 1.5 (40.0) |
| Tanchanga (35) | 0.3 (11.1) | 1.3 (36.1) | 0.9 (36.1) | 5.7 (61.1) | 0.4 (13.8) |
| <i>All ethnic (107)</i> | <i>0.6 (29.0)</i> | <i>0.8 (28.0)</i> | <i>0.7 (28.9)</i> | <i>7.2 (67.3)</i> | <i>0.6 (18.8)</i> |
| <i>Non-ethnic (30)</i> | - | <i>0.8 (20.0)</i> | <i>0.9 (33.3)</i> | <i>2.8 (56.6)</i> | <i>0.7 (10.0)</i> |
| All: | | | | | |
| <i>All ethnic (427)</i> | <i>0.8 (29.2)</i> | <i>0.7 (22.7)</i> | <i>0.9 (31.0)</i> | <i>6.9 (65.9)</i> | <i>0.5 (7.2)</i> |
| <i>Non-ethnic (90)</i> | - | <i>0.5 (16.6)</i> | <i>1.3 (37.7)</i> | <i>3.8 (46.6)</i> | <i>0.2 (3.4)</i> |
| <i>t – statistics (ethnic vs non-ethnic)</i> | - | <i>1.11^{ns}</i> <i>(p < 0.266)</i> | <i>1.65*</i> <i>(p < 0.10)</i> | <i>3.64***</i> <i>(p < 0.000)</i> | <i>1.65*</i> <i>(p < 0.097)</i> |

Figures in parentheses indicate percent farmer responded

*** and * indicate significant at 1% and 10% level, ns= not significant

Agricultural equipment: Agricultural equipments are one kind of physical assets, generally used for producing agricultural produces that might ensure food security at household level. The respondents used various types of agricultural equipment such as spade, sprayer, baskets, dao(cutter), kaste (Sickle) and hoe. It is found that among equipments Dao, Spade and Baskets were more important for their daily life as these were used by the households in their farming activities. Agriculture equipments owned by the households varied significantly across the groups and locations (Table 3.13).

Table 3.13 Agricultural equipment owned by sample households in CHT

| Respondent type | Percent Household owning | | | | | |
|----------------------------|--------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | Spade | Sprayer | Baskets | Dao | Kaste | Hoe |
| <i>Bandarban:</i> | | | | | | |
| Chakma (33) | 84.8 | - | 93.9 | 93.9 | 27.2 | 87.8 |
| Marma (36) | 83.3 | 33.3 | 83.3 | 83.3 | 27.7 | 69.4 |
| Tanchanga (35) | 77.1 | 05.7 | 100.0 | 100.0 | 02.8 | 62.8 |
| Tripura (36) | 88.8 | 02.7 | 100.0 | 86.1 | 13.8 | 38.8 |
| Mro (38) | 100.0 | 47.3 | 100.0 | 97.3 | 94.7 | 36.8 |
| Bawm (36) | 100.0 | 11.1 | 100.0 | 94.4 | 02.7 | 83.3 |
| <i>All ethnic (214)</i> | <i>76.3</i> | <i>16.7</i> | <i>96.2</i> | <i>92.5</i> | <i>28.2</i> | <i>63.2</i> |
| <i>Non-ethnic (30)</i> | <i>80.0</i> | <i>-</i> | <i>-</i> | <i>86.6</i> | <i>-</i> | <i>60.0</i> |
| <i>Khagrachari:</i> | | | | | | |
| Chakma (37) | 48.6 | - | 35.1 | 54.0 | 21.6 | 10.8 |
| Marma (36) | 88.8 | 13.8 | 38.8 | 83.3 | 38.8 | 38.8 |
| Tripura (33) | 81.8 | 6.0 | 45.4 | 75.7 | 57.5 | 66.6 |
| <i>All ethnic (106)</i> | <i>73.1</i> | <i>6.6</i> | <i>39.8</i> | <i>71.0</i> | <i>39.3</i> | <i>38.7</i> |
| <i>Non-ethnic (30)</i> | <i>93.3</i> | <i>10.0</i> | <i>23.3</i> | <i>93.3</i> | <i>40.0</i> | <i>43.3</i> |
| <i>Rangamati:</i> | | | | | | |
| Chakma (36) | 100.0 | - | 100.0 | 86.1 | 2.7 | 88.8 |
| Marma (36) | 80.0 | - | 54.2 | 82.8 | - | 68.5 |
| Tanchanga (35) | 91.6 | 25.0 | 58.3 | 86.1 | 22.2 | 55.5 |
| <i>All ethnic (107)</i> | <i>90.5</i> | <i>8.3</i> | <i>70.8</i> | <i>85.0</i> | <i>8.3</i> | <i>71.0</i> |
| <i>Non-ethnic (30)</i> | <i>53.3</i> | <i>-</i> | <i>-</i> | <i>70.0</i> | <i>-</i> | <i>40.0</i> |
| <i>All:</i> | | | | | | |
| <i>All ethnic (427)</i> | <i>80.0</i> | <i>10.5</i> | <i>68.9</i> | <i>82.8</i> | <i>25.3</i> | <i>57.6</i> |
| <i>Non-ethnic (90)</i> | <i>75.5</i> | <i>3.3</i> | <i>7.7</i> | <i>83.3</i> | <i>13.3</i> | <i>47.7</i> |

Modern amenities: Modern amenities owned by the households are important indicators of living standards. There are various types of modern amenities namely mobile phone, television, radio, sowing machine, clock etc. It was found that 31.1% ethnic and 38.9% non-ethnic households had mobile phones; 29.87% ethnic and 26.66% non-ethnic had a television set and 14.47% ethnic and 6.66% non-ethnic had radio sets (Table 3.14). Some of the ethnic and non-ethnic households also had a sewing machine and a clock. Households in Rangamati used more modern amenities compared to those of Bandarban and Khagrachari. The differences in owning radio between the ethnic and non-ethnic groups were found statistically significant ($p < .008$) but other modern amenities owned by the households did not vary significantly among the groups and locations.

Table 3.14 Modern amenities occupied by sample households among groups and locations

| Respondent type | Percent Households owning | | | | |
|--|---|---|--|--|---|
| | Mobile | Television | Radio | Sewing machine | Clock |
| <i>Bandarban:</i> | | | | | |
| Chakma (33) | 18.1 | - | 18.1 | - | 18.1 |
| Marma (36) | 38.8 | 30.5 | 8.3 | 16.6 | 72.2 |
| Tanchanga (35) | 22.8 | 11.4 | 11.4 | - | 22.8 |
| Tripura (36) | 25.0 | 22.2 | 11.1 | 13.8 | 50.0 |
| Mro (38) | 31.5 | 34.2 | 44.7 | 15.7 | 57.8 |
| Bawm (36) | 58.3 | 30.5 | 8.3 | 55.5 | 83.3 |
| <i>All ethnic (214)</i> | <i>32.4</i> | <i>21.5</i> | <i>17.0</i> | <i>16.9</i> | <i>50.7</i> |
| <i>Non-ethnic (30)</i> | <i>33.3</i> | <i>20.0</i> | <i>-</i> | <i>6.6</i> | <i>33.3</i> |
| <i>Khagrachari:</i> | | | | | |
| Chakma (37) | 10.8 | 10.8 | 2.7 | 2.7 | 13.5 |
| Marma (36) | 27.7 | 30.5 | 13.8 | 11.1 | 30.5 |
| Tripura (33) | 12.1 | - | 15.1 | 9.0 | 24.2 |
| <i>All ethnic (106)</i> | <i>16.90</i> | <i>13.7</i> | <i>10.5</i> | <i>7.6</i> | <i>22.7</i> |
| <i>Non-ethnic (30)</i> | <i>36.6</i> | <i>10.0</i> | <i>10.0</i> | <i>6.6</i> | <i>36.6</i> |
| <i>Rangamati:</i> | | | | | |
| Chakma (36) | 19.4 | 30.5 | 13.8 | 5.5 | 66.6 |
| Marma (36) | 57.1 | 68.5 | 17.1 | 25.7 | 57.1 |
| Tanchanga (35) | 55.5 | 63.8 | 16.6 | 25.0 | 58.3 |
| <i>All ethnic (107)</i> | <i>44.0</i> | <i>54.3</i> | <i>15.9</i> | <i>18.7</i> | <i>60.7</i> |
| <i>Non-ethnic (30)</i> | <i>46.6</i> | <i>50.0</i> | <i>10.0</i> | <i>16.6</i> | <i>46.6</i> |
| <i>All:</i> | | | | | |
| <i>All ethnic (427)</i> | <i>31.1</i> | <i>29.8</i> | <i>14.5</i> | <i>14.4</i> | <i>44.7</i> |
| <i>Non-ethnic (90)</i> | <i>38.8</i> | <i>26.6</i> | <i>6.6</i> | <i>10.0</i> | <i>38.8</i> |
| <i>t - Statistics (ethnic vs non-ethnic)</i> | <i>1.34^{ns}</i> <i>(p < 0.181)</i> | <i>0.18^{ns}</i> <i>(p < 0.852)</i> | <i>2.67^{***}</i> <i>(p < 0.008)</i> | <i>1.407^{ns}</i> <i>(p < 0.161)</i> | <i>1.24^{ns}</i> <i>(p < 0.215)</i> |

*** indicate significant at 1% level, ns= not significant

Fruit and timber trees: Fruit and timber trees owned are also physical assets for livelihood security and lead to better nutritional security through consumption of fruits. Different types of fruit trees were observed in the study areas. It was observed that irrespective of ethnic group and location, most of the households owned at least one type of fruit tree. Fruit trees like mango, jackfruit, banana and papaya were commonly observed in most of the households. The average number of fruit trees per farm for ethnic minorities was recorded as 40 for mango, 16 for jackfruit, 95 for banana, 2 for pomelo, 15 for papaya, 8 for orange, 7 for litchi and 3 for guava (Table 3.15). The average number of fruit trees per farm for non-ethnic households were less in all the study areas compared to ethnic households. Uddin *et al.* (2000) recorded less number of fruit trees per farm for both ethnic and non-ethnic households indicating that the number of fruits trees increased over time.

Timber trees are valuable physical assets for households. It provides cash income for maintaining their livelihoods as well as ensuring food security. It was found that most of the ethnic households had segun, gamar/karoi, garjan and mahogany trees. The average number of timber trees per farm for ethnic households was recorded as 215 for segun, 67 for gamar/koroi and 10 for mahogany (Table 3.16). Number of garjan trees was very few and non-ethnic settlers generally owned very low number of timber trees.

Table 3.15 Fruit trees owned by sample households in CHT region

| Respondent type | Average number of trees per farm | | | | | | | | | | |
|---------------------|----------------------------------|------------|----------|----------|-----------|-----------|----------|------------|----------|-----------|----------|
| | Mango | Jack-fruit | Bana-na | Pum-melo | Papaya | Olive | Oran-ge | Tama-rind | Litchi | Jujube | Guava |
| Bandarban: | | | | | | | | | | | |
| Chakma | 3 (33) | 1 (15) | 24 (6) | - | 1 (36) | - | - | - | 0.12 (3) | - | - |
| Marma | 5 (50) | 3 (31) | 91 (17) | 47 (6) | 2 (6) | - | 0.26 (6) | 2 (44) | 0.08 (3) | 0.2 (3) | - |
| Tanchanga | 41 (71) | 27 (54) | 329 (74) | 1 (6) | 3 (6) | 1 (6) | 18 (17) | 0.3 (11) | 6 (26) | - | - |
| Tripura | 118 (81) | 23 (78) | 375 (81) | 4 (33) | 9 (31) | 2 (19) | 85 (58) | 1 (39) | 46 (39) | 3 (8) | 7 (25) |
| Mro | 87 (79) | 19 (68) | 164 (89) | - | 174 (68) | - | 3 (8) | 3 (24) | 0.36 (5) | 3 (8) | 14 (10) |
| Bawm | 306 (100) | 26 (100) | 239 (94) | 16 (39) | 30 (72) | 1 (11) | 2 (22) | 2 (56) | 4 (53) | 1.3 (50) | 15 (39) |
| <i>All ethnic</i> | 93 (69) | 16 (58) | 204 (60) | 4 (14) | 36.5 (36) | 0.6 (16) | 18 (18) | 1.4 (29) | 9 (21) | 1.27 (11) | 6 (12) |
| <i>Non-ethnic</i> | 2 (13) | - | 11 (17) | - | 3 (17) | - | - | - | - | - | - |
| Khagrachari: | | | | | | | | | | | |
| Chakma | 6 (40.5) | 37 (4) | 6 (15) | 16 (11) | 0.7 (11) | 0.05 (3) | 0.2 (3) | - | 2 (16) | - | 0.8 (97) |
| Marma | 38 (75.0) | 24 (64) | 55 (49) | 3 (33) | 2 (22) | 0.9 (22) | 4 (17) | 0.13 (14) | 16 (67) | 0.8 (3) | 0.1 (1) |
| Tripura | 14 (51.5) | 12 (48) | 10 (23) | 42 (15) | 0.7 (21) | 0.15 (.1) | 2 (30) | 1 (21) | 2 (27) | 0.5 (12) | 0.2 (85) |
| <i>All ethnic</i> | 19 (55.7) | 24 (51) | 9 (29) | 1 (20) | 1 (18) | 0.3 (10) | 2 (17) | 0.4 (12) | 7 (37) | 0.4 (5) | 1 (10) |
| <i>Non-ethnic</i> | 22 (80.0) | 23 (80) | 10 (33) | 0.5 (27) | 5 (53) | 1 (30) | 2 (27) | 1 (40) | 4 (57) | 2 (33) | 3 (27) |
| Rangamati: | | | | | | | | | | | |
| Chakma | 8 (83.3) | 4 (69) | 90 (78) | 0.6 (25) | 9 (58) | 0.02 (3) | 2 (17) | 0.1 (11) | 2 (33) | 2 (25) | 1 (25) |
| Marma | 3 (74.3) | 2 (63) | 10 (49) | 0.05 (6) | 2 (49) | 0.5 (40) | - | 0.02 (3) | 1 (54) | 0.08 (6) | 0.2 (11) |
| Tanchanga | 12 (61.1) | 21 (56) | 116 (50) | 0.6 (17) | 15 (36) | 2 (78) | 7 (25) | 0.4 (19) | 14 (36) | 3 (33) | 4 (28) |
| <i>All ethnic</i> | 8 (72.9) | 9 (63) | 72 (59) | 0.4 (16) | 9 (48) | 0.8 (23) | 3 (14) | 0.2 (11) | 6 (41) | 2 (21) | 2 (21) |
| <i>Non-ethnic</i> | 0.8 (23.2) | 0.9 (27) | 2 (20) | 0.1 (10) | 1 (13) | 0.1 (13) | 0.03 (3) | 0.1 (7) | 0.2 (13) | 1 (20) | 1 (20) |
| All: | | | | | | | | | | | |
| <i>All ethnic</i> | 40 (66) | 16 (57) | 95 (49) | 2 (16) | 15 (34) | 0.6 (13) | 8 (16) | 0.6 (17.3) | 7 (33) | 1 (13) | 3 (15) |
| <i>Non-ethnic</i> | 8 (34) | 8 (35) | 4 (18) | 0.2 (12) | 2 (22) | 0.6 (14) | 0.6 (10) | 0.3 (15.6) | 1 (32) | 1 (18) | 1 (16) |

Figures in parentheses indicate percent farmer responded

Table 3.16 Timber trees owned by sample households among groups and location

| Location/ Respondent type | Average number of trees per farm | | | |
|---------------------------|----------------------------------|-------------------|------------------|-------------------|
| | Segun | Garjan | Mahogany | Gamar /Koroi |
| Bandarban: | | | | |
| Chakma (33) | 123 (33.3) | - | - | 4 (21.2) |
| Marma (36) | 343 (27.8) | - | - | 85 (11.1) |
| Tanchanga (35) | 805 (57.1) | 1.4 (5.7) | - | 417 (22.9) |
| Tripura (36) | 745 (77.8) | 23 (36.1) | 0.4 (5.6) | 76 (50.0) |
| Mro (38) | 48 (36.8) | - | - | 62 (26.3) |
| Bawm (36) | 389 (91.7) | 0.8 (19.4) | 1.3 (22.2) | 182 (75.0) |
| <i>All ethnic (214)</i> | <i>407 (54.1)</i> | <i>4 (10.2)</i> | <i>0.3 (4.6)</i> | <i>138 (34.4)</i> |
| <i>Non-ethnic (30)</i> | - | - | - | - |
| Khagrachari: | | | | |
| Chakma (37) | 50 (35.1) | 2 (8.1) | 7 (10.8) | 9 (21.6) |
| Marma (36) | 37 (47.2) | 0.3 (5.6) | 7 (5.6) | 26 (50.0) |
| Tripura (33) | 11 (54.5) | 0.6 (12.1) | 0.1 (3.0) | 24 (45.4) |
| <i>All ethnic (106)</i> | <i>33 (45.6)</i> | <i>1 (8.6)</i> | <i>6 (6.5)</i> | <i>19 0 (39.)</i> |
| <i>Non-ethnic (30)</i> | <i>13 (2.7)</i> | <i>1 (6.7)</i> | <i>1 (13.3)</i> | <i>2 (20.0)</i> |
| Rangamati: | | | | |
| Chakma (36) | 509 (75.0) | 0.08 (5.6) | 1 (11.1) | 35 (19.4) |
| Marma (36) | 6 (51.4) | - | 0.3 (11.4) | 0.02 (2.9) |
| Tanchanga (35) | 96 (55.6) | - | 70 (44.4) | 95 (27.8) |
| <i>All ethnic (107)</i> | <i>204 (60.7)</i> | <i>0.02 (1.8)</i> | <i>24 (22.3)</i> | <i>43 (16.7)</i> |
| <i>Non-ethnic (30)</i> | <i>2 (16.7)</i> | - | - | - |
| All: | | | | |
| <i>All ethnic (427)</i> | <i>215 (53.5)</i> | <i>2 (6.9)</i> | <i>10 (11.1)</i> | <i>67 (30.0)</i> |
| <i>Non-ethnic (90)</i> | <i>5 (6.4)</i> | <i>0.3 (2.2)</i> | <i>0.3 (4.4)</i> | <i>0.6 (6.7)</i> |

Figures in parentheses indicate percent farmer responded

Financial capital: Financial capital includes income, savings, access to credit etc. Details are discussed in the following sections.

Income: The level of income indicates to some extent the standard of livelihood and status of food security existing among sample households. The last year's incomes earned from different sources by locations are presented in the Figures 3.1 to 3.3.

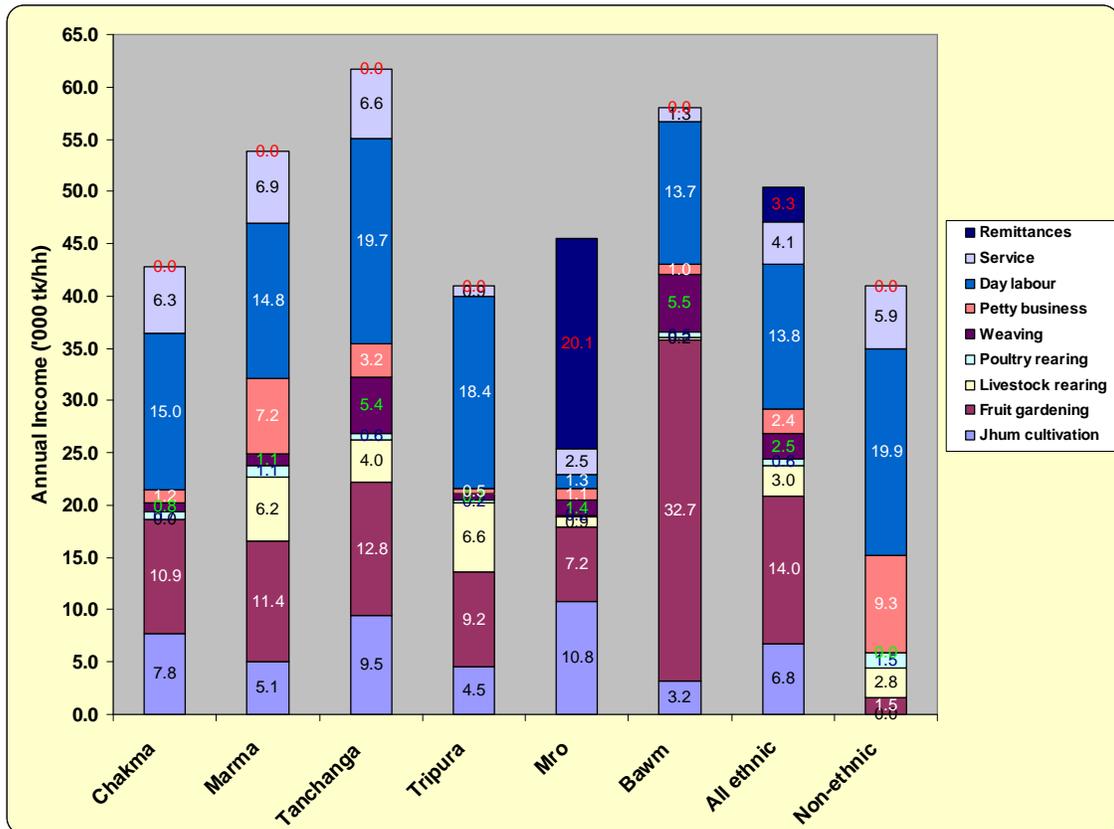


Figure 3.1 Annual income by sources among groups in Bandarban Hill District

Sources of income in Bandarban: It was revealed that average annual income of the ethnic households was Tk.50464 which came from different sources like *Jhum* farming, fruit gardening, day labourer, livestock rearing, weaving, service etc. Major part of income of the ethnic households came from three main sources like day labourer, fruit gardening and *Jhum* farming (Figure 3.1). It was observed that amount of annual income varied significantly with the ethnic groups. The highest annual income was recorded with the Tanchanga households (Tk.61693/hh) followed by Bawm and Marma. The lowest annual income was recorded with Tripura (Tk.40927/hh). Differences in the incomes between the ethnic groups were found statistically highly significant at 1% level of probability ($F= 20.297^{**}$ and $p < .000$).

Sources of income in Khagrachari: It was revealed that average annual income of the ethnic households was Tk.53306 which came from different sources like plain land agriculture, day labourer, and agriculture in plain land. On average, the major part of income of ethnic households came from two main sources: day labourer and plain land agriculture (Figure 3.2). It was observed that the amount of annual income varied significantly among ethnic groups. The highest annual income was recorded for Chakma households (Tk.61277/hh) followed by Marma. Differences in the incomes between the ethnic groups were found statistically significant at 5% level of probability ($F= 3.183^{**}$ and $p < .046$).

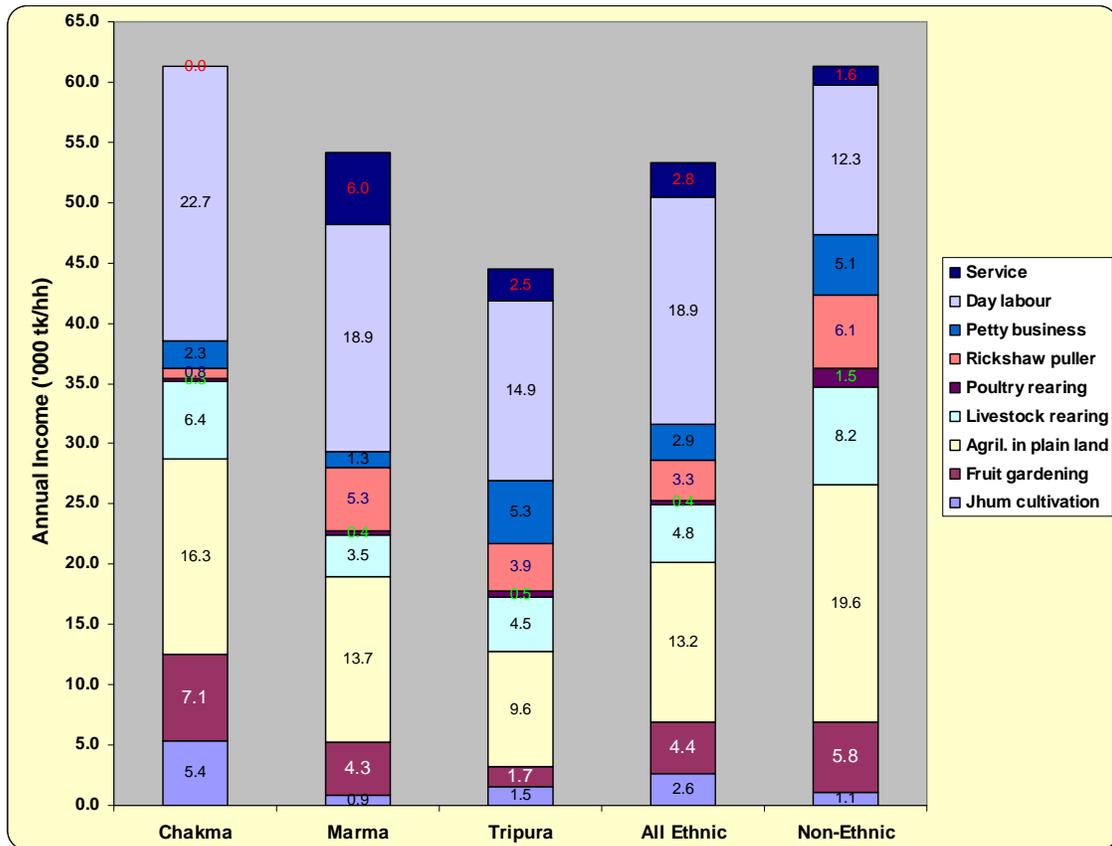


Figure 3.2 Annual income by sources among groups in Khagrachari Hill District

Sources of income in Rangamati: The average annual income of the ethnic households was Tk.45309 which came from different sources: day labour, petty business, service, fruit gardening, livestock rearing, weaving etc. On average, a major part of the income of ethnic households came from three main sources: day labour and service (Figure 3.3). It was calculated that the annual income varied insignificantly with the ethnic groups. The highest annual income was recorded for Marma households (Tk.54,024/hh) followed by Tanchanga (Tk.45,850/hh). It was also noted that day labour was a main source of income of all ethnic and non ethnic households.

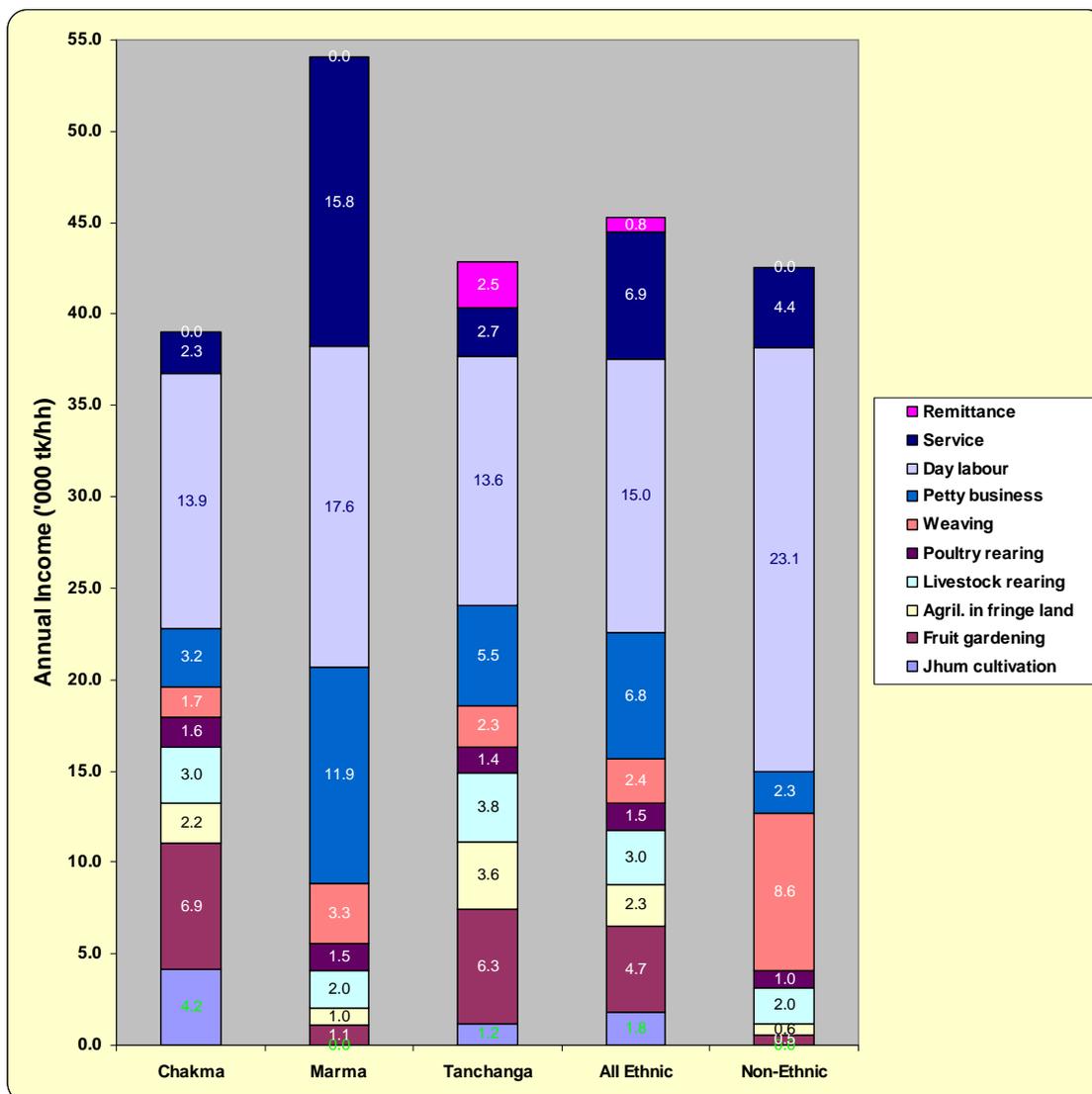


Figure 3.3 Annual income by sources among groups in Rangamati Hill District

Monthly per capita income: Table 3.17 provides monthly per capita income per household in the study areas. In all location, the average monthly per capita per household income was estimated at taka 814 for all ethnic which was higher than non-ethnic (tk.757). Both the figure was lower than national average. Also, the average per capita monthly incomes of households in all ethnic groups were found lower than national figure.

Table 3.17 Monthly per capita household incomes in the year of 2008

| Location | Monthly per capita household income (tk.) | | | | | | | |
|-------------|---|------------|------------|------------|------------|------------|------------|------------|
| | Chakma | Marma | Tanchanga | Tripura | Mro | Bawm | All Ethnic | Non-Ethnic |
| Bandarban | 763 | 924 | 1022 | 555 | 635 | 792 | 765 | 566 |
| Khagrachari | 940 | 935 | - | 633 | - | - | 827 | 866 |
| Rangamati | 746 | 1117 | 726 | - | - | - | 850 | 838 |
| All | 816 | 992 | 874 | 594 | 635 | 792 | 814 | 757 |

Note: National average in rural (2005) monthly per capita income (tk) = 1246 (HIES, 2007, Pp: 26)

Credit received: It was estimated that 47.4% ethnic households received micro credit amounting Tk.3699 for agriculture purposes only, while 40% non-ethnic household received micro credit amounting Tk.2988 in the last year. By district comparison, for ethnic households, the highest amount of credit was received by the households in Bandarban

(Tk.5279/hh) followed by Rangamati (Tk.3198/hh) and Khagrachari (Tk.2622/hh) (Table 3.18). It was found that among the ethnic minorities Mro households received more credit (Tk.6947/hh) followed by Bawm (Tk.4556/hh) and Tanchanga (Tk.4502/hh). The differences in credit received by different ethnic groups were statistically significant in Bandarban and Rangamati ($F= 3.62$; $p<0.004$ and $F= 2.724$; $p< 0.74$) may be due to more NGOs work in some areas than others, but this is insignificant in Khagrachari district.

Table 3.18 Credit received by sample households in the last year

| Location | Amount received (Tk/hh) | | | | | | | |
|--|------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|------------------------------------|------------------------------|
| | Chakma | Marma | Tanchanga | Tripura | Mro | Bawm | All Ethnic | Non-Ethnic |
| Bandarban | 7467 (45.5) | 3060 (41.7) | 6561 (94.3) | 3083 (36.1) | 6947 (86.8) | 4556 (27.8) | 5279 (55.4) | 633 (10.0) |
| Khagrachari | 2892 (35.1) | 3611 (50.0) | - | 1364 (21.2) | - | - | 2622 (35.4) | 6366 (60.0) |
| Rangamati | 2778 (55.5) | 4371 (65.7) | 2444 (33.3) | - | - | - | 3198 (51.5) | 1967 (50.0) |
| All | 4379 (45.4) | 3680 (52.5) | 4502 (63.8) | 2223 (28.65) | 6947 (86.8) | 4556 (27.8) | 3699 (47.4) | 2988 (40.0) |
| F- value among ethnic groups: 9.801*** (p <0 .000) | | | | | | | t = 0.84 ^{ns} (p <0.401) | |

Figure in the parenthesis indicates percent farmer responded,

*** indicate statistically significant at 1 % level of probability, ns = Not significant

3.1.6 Sources of potable water

The study revealed that 70% of non-ethnic and 46.7% of ethnic households used tube wells for drinking water (Table 3.19). On the other hand, 30.2% of the ethnic and 6.7% of non-ethnic households used natural spring for drinking water. Main source of drinking water for ethnic households was natural spring in Bandarban (59.9%), tube-well in Khagrachari (72%) and Rangamati (51.8%). On the other hand, non-ethnic households depended mostly on supply tap in Bandarban and tube-well in Khagrachari and Rangamati. A small number of ethnic households used water from ditches for drinking water due to unavailability of others source. The variation in using drinking water may be due to the differences in location and source.

Table 3.19 Source of drinking water in CHT region

| Source | Farmer responded (%) | | | | | | | |
|----------------|----------------------|------------|-------------|------------|-----------|------------|--------|------------|
| | Bandarban | | Khagrachari | | Rangamati | | All | |
| | Ethnic | Non-Ethnic | Ethnic | Non-Ethnic | Ethnic | Non-Ethnic | Ethnic | Non-Ethnic |
| Tube-well | 15.4 | 26.7 | 72.0 | 86.7 | 51.8 | 93.3 | 46.7 | 70.0 |
| Supply tap | 13.9 | 60.0 | - | - | - | - | 8.0 | 20.0 |
| Natural spring | 59.9 | 13.3 | 5.6 | 13.3 | 35.9 | - | 30.2 | 6.7 |
| Ditches | 10.8 | - | 22.4 | - | 12.3 | 6.7 | 15.1 | 3.3 |

3.1.7 Sources of lighting

Three sources of lighting were found in the study areas: electricity, solar energy and kerosene oil. The majority of the ethnic and non-ethnic households used kerosene oil for lighting in all the study areas. The highest percentages of ethnic households used kerosene for lighting in Khagrachari (80.8%) followed by Bandarban (65.5%). (Table 3.20) About 93.3% of non-ethnic households in Khagrachari and 63.3% of in Rangamati used kerosene for lighting (Table 3.20). On the other hand, use of electricity varied from 19.2 to 22.0% in different locations for ethnic households and 0% to 36.7% for non-ethnic households. Notably a good

number of ethnic households in Bandarban used solar energy with the support of NGOs. A few non-ethnic households in Khagrachari and ethnic households in Rangamati also used solar energy.

Table 3.20 Major sources of lighting in CHT region

| Source of lighting | Farmer responded (%) | | | | | | | |
|--------------------|----------------------|------------|-------------|------------|-----------|------------|--------|------------|
| | Bandarban | | Khagrachari | | Rangamati | | All | |
| | Ethnic | Non-Ethnic | Ethnic | Non-Ethnic | Ethnic | Non-Ethnic | Ethnic | Non-ethnic |
| Electricity | 20.6 | 35.7 | 19.2 | - | 22.0 | 36.7 | 18.6 | 28.3 |
| Solar Energy | 13.9 | - | - | 6.67 | 0.9 | - | 6.9 | - |
| Kerosene oil | 65.5 | 64.3 | 80.8 | 93.3 | 77.0 | 63.3 | 74.4 | 71.7 |

3.2 Food Security Status of Sample Households

3.2.1 Food requirement, availability and shortage

There are four sources through which households were able to meet their rice requirement. The sources are own production, purchase from the market, in kind wages and food aid from SSNP. In this study, food (rice) availability was estimated from own production due to unavailability of wage received as kind and small amount of food aid. Sometimes availability of rice from own production did not meet the household requirement. Therefore, they bought remaining amount of rice from the market but it is not included in the availability. In order to assess food security status at household level, it is important to know food requirements, availability and shortages that help formulating policy options for the betterment of the ethnic minorities in CHT.

Data of annual food requirement were collected from individual farmers on recall basis asking a simple question: How much rice is needed for whole family consumption per day? In the case of food availability data, total annual rice production in *Jhum* and plain land were added altogether. On average, per household per annum food (rice) requirement was estimated at 1.26 ton for ethnic and 1.01 ton for non-ethnic households in the study areas which was derived from per household per day (Table 3.21). Per household annual food requirement was found lower in Rangamati than other two districts due to smaller household size. On the other hand, food availability from own production was recorded to be 0.79 ton for ethnic and 0.14 ton for non-ethnic households which constituted 54.1 and 15.4% of total requirements, respectively. As a result, food (rice) shortage was found higher (0.87 ton) for non-ethnic and lower for ethnic households (0.49 ton) which constitutes 84.5 and 45.9%, respectively. The food requirement, availability and shortages varied significantly among groups and locations due to different sizes of land owned for rice production. Among the ethnic minorities, the highest amount of rice was available in the Mro family due to higher yield of rice from *Jhum*.

Table 3.21 Annual food (rice) requirement, availability and shortage in CHT region

| Location/ Respondent type | Rice (ton/hh/yr) | | |
|---------------------------|------------------|----------------------------------|--------------------|
| | Requirement | Availability from own production | Shortages |
| Bandarban: | | | |
| Chakma (33) | 1.04 | 0.18 (17.3) | 0.86 (82.7) |
| Marma (36) | 1.53 | 1.10 (71.9) | 0.43 (28.1) |
| Tanchanga (35) | 1.59 | 0.54 (30.2) | 1.05 (69.8) |
| Tripura (36) | 1.57 | 0.56 (35.7) | 1.01 (64.3) |
| Mro (38) | 1.44 | 1.43 (87.2) | 0.01 (14.0) |
| Bawm (36) | 1.48 | 0.27 (14.2) | 1.21 (85.6) |
| <i>All ethnic (214)</i> | <i>1.45</i> | <i>0.84 (48.3)</i> | <i>0.61 (51.7)</i> |
| <i>Non-ethnic (30)</i> | <i>1.19</i> | <i>0.014 (1.3)</i> | <i>1.18 (99.1)</i> |
| Khagrachari: | | | |
| Chakma (37) | 1.19 | 1.34 (112.6) | 0.67 (56.3) |
| Marma (36) | 1.34 | 0.74 (55.2) | 0.60 (44.8) |
| Tripura (33) | 1.76 | 1.31 (59.5) | 0.45 (40.5) |
| <i>All ethnic (106)</i> | <i>1.42</i> | <i>1.13 (61.1)</i> | <i>0.29 (38.9)</i> |
| <i>Non-ethnic (30)</i> | <i>0.98</i> | <i>0.35 (35.7)</i> | <i>0.63 (64.3)</i> |
| Rangamati: | | | |
| Chakma (36) | 0.75 | 0.68 (90.7) | 0.07 (9.3) |
| Marma (36) | 0.83 | 0.12 (14.5) | 0.71 (85.5) |
| Tanchanga (35) | 0.80 | 0.43 (53.8) | 0.37 (46.3) |
| <i>All ethnic (107)</i> | <i>0.79</i> | <i>0.41 (51.9)</i> | <i>0.38 (48.1)</i> |
| <i>Non-ethnic (30)</i> | <i>0.95</i> | <i>0.057 (8.8)</i> | <i>0.89 (90.8)</i> |
| All: | | | |
| All ethnic (427) | 1.26 | 0.79 (54.1) | 0.49 (45.9) |
| Non-ethnic (90) | 1.01 | 0.14 (15.4) | 0.87 (84.5) |

Figures in the parentheses indicate percentage

3.2.2 Production of *Jhum* crops

Different *Jhum* crops were found to be grown by the ethnic minorities. These crops were rice, maize, gourds, cucumber, chili, sesame, bean, brinjal, cotton, kaon, cassava, ginger, turmeric and banana. The number of *Jhum* crops varied among the ethnic groups and locations and the combination of crops depended on their preference and availability of seeds. It was found that the intensity of *Jhum* cultivation was higher in Bandarban than in the other two study districts. The yield of *Jhum* crops has been decreasing day by day due to low soil fertility (Miah and Islam, 2007). Although *Jhum* itself provokes environmental degradation, it is still being practiced by people to ensure their livelihood.

Rice is the most common crop in *Jhum* farming and cultivated in rainfed condition. Average rice yield was recorded 1.15 t/ha under *Jhum* cultivation which is much lower than national average of rice (2.73t/ha) (BBS, 2009) (Table 3.22). The highest yield of rice was estimated at 1.54 t/ha in Bandarban followed by Khagrachari (1.11 t/ha). Among the ethnic groups, the highest yield of rice was obtained by the Mro (2.29 t/ha) followed by the Chakma (1.71 t/ha) in Bandarban. It may be due to the Mro's was more dependent on *Jhum* cultivation. In all districts, the differences of yield of *Jhum* paddy were found statistically highly significant. The same results were found in Bandarban and Rangamati. Almost all the farmers used local variety of *Jhum* paddy. The used varieties were three to six types of which some varieties were sticky and coarse. The seed rate of rice varied from 49 to 56 kg/ha in different locations.

Table 3.22 Yield of rice under *Jhum* cultivation in CHT region

| Ethnic groups | Yield (ton/ha) | | | |
|-----------------------------|-------------------------|-----------------------------------|------------------------|--------------------------|
| | Bandarban | Khagrachari | Rangamati | All |
| Chakma | 1.71 | 0.64 | 1.10 | 1.15 |
| Marma | 1.25 | 1.27 | - | 1.26 |
| Tanchanga | 0.90 | - | 0.49 | 0.70 |
| Tripura | 1.02 | 1.41 | - | 1.22 |
| Mro | 2.29 | - | - | 2.29 |
| Bawm | 1.25 | - | - | 1.25 |
| All | 1.54 | 1.11 | 0.80 | 1.15 |
| F- value (P - value) | 57.321*** (.000) | 0.601^{ns} (0.550) | 26.297***(.000) | 114.756***(0.000) |

Source: Field Survey, 2009, *** Significant at 1% level of probability (p < .000), ns= not significant

Other than rice, among the 17 crops identified in *Jhum* farming, the highest yield was obtained from yard long bean (48.42 t/ha) followed by turmeric (0.858 t/ha) and Ginger (0.231 t/ha) (Table 3.23). The yield of these crops was found higher in Rangamati compared to other two locations. It might be due to lower combination of *Jhum* crops in that area. It was observed that in Rangamati only four *Jhum* crops such as rice, bean, ginger and turmeric were cultivated in the same plot whereas in Bandarban more than seven crops were found. The yield of *Jhum* crops varies on the amount of seed used per plot.

Table 3.23 Yield of different *Jhum* crops in CHT region

| Sl. no. | <i>Jhum</i> crops | Yield (t/ha) | | | |
|---------|----------------------|--------------|-----------|-------------|--------|
| | | Bandarban | Rangamati | Khagrachari | All |
| 1 | Maize | 0.143 | 0.017 | 0.026 | 0.062 |
| 2 | Marfa (Cucumber) | 0.181 | 0.059 | 0.071 | 0.104 |
| 3 | Chinal (Cucumber) | 0.001 | - | 0.505 | 0.001 |
| 4 | White gourd | 0.158 | 0.004 | 0.028 | 0.063 |
| 5 | Til (Sesame) | 0.012 | 0.007 | 0.025 | 0.015 |
| 6 | Chilli | 0.163 | 0.095 | 0.022 | 0.094 |
| 7 | Yard long bean | 34.71 | 73.75 | 37.08 | 48.52 |
| 8 | Brinjal | 0.037 | 0.054 | 0.008 | 0.033 |
| 9 | Cotton | 0.068 | - | 0.0015 | 0.023 |
| 10 | Sweet gourd | 0.197 | 0.181 | 0.020 | 0.133 |
| 11 | Kaon | 0.008 | 0.001 | 0.002 | 0.004 |
| 12 | Cassava | 0.027 | 0.016 | 0.007 | 0.017 |
| 13 | Bottle gourd | 0.001 | 0.151 | 0.002 | 0.051 |
| 14 | Country bean | 0.002 | - | 0.008 | 0.003 |
| 15 | Ginger | 0.167 | 0.510 | 0.014 | 0.231 |
| 16 | Turmeric | 0.288 | 1.449 | 0.84 | 0.858 |
| 17 | Banana (no.of bunch) | 109.21 | 165.70 | 48.76 | 107.89 |

3.2.3 Benefit received from social safety net program

Social Safety Net Programs (SSNPs) are generally devoted to the hardcore poor. A number of SSNPs are being operated in the country. In the study, VGD, VGF, Old age allowances, widow allowances and relief provided by the NGOs were considered on the basis of responses made by the sample households. Benefit received from social safety net program varied among the groups and locations. Among the safety net programs, VGF covered highest percentage of households in the CHT. Benefit received by the non-ethnic households was found higher than ethnic in all types of social safety net program except relief and widow allowances (Table 3.24).

Table 3.24 Various social safety net programs in the study areas in the last 3 years

| Respondents | Percent household received benefits from | | | | |
|----------------------------|--|-------------|--------------------|------------------|----------------|
| | VGD | VGF | Old age allowances | Widow allowances | Relief by NGOs |
| <i>Bandarban:</i> | | | | | |
| Chakma (33) | 3.0 | - | - | - | 3.0 |
| Marma (36) | 11.1 | 5.5 | - | - | 27.7 |
| Tanchanga (35) | 11.4 | - | - | - | 42.8 |
| Tripura (36) | 13.8 | 47.2 | - | 2.7 | 58.3 |
| Mro (38) | 7.8 | 2.6 | 21.1 | 10.5 | 86.8 |
| Bawm (36) | 25.0 | 66.6 | - | - | - |
| <i>All ethnic (214)</i> | <i>12.0</i> | <i>20.3</i> | <i>3.5</i> | <i>2.2</i> | <i>36.4</i> |
| <i>Non-ethnic (30)</i> | <i>26.6</i> | <i>46.6</i> | <i>-</i> | <i>-</i> | <i>10.0</i> |
| <i>Khagrachari:</i> | | | | | |
| Chakma (37) | 18.9 | 43.2 | 2.7 | 5.4 | - |
| Marma (36) | 8.3 | 5.5 | 5.5 | - | 33.3 |
| Tripura (33) | - | 30.3 | - | 6.1 | 3.0 |
| <i>All ethnic (106)</i> | <i>9.0</i> | <i>26.3</i> | <i>2.7</i> | <i>3.8</i> | <i>12.1</i> |
| <i>Non-ethnic (30)</i> | <i>50.0</i> | <i>13.3</i> | <i>-</i> | <i>-</i> | <i>20.0</i> |
| <i>Rangamati:</i> | | | | | |
| Chakma (36) | 36.1 | 66.6 | 13.8 | - | 41.6 |
| Marma (36) | 20.0 | 37.1 | 8.5 | - | 2.8 |
| Tanchanga (35) | 02.7 | 13.8 | - | - | 5.5 |
| <i>All ethnic (107)</i> | <i>19.6</i> | <i>39.2</i> | <i>7.4</i> | <i>-</i> | <i>16.6</i> |
| <i>Non-ethnic (30)</i> | <i>6.6</i> | <i>63.3</i> | <i>16.6</i> | <i>3.3</i> | <i>16.6</i> |
| <i>All:</i> | | | | | |
| <i>All ethnic (427)</i> | <i>13.5</i> | <i>28.6</i> | <i>4.5</i> | <i>2.0</i> | <i>21.7</i> |
| <i>Non-ethnic (90)</i> | <i>27.7</i> | <i>41.1</i> | <i>5.5</i> | <i>-</i> | <i>15.5</i> |

3.2.4 Level of food consumption

Every food item has its own nutritional value (i.e. calorie, protein, iron etc.) and the nutritional values vary from food item to food item. People take different food items to balance their calorie, protein and other nutritional need. But, in Bangladesh, a large segment of people fails to consume necessary food items at the required level. This inability may be partly attributed to poverty (BBS, 2007). The level of food consumption might be different within groups and locations. The food intake data were collected for the past three days on recall basis.

Per capita per day aggregate food intake: Selected food items were taken into consideration in working out per capita per day intake for the sample households. The average quantity of food consumed was calculated at 876 gm by ethnic and 816 gm by non-ethnic (Table 3.25). The national average was 947.8 grams in the year of 2005 (BBS, 2007). Average food intake by locations for ethnic was recorded at 903, 913 and 812 gm/capita/day for Bandarban, Khagrachari and Rangamati, respectively. Highest food intake was recorded by the Chakma's and the Marma's in Khagrachari district may be due to higher amount of rice availability in that district which shown in table 3.21. The differences in food intake between ethnic groups were found statistically significant in Bandarban and Rangamati district.

Table 3.25 Per capita per day aggregate food intake by groups and locations in CHT

| Location | Food intake (gm/capita/day) | | | | | | | |
|-------------|---|-------|-----------|---------|-----|------|-------------------------|------------|
| | Chakma | Marma | Tanchanga | Tripura | Mro | Bawm | All Ethnic | Non-Ethnic |
| Bandarban | 803 | 913 | 941 | 902 | 925 | 934 | 903 | 798 |
| | F -value between ethnic groups = 17.590*** (p < 0.000) | | | | | | t = 0.189 ^{ns} | |
| Khagrachari | 982 | 919 | - | 838 | - | - | 913 | 872 |
| | F -value between ethnic groups = 2.14 ^{ns} | | | | | | t = 2.03** | |
| Rangamati | 799 | 827 | 809 | - | - | - | 812 | 778 |
| | F -value between ethnic groups = 17.299*** (p < 0.000) | | | | | | t = 0.902 ^{ns} | |
| All | 861 | 886 | 875 | 870 | 925 | 934 | 876 | 816 |
| | F -value between ethnic groups in all locations = 13.098*** (p < 0.000) | | | | | | t = 0.875 ^{ns} | |

*** and ** indicate significant at 1% and 5% level of probability, ns = not significant statistically

Source: Field Survey, 2009.

Item wise intake of food: Per capita per day intake of major food items in different locations and groups have been presented in Table 3.26. The selected food items were cereal (rice), pulses, fish, meat, egg, milk, potato, nappi (shrimp paste) and vegetables (tomato, brinjal, lady's finger, cucumber, radish, leafy vegetables etc.)

Per capita per day rice intake was recorded at 436.5 gm for ethnic and 421.1 gm for non-ethnic group which were lower than national average of 439.6 gm (BBS, 2007). Irrespective of ethnic groups, higher rice intake was recorded in Khagrachari (469.5 gm/capita/day) followed by Rangamati (433.9 gm/capita/day) and Bandarban (406.0 gm/capita/day) which was lower than national average (Table 3.26). In the ethnic groups, the highest amount of rice intake was 487.0 gm for the Marma followed by Chakma in Khagrachari and the Tanchangyas in Rangamati. The consumption of pulses was recorded to be 9.3 gm/capita/day for ethnic and 10.5 gm/capita/day for non-ethnic which seems to be lower than the national average of 14.2 gm/capita/day (BBS, 2007). The highest amount of pulses consumed was 15.7 gm by the Tripura in Bandarban followed by the Chakma in Khagrachari (Table 3.26).

The consumption of fish was recorded at 37.2 gm for ethnic and 32.9 gm for non-ethnic group which was lower than national average of 42.1 gm (BBS, 2007). Among the districts, the highest amount of fish consumed was 41.9 gm/capita/day by the ethnic group in Rangamati followed by 37.2 gm/capita/day by the ethnic group in Bandarban (Table 3.26). The consumption of meat was recorded to be 16.7 gm/capita/day for all ethnic in the CHT which is slightly higher than national average. This may be due to consumption of more wild animals like pig by the ethnic household. Meat consumption was 14.7 gm/capita/day for non-ethnic which is lower than the national average of 15.6 gm/capita/day (BBS, 2007). The highest amount of meat consumed was 18.0 gm/capita/day by ethnic in Bandarban followed by those in Rangamati (Table 3.26).

Per capita per day consumption of egg was estimated at 4.6 gm for ethnic that was lower than national average and 5.5 gm for non-ethnic which was slightly higher than national average of 5.2 gm (Table 3.26). Highest consumption of egg was recorded in Rangamati for non-ethnic (6.4 gm/capita/day) while it was lowest in Khagrachari for the ethnic groups (4.1 gm/capita/day). Among the ethnic groups, highest amount of egg was consumed by Marma in Rangamati (6.2 gm/capita/day) followed by the Bawm in Bandarban (6.0 gm/capita/day). Per capita per day consumption of milk was recorded at 16.2 ml for ethnic and 13.5 ml for non-ethnic groups which was lower than the national average of 32.4 ml (Table 3.26). In Bandarban the average amount consumed by the ethnic population is very limited and non-ethnic people were found not to consume any milk due to scarcity of milk in their locality. Comparatively higher amounts of milk were found to be consumed in Khagrachari than in other two locations. It may be due to more cattle rearing in Khagrachari.

Potato consumption was recorded at 54.2 and 55.7 gm/capita/day for ethnic and non-ethnic, respectively, which was lower than national average of 63.3 gm/capita/day (Table 3.26). Among the districts, the highest amount of potato consumption was estimated at 64.9

gm/capita/day for non-ethnic people in Khagrachari while it was found to be the lowest at 41.9 gm/capita/day for non-ethnic people in Rangamati. As for differences between ethnic groups, the highest amount of potato was consumed by the Tripura's (67.5 gm/capita/day) and the lowest amount was consumed by the Tanchangya's (41.9 gm/capita/day) in Rangamati.

Per capita vegetables consumption was recorded at 138.5 and 118.0 gm/capita/day for ethnic and non-ethnic, respectively in the CHT which was lower than national average of 157 gm/capita/day (Table 3.26). Comparing the districts, the highest amount of vegetables was consumed by the ethnic minorities in Bandarban(163.0 gm/capita/day) and the lowest amount of vegetables consumption was recorded (108.1 gm/capita/day)by the ethnic group in Rangamati. Comparing ethnic groups, the Chakma consumed highest amount (192.8 gm/capita/day) and less amount of vegetables were consumed by the Tanchanga (67.6 gm/capita/day) in Rangamati. The shrimp paste (locally called nappi) is a popular and regularly consumed food item among the ethnic households. It is usually consumed with rice and used as an alternative to edible oil. Average consumption of shrimp paste was recorded at 16.7 gm/capita/day with some variation with ethnic groups and locations. Non-ethnic populations were not found to consume this food. The ethnic people sometimes took some other indigenous food with fewer amounts which are not included in this study. The above discussions revealed that food consumption pattern among the ethnic and non-ethnic groups varied significantly.

Table 3.26 Per capita per day food intake of selected food items in CHT region

| Respondents | Food intake (gm/capita/day) | | | | | | | | |
|----------------------|-----------------------------|--------|------|------|-----|-----------|--------|------------|-------|
| | Rice | Pulses | Fish | Meat | Egg | Milk (ml) | Potato | Vegetables | Nappi |
| Bandarban: | | | | | | | | | |
| Chakma | 416.9 | 4.31 | 24.9 | 11.7 | 5.2 | - | 51.5 | 192.8 | 6.3 |
| Marma | 405.3 | 5.2 | 32.4 | 15.5 | 4.3 | 8.8 | 63.5 | 187.7 | 32.1 |
| Tanchanga | 394.7 | 1.5 | 45.4 | 18.8 | 3.5 | 6 | 53.9 | 171.0 | 15.3 |
| Tripura | 400.7 | 15.7 | 44.9 | 21 | 4.8 | 12.9 | 67.5 | 123.3 | 18.4 |
| Mro | 412.8 | 7.3 | 34.3 | 16.9 | 4.2 | - | 55.4 | 126.9 | 21.1 |
| Bawm | 405.3 | 3.4 | 41.2 | 24.2 | 6.0 | - | 49.8 | 176.1 | 27.7 |
| All ethnic | 406.0 | 6.2 | 37.2 | 18.0 | 4.7 | 4.6 | 56.9 | 163.0 | 20.2 |
| Non-ethnic | 413.1 | 9.4 | 18.5 | 15.6 | 4.6 | - | 53.8 | 114.9 | - |
| Khagrachari: | | | | | | | | | |
| Chakma | 483.6 | 14.5 | 51.3 | 17.1 | 4.9 | 17.8 | 47.9 | 163.4 | 25.2 |
| Marma | 487.0 | 9.7 | 19.8 | 12.2 | 4.2 | 35.2 | 52.4 | 117.9 | 12.9 |
| Tripura | 438.0 | 11.9 | 26.6 | 16.1 | 3.3 | 42.4 | 58.9 | 151.9 | 10.3 |
| All ethnic | 469.5 | 12.0 | 32.6 | 15.1 | 4.1 | 31.8 | 53.1 | 144.4 | 16.1 |
| Non-ethnic | 444.9 | 8.6 | 35.4 | 13.9 | 5.4 | 29.6 | 64.9 | 129.7 | - |
| Rangamati: | | | | | | | | | |
| Chakma | 422.5 | 13.4 | 49.5 | 15.1 | 5.7 | 10.9 | 59.6 | 121.2 | 21.8 |
| Marma | 426.6 | 11.8 | 43.9 | 13.1 | 6.2 | - | 56.6 | 135.5 | 12.8 |
| Tanchanga | 452.7 | 3.6 | 32.2 | 22.9 | 3.5 | 13.4 | 41.9 | 67.6 | 6.9 |
| All ethnic | 433.9 | 9.6 | 41.9 | 17.0 | 5.1 | 12.2 | 52.7 | 108.1 | 13.8 |
| Non-ethnic | 405.2 | 13.5 | 44.9 | 14.7 | 6.4 | 10.9 | 48.5 | 109.4 | - |
| All: | | | | | | | | | |
| All ethnic | 436.5 | 9.3 | 37.2 | 16.7 | 4.6 | 16.2 | 54.2 | 138.5 | 16.7 |
| Non-ethnic | 421.1 | 10.5 | 32.9 | 14.7 | 5.5 | 13.5 | 55.7 | 118.0 | - |
| National av.* | 439.6 | 14.2 | 42.1 | 15.6 | 5.2 | 32.4 | 63.3 | 157 | - |

Source: Field Survey (2009) *BBS (2007),

Per capita per day calorie intake: The average calorie intake was estimated at 2051 k.cal for ethnic and 1978 k.cal for non-ethnic people (Table 3.27). Both the figures were lower than the national average of 2238.5 k.cal/capita/day (BBS, 2007). Irrespective of ethnic groups, average calorie intake was found higher in Khagrachari (2173 k.cal/capita/day) followed by Rangamati (1972 k.cal/capita/day). On the other hand, irrespective of locations Chakmas were found to take higher calorie (2102 k.cal/capita/day) followed by Marma (2081 k.cal/capita/day) and Tripura (2049 k.cal/capita/day). The lowest calorie intake was recorded

for *Tanchanga* (1901 k.cal/capita/day) which was significantly lower than national average. The differences in calorie intake among ethnic groups were found statistically significant in Bandarban and Rangamati district.

Table 3.27 Per capita per day calorie intake by ethnic and non-ethnic groups in CHT

| Location | Food intake (k.cal/capita/day) | | | | | | | |
|-------------|---|-------------|-------------|-------------|-------------|-------------|------------------------|-------------|
| | Chakma | Marma | Tanchanga | Tripura | Mro | Bawm | All Ethnic | Non-Ethnic |
| Bandarban | 2067 | 2149 | 1942 | 2011 | 1963 | 1919 | 2009 | 1921 |
| | F-value between ethnic groups =2.239** (p<0.052) | | | | | | t = 2.42** | |
| Khagrachari | 2268 | 2174 | - | 2078 | - | - | 2173 | 2159 |
| | F-value between ethnic groups =0.41 ^{ns} | | | | | | t = 2.21** | |
| Rangamati | 1973 | 2085 | 1859 | - | - | - | 1972 | 1853 |
| | F-value between ethnic groups =17.299*** (p<0.000) | | | | | | t = 1.06 ^{ns} | |
| All | 2102 | 2081 | 1901 | 2049 | 1937 | 1836 | 2051 | 1978 |
| | F-value between ethnic groups in all locations = 32.31*** (p<0.000) | | | | | | t =2.51** | |

*** and ** indicate significant at 1% and 5% level of probability, ns = not significant, Source: Field Survey, 2009

3.2.5 Level of food insecurity

Sample respondents were asked some questions regarding food insecurity. The level of food insecurity among sample households was estimated based on their answers.

Anxiety about the next meal: A high number of both ethnic (32.8%) and non-ethnic (28.9%) respondents opined that they '*sometimes*' worried about their next meal (Table 3.28). About 24.0% and 12.5% of ethnic respondents told that they were 'often' and 'always' worried about their next meal, respectively. In the case of non-ethnic households, 25.6 and 24.4% households were '*often*' and '*always*' worried about their next meal respectively. Only 17.3% and 13.4% of ethnic and 10.0% and 11.1% of non-ethnic respondents were 'never' and 'rarely' worried about their next meal, respectively.

Table 3.28 Responses of household heads anxiety about next meal

| Respondents | Farmer responded (%) | | | | | |
|---------------------|----------------------|--------|-----------|-------|--------|-------|
| | Never | Rarely | Sometimes | Often | Always | Total |
| Bandarban: | | | | | | |
| Chakma (33) | 3.0 | 6.1 | 27.3 | 42.4 | 21.2 | 100 |
| Marma (36) | 2.8 | 22.2 | 25.0 | 41.7 | 8.3 | 100 |
| Tanchanga (35) | 8.6 | 11.4 | 54.3 | 11.4 | 14.3 | 100 |
| Tripura (36) | 8.3 | 36.1 | 38.9 | 5.6 | 11.1 | 100 |
| Mro (38) | 31.6 | 34.2 | 13.2 | 18.4 | 2.6 | 100 |
| Bawm (36) | 11.1 | 13.9 | 27.8 | 8.3 | 38.9 | 100 |
| All ethnic (214) | 10.9 | 20.6 | 31.1 | 21.3 | 16.1 | 100 |
| Non-ethnic (30) | 3.3 | 6.7 | 20.0 | 36.7 | 33.3 | 100 |
| Khagrachari: | | | | | | |
| Chakma (37) | 13.5 | 10.8 | 29.7 | 32.4 | 13.5 | 100 |
| Marma (36) | 50.0 | 8.3 | 19.4 | 16.7 | 5.6 | 100 |
| Tripura (33) | 6.1 | 9.1 | 48.5 | 33.3 | 3.0 | 100 |
| All ethnic (106) | 23.2 | 9.4 | 32.6 | 27.5 | 7.4 | 100 |
| Non-ethnic (30) | 20.0 | 16.7 | 40.0 | 16.7 | 6.7 | 100 |
| Rangamati: | | | | | | |
| Chakma (36) | 22.2 | 8.3 | 36.1 | 16.7 | 16.7 | 100 |
| Marma (36) | 20.0 | 5.7 | 40.0 | 17.1 | 17.1 | 100 |
| Tanchanga (35) | 11.1 | 16.7 | 27.8 | 36.1 | 8.3 | 100 |
| All ethnic (107) | 17.8 | 10.2 | 34.6 | 23.3 | 14.1 | 100 |
| Non-ethnic (30) | 6.7 | 10.0 | 26.7 | 23.3 | 33.3 | 100 |
| All: | | | | | | |
| All ethnic (427) | 17.3 | 13.4 | 32.8 | 24.0 | 12.5 | 100 |
| Non-ethnic (90) | 10.0 | 11.1 | 28.9 | 25.6 | 24.4 | 100 |

Source: Field Survey, 2009

Responses regarding balanced meal intake: In all areas, 61.5% and 70.0% of ethnic and non-ethnic respondents respectively reported that they could ‘never’ afford to take balanced meals. The majority of respondents in Bandarban had the same views (Table 3.29). Comparing the ethnic minorities, it was the highest for *Marma* in Khagrachari followed by *Mro* in Bandarban.

Table 3.29 Level of responses regarding intake of balanced meals

| Respondents | Farmer responded (%) | | | Total |
|-------------------------|----------------------|-------------|------------|------------|
| | Never | Sometimes | Often | |
| Bandarban: | | | | |
| Chakma (33) | 93.9 | 6.1 | - | 100 |
| Marma (36) | 77.8 | 22.2 | - | 100 |
| Tanchanga (35) | 71.4 | 25.7 | 2.9 | 100 |
| Tripura (36) | 66.7 | 25.0 | 8.3 | 100 |
| Mro (38) | 57.9 | 39.5 | 2.6 | 100 |
| Bawm (36) | 61.1 | 30.6 | 5.6 | 100 |
| <i>All ethnic (214)</i> | <i>71.5</i> | <i>24.8</i> | <i>3.2</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | <i>83.3</i> | <i>16.7</i> | <i>-</i> | <i>100</i> |
| Khagrachari: | | | | |
| Chakma (37) | 54.1 | 45.9 | - | 100 |
| Marma (36) | 58.3 | 33.3 | 8.3 | 100 |
| Tripura (33) | 57.6 | 39.4 | 6.1 | 100 |
| <i>All ethnic (106)</i> | <i>56.7</i> | <i>39.6</i> | <i>4.8</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | <i>63.3</i> | <i>30.0</i> | <i>6.7</i> | <i>100</i> |
| Rangamati: | | | | |
| Chakma (36) | 69.4 | 30.6 | - | 100 |
| Marma (36) | 42.9 | 51.4 | 5.7 | 100 |
| Tanchanga (35) | 61.1 | 36.1 | 2.8 | 100 |
| <i>All ethnic (107)</i> | <i>57.8</i> | <i>39.4</i> | <i>2.8</i> | <i>100</i> |
| <i>Non-ethnic (30)</i> | <i>63.3</i> | <i>36.7</i> | <i>-</i> | <i>100</i> |
| All: | | | | |
| <i>All ethnic (427)</i> | <i>61.5</i> | <i>35.0</i> | <i>3.6</i> | <i>100</i> |
| <i>Non-ethnic (90)</i> | <i>70.0</i> | <i>27.8</i> | <i>1.2</i> | <i>100</i> |

Source: Field Survey, 2009

Capability of purchasing food: A large portion of the respondents (ethnic 35.9% and non-ethnic 62.2%) opined that they had ‘never’ enough money to buy required food (Table 3.30). The respondents in Rangamati and Bandarban had less capability of purchasing food compared to those of Khagrachari. Among the ethnic groups, *Chakma* and *Marma* in both Bandarban and Rangamati had less capability of purchasing required food.

Thus in terms of food purchasing capacity, the respondents of Bandarban were worse-off followed by those of Rangamati. Among the two broad groups, the non-ethnic group was worse-off than the ethnic group; and among the ethnic groups, *Chakma* and *Marma* households in both Bandarban and Rangamati were better off compared to others.

Table 3. 30 Responses regarding capability of purchasing required food

| Respondents | Farmer responded (%) | | |
|-------------------------|----------------------|--------------|--------------|
| | Never | Sometimes | Often |
| Bandarban: | | | |
| Chakma (33) | 75.8 | 24.2 | - |
| Marma (36) | 55.6 | 38.9 | 5.6 |
| Tanchanga (35) | 31.4 | 42.9 | 11.4 |
| Tripura (36) | 19.4 | 63.9 | 13.9 |
| Mro (38) | 18.4 | 55.3 | 26.3 |
| Bawm (36) | 38.9 | 52.8 | 5.6 |
| <i>All ethnic (214)</i> | <i>39.9</i> | <i>46.3</i> | <i>10.4</i> |
| <i>Non-ethnic (30)</i> | <i>63.3</i> | <i>30.0</i> | <i>6.7</i> |
| Khagrachari: | | | |
| Chakma (37) | 32.4 | 62.2 | 5.4 |
| Marma (36) | 16.7 | 55.6 | 11.1 |
| Tripura (33) | 33.3 | 57.6 | 9.1 |
| <i>All ethnic (106)</i> | <i>27.5</i> | <i>58.4</i> | <i>8.5</i> |
| <i>Non-ethnic (30)</i> | <i>53.3</i> | <i>36.7</i> | <i>10.0</i> |
| Rangamati: | | | |
| Chakma (36) | 52.8 | 38.9 | 8.3 |
| Marma (36) | 51.4 | 40.0 | 8.6 |
| Tanchanga (35) | 16.67 | 52.78 | 19.44 |
| <i>All ethnic (107)</i> | <i>40.29</i> | <i>43.89</i> | <i>12.12</i> |
| <i>Non-ethnic (30)</i> | <i>70.0</i> | <i>26.7</i> | <i>3.3</i> |
| All: | | | |
| <i>All ethnic (427)</i> | <i>35.9</i> | <i>49.5</i> | <i>10.4</i> |
| <i>Non-ethnic (90)</i> | <i>62.2</i> | <i>31.1</i> | <i>6.7</i> |

Source: Field Survey, 2009

Level of household food insecurity: There are two types of food insecurity at household level: chronic and transitory. Transitory food insecurity is a temporary decline in a household's access to enough food. Transitory food insecurity can be further divided into temporary food insecurity and cyclical or seasonal food insecurity. Temporary food insecurity occurs when there are sudden and unpredictable shocks, such as wars, drought or pest attack etc. Seasonal food insecurity occurs when there is regular pattern of inadequate access to food. This is often linked to agricultural seasons. Chronic food insecurity is a continuously inadequate diet caused by the inability to acquire food (Rahman and Schmitz, 2007).

Measuring food insecurity is a costly and complicated exercise. In highly food insecure countries operational agencies need regular measurements for monitoring changes and for assessing the impact of food aid interventions. Tools are needed for measuring food security status. The Coping Strategies Index (CSI) is one such tool. It is an indicator of household food security that is relatively simple and quick to use (Maxwell *et al.*, 2003) (see details in methodology section). For easy understanding food insecurity at household level was divided into three categories i.e. (i) high insecurity (CSI Score above 60), (ii) moderate insecurity (CSI Score 40 to 60) and (iii) low insecurity households (CSI Score below 40).

In all ethnic groups, 24.5%, 36.7% and 38.9% households possessed high, moderate and low level of food insecurity respectively, while 46.7%, 27.8% and 25.6% non-ethnic households fell in high, moderate and low food insecurity level, respectively. A high food insecurity level was found in Bandarban (25%) for all ethnic groups which were also similar to other two districts. But in the case of moderate level of food insecurity, the highest percentage of ethnic groups was found in Bandarban followed by Rangamati. In the case of low food insecurity level, the highest percentages of households were found in Khagrachari followed by Rangamati for both ethnic and non-ethnic groups. For ethnic groups in all districts, high food

insecurity level was found in the *Chakma*, followed by *the Marma* and the *Bawm*. In moderate food insecurity level, the majority of households were found in the *Tanchanga* followed by the *Bawm*. In the case of low food insecurity level, the highest percentages of households were found in *the Marma* followed by the *Tripura* and the *Mro*. Among the non-ethnic settlers, the highest percentages of households fell in the moderate level of food insecurity in Bandarban (Table 3.31). The above discussion reveals that in most cases majority of the households suffered from moderate to high degree of food insecurity and the incidence of food insecurity was higher for the non-ethnic than for the ethnic households.

Table 3.31 Status of household food insecurity in CHT region

| Groups | Level of food insecurity (% hh) | | | CSI statistics | | |
|----------------------------|---------------------------------|-------------------|-------------------|----------------|-------------|----------------|
| | High | Moderate | Low | CSI mean | Stdev | Range |
| Bandarban: | | | | | | |
| Chakma (33) | 45.5 (15) | 42.4 (14) | 12.1 (4) | 57.0 | 13.2 | 26-76 |
| Marma (36) | 16.2 (6) | 25.0 (9) | 58.3 (21) | 41.3 | 16.5 | 16-79 |
| Tanchanga (35) | 5.7 (2) | 74.3 (26) | 20.0 (7) | 44.9 | 9.7 | 23-63 |
| Tripura (36) | 27.8 (10) | 30.6 (11) | 41.7 (15) | 46.5 | 17.2 | 18-81 |
| Mro (38) | 20.1 (8) | 31.6 (12) | 47.4 (18) | 42.2 | 17.2 | 23-82 |
| Bawm (36) | 33.3 (12) | 50.0 (18) | 19.4 (6) | 51.8 | 12.5 | 29-78 |
| <i>All ethnic (214)</i> | <i>25.0 (53)</i> | <i>42.3 (90)</i> | <i>33.2 (72)</i> | <i>47.4</i> | <i>14.4</i> | <i>22-77</i> |
| <i>All non-ethnic (30)</i> | <i>30.0 (9)</i> | <i>56.7 (17)</i> | <i>13.3 (4)</i> | <i>55.1</i> | <i>16.5</i> | <i>25-86</i> |
| Khagrachari: | | | | | | |
| Chakma (33) | 18.9 (7) | 32.4 (12) | 48.6 (18) | 42.9 | 19.4 | 13-87 |
| Marma (37) | 33.3 (12) | 27.3 (10) | 38.9 (14) | 45.9 | 18.1 | 12-42 |
| Tripura (36) | 21.1 (7) | 24.2 (8) | 54.5 (18) | 43.0 | 18.8 | 6-91 |
| <i>All ethnic (106)</i> | <i>24.5 (26)</i> | <i>28.2 (30)</i> | <i>47.4 (50)</i> | <i>43.9</i> | <i>18.8</i> | <i>6-91</i> |
| <i>All non-ethnic (30)</i> | <i>33.3 (10)</i> | <i>23.3 (7)</i> | <i>43.3 (13)</i> | <i>37.8</i> | <i>17.9</i> | <i>4.5-66</i> |
| Rangamati: | | | | | | |
| Chakma (36) | 38.4 (14) | 25.0 (9) | 36.1 (13) | 46.5 | 28.0 | 2-108 |
| Marma (36) | 5.7 (2) | 31.4 (11) | 62.8 (22) | 36.8 | 14.0 | 12-81 |
| Tanchanga (35) | 27.8 (10) | 47.2 (17) | 25.0 (9) | 47.2 | 21.5 | 8-96 |
| <i>All ethnic (107)</i> | <i>24.1 (26)</i> | <i>34.5 (37)</i> | <i>41.3 (44)</i> | <i>43.5</i> | <i>21.1</i> | <i>11-95</i> |
| <i>All non-ethnic (30)</i> | <i>53.3 (16)</i> | <i>30.0 (9)</i> | <i>16.7 (5)</i> | <i>57.0</i> | <i>16.9</i> | <i>25-86</i> |
| All: | | | | | | |
| <i>All ethnic (427)</i> | <i>24.5 (105)</i> | <i>36.7 (157)</i> | <i>38.8 (166)</i> | <i>45.8</i> | <i>16.6</i> | <i>18 - 81</i> |
| <i>All non-ethnic (90)</i> | <i>46.7 (42)</i> | <i>27.8 (25)</i> | <i>25.6 (23)</i> | <i>50.6</i> | <i>17.3</i> | <i>18 - 79</i> |

Note: Highly insecure (CSI score <60); moderately insecure (CSI score 40-60) and low insecure (CSI score >40)
Figure in the parentheses indicates number of household, Source: Field Survey, 2009

3.2.6 Causes of food insecurity

There are various causes responsible for food insecurity at household level. The present study identified major six causes for household food insecurity as per perception of the people interviewed. These were i) low yield in *Jhum* crops, ii) limited land for cultivation, iii) crop damage, iv) rodent threats in *Jhum* crops, v) limited working facilities, and vi) lack of cash.

Low yield in *Jhum* crops was the major cause of food insecurity reported by 51.6% of ethnic respondents (Table 3.32). In the study areas, *Jhum* crops were damaged mainly due to drought, attack of wild animals, water stagnation and flash flood (water flow from Kaptai lake). Crop damage was another cause of food insecurity at household level, reported by 50.5% ethnic respondents. Limited land for cultivation and rodents threats were also reported as the causes of food insecurity by 41.9% and 41.2% respectively of the ethnic respondents in all districts. Lack of cash and limited working facilities were the other two causes of food insecurity reported by 43.0% and 34.0% ethnic respondent respectively. The highest percent (82.2%) of non-ethnic respondent opined that limited land for cultivation was their major

cause of food insecurity followed by lack of cash and limited working facilities, especially in the rainy season.

Table 3.32 Causes of food insecurity at household level in CHT region

| Causes of food insecurity | Farmer responded (%) | | | | | | | |
|-------------------------------------|----------------------|---------------|--------------|--------------|--------------|--------------|---------------|---------------|
| | Bandarban | | Khagrachari | | Rangamati | | All | |
| | Ethnic | Non-ethnic | Ethnic | Non-ethnic | Ethnic | Non-ethnic | Ethnic | Non-ethnic |
| Low yield in <i>Jhum</i> crops | 74.2 (159) | - | 44.6 (47) | 6.7 (2) | 36.1 (39) | - | 51.6 (245) | 2.2 (2) |
| Limited land for cultivation | 24.7 (54) | 93.33 (28) | 52.0 (55) | 56.7 (17) | 49.2 (52) | 96.7 (29) | 41.9 (161) | 82.2 (74) |
| Crop damage | 76.95 (164) | - | 35.3 (37) | 13.3 (4) | 39.0 (42) | 20.0 (6) | 50.5 (243) | 11.11 (10) |
| Rodent threats in <i>Jhum</i> crops | 74.15 (161) | - | 28.2 (30) | 36.7 (11) | 21.3 (23) | 13.3 (4) | 41.2 (214) | 16.7 (15) |
| Limited working facilities | 38.9 (82) | 53.33 (16) | 29.2 (31) | 26.7 (8) | 34.5 (37) | 73.3 (22) | 34.0 (150) | 51.1 (46) |
| Lack of cash | 40.3 (86) | 66.67 (20) | 38.3 (40) | 43.3 (13) | 50.5 (54) | 80.0 (24) | 43.0 (180) | 63.3 (57) |

Figures in the parentheses indicate number of respondents. Same respondents reported more than one causes for food insecurity, so, summation of all causes would not necessarily be equal to 100.

Source: Field Survey, 2009

3.3 Factors Affecting Household Food Security

Household food security is likely to be influenced by various exogenous and endogenous factors. These factors are aggregate farm output, household size, average food price, farming experience, education of the respondents, farm size, training, credit, extension contact, etc. The estimated values and related statistics of Cobb-Douglas type calorie intake models are shown in Tables 3.33 to 3.35.

Aggregate output consists of rice production from own land and received food (rice) aid from different sources. Rice is the main source of calorie of the respondent households. The empirical results indicated that the coefficients of income, farm size, extension contact, education of spouse and dummy for household head spending more time in *jhum* farming were positive and significant, while that of dummy for credit were negative and significant for Chakma households in Bandarban. It indicated that income, farm size, extension contact, education, spending more time in *jhum* farming had significant and positive impact on household food security for the Chakma households. On the other hand, dummy for credit had significant and negative impact on household food security for the Chakma households.

The coefficients of age and education were positive and significant, while that of average food price was negative and significant for Marma households in Bandarban. It indicated that age and education of wife had significant and positive impact on household food security for the Marma households. On the other hand, aggregate food price had significant and negative impact on household food security for the Marma households (Table 3.33).

The coefficient of dummy for credit was positive and significant, while that of household size and aggregate food price were negative and significant for Tanchanga households in Bandarban. It indicated that credit had significant and positive impact on household food security for the Tanchanga households. On the other hand, household size and average food price had significant and negative impact on household food security for the Tanchanga households. The coefficient of aggregate output was positive and significant, while that of average food price was negative and significant for Tripura households in Bandarban. It

indicated that aggregate output had significant and positive impact on household food security for the Tripura households. On the other hand, average food price had significant and negative impact on household food security for the Tripura households. The coefficient of age of household head was positive and significant, while that of household size was negative and significant for Mro households in Bandarban. It indicated that age of wife had significant and positive impact on household food security and household size had significant and negative impact on household food security for the Mro households in Bandarban. The coefficient of dummy for women health was positive and significant for Bawm households in Bandarban. It indicated that women health had significant and positive impact on household food security for the Bawm households in Bandarban. In the aggregate level the coefficients of average food price and age of wife were positive and significant, while that of household size was negative and significant for all ethnic households in Bandarban. It indicated that average food price and age of wife had significant and positive impact on household food security and household size had significant and negative impact on household food security for the ethnic households in Bandarban (Table 3.33).

Table 3.33 Estimated values of coefficients and related statistics of household food (calorie) security of the Cobb-Douglas calorie intake model in Bandarban

| Exogenous variables | Ethnic minorities (Co-efficient) | | | | | | | Non-ethnic settler |
|---|----------------------------------|---------------|--------------|----------------|--------------|--------------|----------------|--------------------|
| | Chakma | Marma | Tanch-anga | Tripura | Mro | Bawm | All Ethnic | |
| Constant | 6.095 | 3.455 | 4.982 | 7.768 | 5.695 | 6.497 | 7.060 | 9.426 |
| Aggregate output (kg/hh) | 0.244 | -0.023 | 0.028 | 0.031** | 0.074 | 0.013 | -0.006 | - |
| Household size (no.) | 0.688 | 0.171 | -0.144* | -0.145 | -0.584* | 0.119 | -0.024* | -0.054 |
| Annual income (Tk/hh) | 0.170** | 0.035 | 0.084 | -0.006 | 0.010 | -0.012 | -0.032 | -0.051 |
| Average food prices (Tk.) | 0.006 | -0.274*** | -0.088* | -0.142*** | -0.046 | 0.030 | -0.052** | 0.055 |
| Farming experience (Year) | 0.204 | 0.109 | 0.034 | -0.007 | 0.018 | -0.176 | 0.029 | -0.027 |
| Education of the household head (year of schooling) | -0.001 | -0.062 | 0.087 | -0.007 | 0.062 | -0.004 | 0.039 | 0.045 |
| Farm size (ha) | 0.287** | -0.117 | -0.127 | -0.044 | -0.246 | -0.129 | -0.017 | 1.077 |
| Age of household head (Year) | 0.214 | 0.582** | 0.307 | -0.119 | 0.544** | 0.350 | 0.190*** | -0.415 |
| Education of spouse of the household head (Year of Schooling) | 0.123* | 0.116* | -0.023 | -0.094 | -0.041 | 0.026 | -0.019 | 0.010 |
| Dummy for training in agriculture (1=Yes, 0=otherwise) | -0.351 | 0.145 | -0.163 | -0.002 | -0.226 | -0.022 | -0.057 | -0.006 |
| Dummy for credit received (1=Yes, 0=otherwise) | -0.420** | 0.160 | 0.307* | -0.010 | 0.091 | -0.018 | 0.025 | -0.054 |
| Dummy for extension contact (1=Yes, 0=otherwise) | 0.230* | 0.110 | -0.039 | -0.135 | 0.059 | -0.015 | 0.005 | -0.143 |
| Dummy for health of household head (1=Good, 0=Otherwise) | -0.026 | 0.044 | 0.021 | -0.033 | 0.014 | 0.269** | 0.013 | -0.191 |
| Dummy for time spent (1=More in <i>jhum</i> farming, 0=otherwise) | 0.220* | -0.048 | 0.023 | 0.055 | -0.130 | -0.023 | 0.045 | -0.212 |
| R² | 0.742 | 0.616 | 0.439 | 0.599 | 0.437 | 0.572 | 0.671 | 0.353 |
| n | 33 | 35 | 35 | 36 | 38 | 36 | 213 | 30 |
| F | 3.703*** | 2.141* | 0.767 | 2.241** | 0.836 | 0.570 | 2.64*** | 0.670 |

***, ** and * indicate significant at 1, 5 and 10% level of probability, respectively.

The empirical results for Khagrachari district are presented in the Table 3.34. The co-efficient of aggregate output had a positive significant effect on calorie intake by the Chakma, Marma and Non-ethnic households in the study areas. This implies that if aggregate output increased one percent then calorie intake increased 16.7, 10.8 and 5.2 percent, respectively. But, household size was found to have negative and significant effect on calorie security for the Chakma's household. This means that if household size increased one percent then calorie intake decreased 57.3 percent. Education of the household head had positive and significant

effect on calorie security for the Chakma and Marma. This may be due to fact that they were more literate than others but in non-ethnic settlers it was negative and not significant may be due to the fact that most of the household heads had no schooling in the study areas. Farm size had a positive and significant effect on calorie intake by the Chakma and Marma households indicating that if farm size increased one percent then calorie intake increased 32.7 and 30.7 percent by the household members, respectively. In non-ethnic settlers, coefficient of this variable was negative and not significant. The reason of this result may be that very low average of farm size was obtained by the household. The dummy for credit received by the Marma household had positive and significant effect on calorie intake implying that if credit received increased one percent then calorie intake increased 52.5 percent in a year but this variable had negative and significant effect on calorie intake for non-ethnic settlers. This means that if credit received increased one percent then calorie intake decreased 35.7 percent in a year. This means that there was inverse relationship between credit received and calorie intake for non-ethnic settlers may be due to the fact that they were unable to take much calorie due to regular loan repayment. The dummy for extension contact had positive and significant effect on calorie intake by the non-ethnic settlers because more extension contact was observed with non-ethnic settlers in the study areas. This variable had indirect influence on calorie intake by encouraging producing and consuming more crops. The dummy for more time spent in Jhum farming had positive and significant effect on calorie security for the Chakma household. This means that if time spent increased one percent on Jhum farming by the head of Chakma household then calorie intake increased 142 percent in a year F-value significant means there are statistically significant differences between the sample means. The other variable i.e. income, average food price, farming experience, age of household head, education of spouse, dummy for training received on agriculture and health of household head had some positive and negative effect on calorie intake but not significant for ethnic and non-ethnic settlers in the study areas (Table 3.34).

Table 3.34 Estimated values of coefficients and related statistics of household food (calorie) security of the Cobb-Douglas calorie intake model in Khagrachari

| Exogenous variables | Ethnic minorities (Co-efficients) | | | | Non-ethnic settler |
|---|-----------------------------------|---------------|--------------|---------------|--------------------|
| | Chakma | Marma | Tripura | All Ethnic | |
| Constant | 6.951 | 6.161 | 6.592 | 7.690 | 8.026 |
| Aggregate output (kg/hh) | 0.167* | 0.108** | -0.035 | 0.027 | 0.052*** |
| Household size (no./he) | -0.573** | -0.702 | -0.799 | -0.339 | -0.576 |
| Annual income (Tk/hh) | -0.040 | 0.209 | 0.077 | 0.026 | 0.003 |
| Average food prices (Tk/kg.) | 0.334 | -0.080 | -0.065 | -0.041 | 0.061 |
| Farming experience (Year) | 0.010 | -0.098 | 0.047 | -0.017 | 0.058 |
| Education of the household head (year of schooling) | 0.461** | 0.409** | 0.013 | -0.016 | -0.049 |
| Farm size (ha) | 0.327** | 0.307** | 0.065 | -0.010 | -0.136 |
| Age of household head (Year) | -0.210 | -0.024 | 0.430 | 0.043 | -0.024 |
| Education of spouse of the household head (Year of Schooling) | 0.116 | 0.243 | 0.019 | 0.041 | 0.080 |
| Dummy for training on agriculture (1=Yes, 0=otherwise) | -0.304 | -0.019 | -0.320 | -0.073 | -0.186 |
| Dummy for credit received (1=Yes, 0=otherwise) | 0.356 | 0.525** | 0.231 | 0.176 | -0.357** |
| Dummy for extension contact (1=Yes, 0=otherwise) | -0.037 | -0.239 | 0.277 | 0.084 | 0.642** |
| Dummy for health of household head (1=Good, 0=Otherwise) | 0.132 | -0.243 | 0.110 | -0.010 | -0.062 |
| Dummy for time spent (1=More in <i>jhum</i> farming, 0=otherwise) | 1.420*** | -0.063 | -0.483 | -0.164 | -0.218 |
| R² | 0.494 | 0.450 | 0.426 | 0.471 | 0.691 |
| n | 37 | 36 | 33 | 106 | 30 |
| F | 1.533 | 1.226* | 0.956 | 1.122* | 2.395* |

***, ** and * indicate significant at 1, 5 and 10% level of probability, respectively.

The empirical results for Rangamati indicated that the coefficients of education of the respondents, farm size, age of spouse and dummy for health of household head were positive and significant, while that of aggregate food price were negative and significant for Chakma households in Rangamati. It indicated that education of the respondents, age and health had significant and positive impact on household food security for the Chakma households. On the other hand, average food price and farm size had significant and negative impact on household food security for the Chakma households in Rangamati (Table 3.35).

Table 3.35 Estimated values of coefficients and related statistics of household food (calorie) security of the Cobb-Douglas calorie intake model in Rangamati

| Variables | Ethnic minorities(Co-efficients) | | | | Non-ethnic settler |
|---|----------------------------------|--------------|--------------|-----------------|--------------------|
| | Chakma | Marma | Tanchanga | All Ethnic | |
| Constant | 4.316 | 7.262 | 6.578 | 5.052 | 3.092 |
| Aggregate output (kg/hh) | 0.006 | 0.005** | 0.031 | -0.013 | 0.051 |
| Household size (no.) | 0.321 | 0.032 | -0.137 | 0.070 | 2.040** |
| Annual income (Tk/hh) | -0.058 | 0.015 | 0.053 | 0.082 | 0.113 |
| Average food prices (Tk.) | -0.297** | -0.136* | 0.064 | 0.126 | 0.522 |
| Farming experience (Year) | -0.101 | -0.002 | 0.006 | -0.041* | -0.268 |
| Education of the household head (year of schooling) | 0.134** | -0.050 | 0.086* | 0.045* | -0.336 |
| Farm size (ha) | 0.141* | -0.301 | -0.231 | 0.156** | 0.178 |
| Age of household head (Year) | 0.470* | -0.111 | 0.038 | 0.217 | -0.336 |
| Education of spouse of the household head (Year of Schooling) | -0.012 | -0.004 | -0.056 | -0.007 | -0.083 |
| Dummy for training in agriculture (1=Yes, 0=otherwise) | -0.076 | -0.119 | 0.043 | 0.076** | -0.095 |
| Dummy for credit received (1=Yes, 0=otherwise) | 0.037 | 0.026 | 0.174 | 0.119 | 0.421 |
| Dummy for extension contact (1=Yes, 0=otherwise) | 0.088 | 0.049 | -0.074 | 0.018* | 0.106 |
| Dummy for health of household head (1=Good, 0=Otherwise) | 0.255* | -0.030 | -0.149 | 0.048 | 0.375 |
| Dummy for time spent (1=More in <i>jhum</i> farming, 0=otherwise) | 0.146 | -0.046 | -0.168* | 0.046 | 1.270* |
| R² | 0.641 | 0.439 | 0.494 | 0.593 | 0.407 |
| n | 36 | 35 | 36 | 107 | 30 |
| F | 2.676** | 0.733 | 0.976 | 3.517*** | 0.734 |

***, ** and * indicate significant at 1, 5 and 10% level of probability, respectively

The coefficients of aggregate output were positive and significant, while that of aggregate food price was negative and significant for Marma households in Rangamati. It indicated that aggregate output had significant and positive impact on household food security for the Marma households. On the other hand, average food price had significant and negative impact on household food security for the Marma households in Rangamati.

The coefficient of education of the respondents was positive and significant, while that of dummy for women spending more time in farming were negative and significant for Tanchanga households in Rangamati. It indicated that education of the respondents had significant and positive impact and spending more time in *jhum* farming had significant and negative impact on household food security for the Tanchanga households in Rangamati.

In the aggregate level the coefficients of farm size, education of the respondents, dummy for training and extension contact were positive and significant, while that of farming experience was negative and significant for all ethnic households in Rangamati. It indicated that education, farm size of the respondents, training and extension contact had significant and positive impact on household food security and farming experience had significant and negative impact on household food security for the ethnic households in Rangamati.

The coefficients of household size and dummy for spending more time in *jhum* farming were positive and significant for non-ethnic households in Rangamati. It indicated that household

size and spending more time in *jhum* farming had significant and positive impact on household food security for the non-ethnic households in Rangamati.

The above discussion provides significant implication for food security in CHT. No single policy can be prescribed for improving food security for all locations and all communities. The impact of the variables was not uniform across ethnic minorities and districts, suggesting that such variation should be taken into account in planning and designing policies for food security. The analysis provides useful inputs for effective household food security planning and decision making processes. Shaikh (2007) also reported that household income, food prices, age and time allocation to farming activities influenced household food security.

3.4 Vulnerabilities to Livelihoods in CHT

Vulnerability refers to unpredictable events that can undermine livelihoods and cause people to fall into poverty or destitution. Some of these events have a sudden onset (e.g. cyclones) while others develop over a long period (e.g. soil fertility, conflict), but all can have negative effects on livelihoods (FAO and ILO, 2008).

Vulnerability depends on the asset base that people have prior to the crisis and their ability to engage in various coping strategies. The risk of livelihood failure determines the level of vulnerability of a household to income, food, health and nutritional insecurity. Therefore, livelihoods are secured when households have secured ownership of, or access to, resources and income earning activities, including reserves and assets, to off-set risks, ease shocks, and meet contingencies (CARE, 2002).

In order to determine vulnerability, risk factors are divided into two groups such as physical risks (i.e. crop damage, land dispute, theft, loan receive as a risk) and natural risk (i.e. low yield in crops, rodent threats, flash flood, drought, heavy rainfall, land slide, cyclone, attack of birds in crop field, diseases/pest in crops).

Physical risk: The study revealed that majority of the ethnic respondents (62.9%) reported attack of wild animal in the locality is the major physical risk to livelihoods followed by theft of garden fruit (17.9%) and loan receive (14.6%) in CHT (Table 3.36). It was found that 76.9% ethnic respondents reported that their *Jhum* crop was damaged in the last year due to droughts or attack of wild animal (pig) or attack of rat in Bandarban, while the damages were 70.2% and 41.7% for Khagrachari and Rangamati, respectively. In Khagrachari, most of the crops especially rice were damaged due to drought or lack of irrigation or flash flood. In Rangamati, most of the crops were damaged due to fringe land causing water flow/stagnation from Kaptai Lake. In Bandarban hill district, non-ethnic settlers cultivate some vegetables or banana or papaya or pineapple at hill valleys due to limited land availability. Most of the households lived on temporary basis in that area.

Theft of garden fruits was a social problem, as reported by ethnic groups in Rangamati and Bandarban. In addition, death of income earner was found higher in Khagrachari followed by Bandarban due to old age and disease as mentioned by the respondents. Robbery in the houses also happened occasionally to the ethnic households in Khagrachari. About 8 to 24% ethnic respondents opined that receiving loan from NGOs was a risk, because they had less ability to repay the monthly installments.

Table 3.36 Physical risks to livelihoods of ethnic and non-ethnic households in CHT

| Physical risks | Farmer responded (%) | | | | | | | |
|------------------------|----------------------|------------|-------------|------------|-----------|------------|--------|------------|
| | Bandarban | | Khagrachari | | Rangamati | | All | |
| | Ethnic | Non-ethnic | Ethnic | Non-ethnic | Ethnic | Non-ethnic | Ethnic | Non-ethnic |
| Attack of wild animal | 76.9 | - | 41.8 | 16.7 | 70.3 | 56.7 | 62.9 | 24.4 |
| Land conflict | 1.3 | - | 12.3 | 3.3 | 5.9 | 3.3 | 6.5 | 2.2 |
| Boundary conflict | 0.01 | - | 2.8 | - | 2.0 | - | 1.6 | - |
| Theft of garden fruit | 19.2 | - | 30.9 | - | 3.8 | 6.7 | 17.9 | 2.2 |
| Death of income earner | 0.3 | - | 0.4 | - | 0.6 | - | 0.4 | - |
| Robbery | 0.9 | - | 0.7 | - | - | 0.5 | 0.7 | 0.2 |
| Loan receive | 7.5 | - | 23.5 | 10.0 | 12.7 | 6.7 | 14.6 | 5.6 |

Source: Field survey, 2009

Natural risks: The majority of the ethnic respondents reported rodent threat/rat flood (47.2%) as the major natural risk followed by Pest attack in crops (40.2%) and draught (26.4%) which affects their food security (Table 3.37). Other natural risks were pest attack in crops (40.2%), draught (26.4%), diseases in crops (22.5%) and flash flood (13.1%).

Rodent threats (locally called rat flood) seriously happened in the *Jhum* crops in the last year, reported by 74% ethnic respondent in Bandarban hill district while it was about 34% each in Khagrachari and Rangamati. In Kharachari, most of the rat attack happened in plain land especially in rice. It is generally said that when hill bamboos bloom, the rodent threat happens. According to the folk observation, every five decades bamboo blooms and fruits, and the rats eat those, resulting in a huge increase in their regeneration. Rats destroy *Jhum* crops including rice, cotton, turmeric, ginger, oil seed, potatoes, papaya, chili, gourd and bananas. The crisis starts from late March and continues until September, the next harvest. As a result, many people, particularly the *Jhumias* in the affected areas face a food crisis. According to DAE (2008), about 1386 ha of hilly land and 2126 households were affected by rodent threats in Bandarban hill district during 2007.

The highest percentage of respondents reported experiencing flash floods and drought last year in Khagrachari and Rangamati. On the other hand, ethnic groups of Rangamati and Khagrachari were slightly affected by heavy rainfall but major landslides happened in Bandarban and Rangamati. Most of the households of non-ethnic community in Rangamati were affected by cyclone followed by those of Bandarban hill district. Pest and birds attacks and diseases prevalence in crops (especially in rice) were severe in Bandarban and moderate in Rangamati hill district. The discussion provides a clear picture of risk to livelihoods. Rodent threat was the first ranked problem followed by lower yield of *Jhum* crops.

Table 3.37 Natural risk/vulnerabilities to livelihoods in CHT

| Natural risks/ vulnerabilities | Farmer responded (%) | | | | | | | |
|-----------------------------------|----------------------|------------|-----------|------------|-------------|------------|--------|------------|
| | Bandarban | | Rangamati | | Khagrachari | | All | |
| | Ethnic | Non-ethnic | Ethnic | Non-Ethnic | Ethnic | Non-Ethnic | Ethnic | Non-Ethnic |
| Rodent threats/Rat flood | 74.1 | - | 33.4 | 13.3 | 34.1 | 20.0 | 47.2 | 11.1 |
| Flash flood | - | - | 4.6 | - | 34.8 | 23.3 | 13.1 | 7.8 |
| Hail storm | 4.6 | - | 2.8 | - | - | - | 2.5 | - |
| Drought | 0.9 | - | 34.6 | - | 43.6 | 40.0 | 26.4 | 13.3 |
| Heavy rainfall | - | - | 10.2 | - | 5.4 | - | 5.2 | - |
| Land slide | 20.3 | - | 5.6 | - | - | - | 8.6 | - |
| Cyclone | 10.6 | - | 9.4 | 40.0 | 4.5 | - | 8.2 | 13.3 |
| Attack of birds in crops | 31.6 | - | 16.7 | - | 2.9 | - | 17.1 | 4.5 |
| Diseases in crops | 29.7 | - | 23.3 | - | 14.5 | 23.3 | 22.5 | 10.8 |
| Pest attack in crops | 46.2 | - | 43.9 | - | 30.5 | 23.3 | 40.2 | 24.4 |

Source: Field Survey, 2009

3.5 Logical Framework for Sustainable Livelihood Security

Sustainable livelihood could be determined by the interaction of several forces and elements. The forces could be human capital, natural capital, physical capital, financial capital and social capital which discussed earlier. These elements are interlinked with one another and it could play role to minimize the risk/vulnerabilities. These are transformed/accumulated into the different activities judiciously resulting food security might be ensured and good health could also be attained which again would come to the feed back from different livelihood capitals. The interactions of different livelihood assets are shown below:

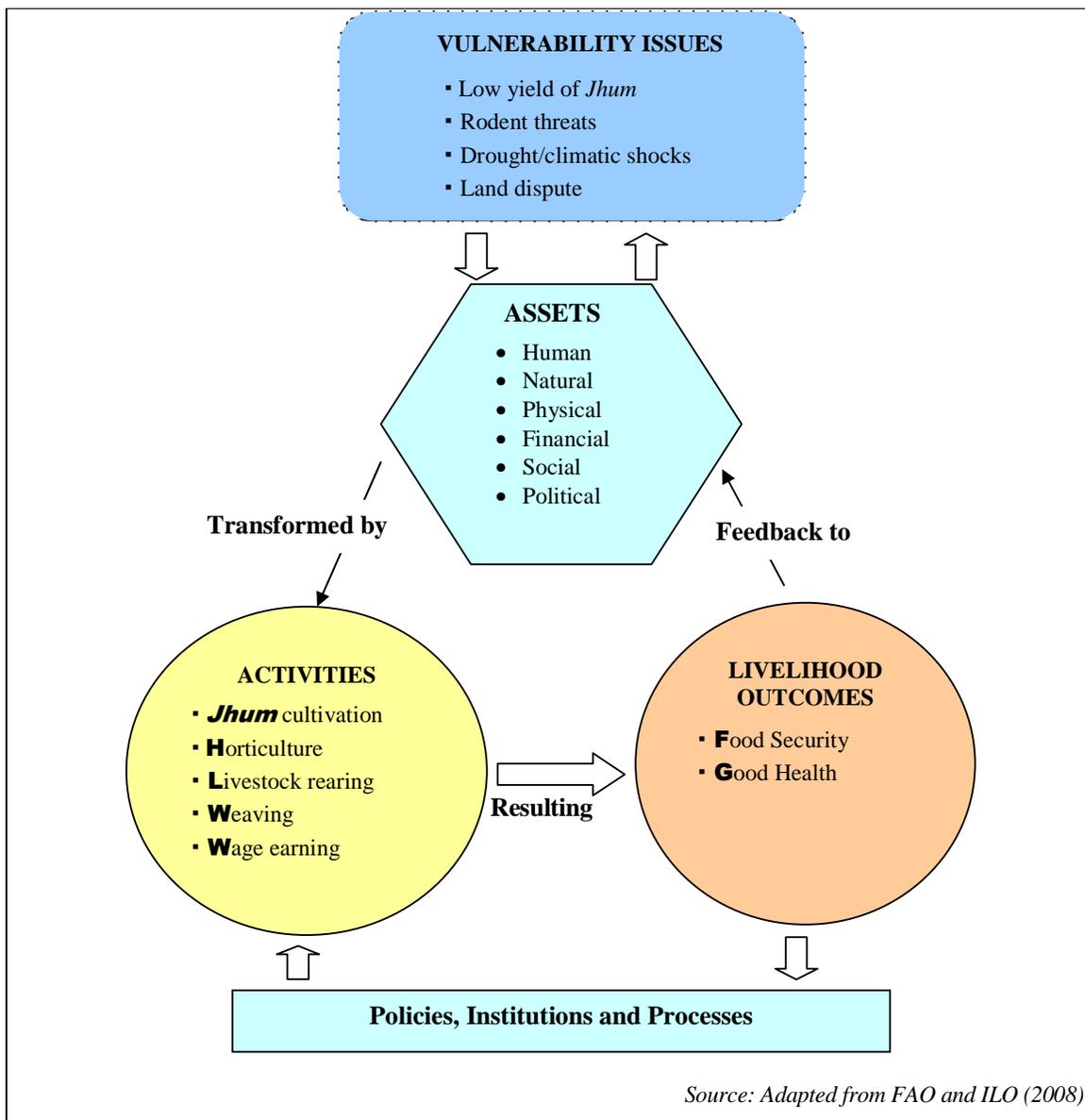


Figure 3.4 Logical framework for Sustainable Livelihoods

3.6 Livelihood Coping Strategies

A livelihood comprises the capabilities, assets (stores, resources, claims and access), and activities required for a means of living (Chambers and Conway, 1992). More specifically, livelihoods can be seen to consist of a range of on-farm and off-farm activities that together provide a variety of procurement strategies for food and cash. A coping strategy is a short-term response to threats to livelihoods. Coping strategies can be successful when they are able to preserve vital assets, or negative when they are unable to do so and may lead to downward spirals of impoverishment. Any response should aim to support existing positive

coping strategies and release households and communities from dependence on negative ones (FAO and ILO, 2008). In the analysis of livelihood strategies, it was also important to capture the types of coping strategies people use when normal livelihood options are not adequate to meet household needs. It is important to distinguish between coping strategies that are non-sustainable and coping strategies that are sustainable. Coping strategies are divided into two parts: a) Consumption coping strategies, and b) Non-consumption coping strategies. Consumption coping strategies are specially related to food consumption and non-consumption coping strategies are related to asset sales and not directly related to food for example sell fuel wood is a non-consumption but eaten seed stock held for next season is a consumption coping strategy which was articulated by Maxwell *et al.*, 2003. In this analysis consumption coping strategies were further divided into four types such as: i) Dietary change, ii) Short-term measures to increase household food availability, iii) Short-term measures to decrease numbers of people to feed and iv). Rationing or managing the shortfall. Consumption coping strategies were identified by asking a simple question to the respondents and the answers were taken following different frequencies such as every day, sometimes, rarely and never. The coping strategies of the sample households are presented in the Tables 3.40 and 3.41.

It was found that 30.5% and 50.4% of the ethnic respondents relied on less expensive foods for 'everyday' and 'sometimes', respectively as consumption coping strategy during food shortage period. Other coping strategies were borrowing food (16.5% everyday and 49.3% sometimes); purchase food on credit (15.9% everyday and 42.8% sometimes); harvest immature crop (5.8% everyday and 29.1% sometimes); consume seed stock (16.5% everyday and 49.3% sometimes); cut quantity of food per meal (12.8% everyday and 37.2% sometimes); adult taking less food (17.6% everyday and 37.5% sometimes); reduce number of meals eaten in a day (8.6% everyday and 34.4% sometimes) etc. (Table 3.38).

Table 3.38 Consumption coping strategies adopted by ethnic households in CHT region

| Coping strategies | Farmer responded (%) | | | |
|---|----------------------|-----------|--------|-------|
| | Every day | Sometimes | Rarely | Never |
| 1. Dietary Change | | | | |
| a. Rely on less expensive foods | 30.5 | 50.4 | 10.3 | 8.8 |
| 2. Increase Short-term household food availability | | | | |
| b. Borrow food | 16.5 | 49.3 | 22.5 | 11.6 |
| c. Purchase food on credit | 15.9 | 42.8 | 31.3 | 10.0 |
| d. Gather wild food or hunt wild animal | 4.2 | 19.1 | 31.9 | 44.8 |
| e. Harvest immature crops | 5.8 | 29.1 | 39.9 | 25.2 |
| f. Consume seed stock held for next season | 16.5 | 49.3 | 22.5 | 11.6 |
| 3. Decrease number of people | | | | |
| g. Send household members to eat elsewhere | 4.0 | 15.0 | 30.7 | 50.3 |
| 4. Rationing Strategies | | | | |
| h. Cut quantity of food per meal | 12.8 | 37.2 | 29.6 | 20.3 |
| i. Adults took less food in order to feed small children | 17.6 | 35.7 | 26.3 | 20.4 |
| j. Reduce number of meals eaten in a day | 8.6 | 34.4 | 32.6 | 24.4 |
| k. Keep entire day without eating | 0.3 | 6.6 | 35.1 | 57.9 |

Source: Field Survey, 2009

For non-ethnic community, Table 3.39 shows that 50.0% and 33.3% respondents rely on less expensive foods for 'everyday' and 'sometimes' respectively as consumption coping strategy during food shortage period. Other coping strategies were borrowing food (25.6% everyday and 40.0% sometimes); cut quantity of food per meal (43.3% everyday and 22.2% sometimes); adult took less food (28.96% everyday and 33.3% sometimes); reduce number of meals eaten (24.4% everyday and 28.9% sometimes); keep entire day without eating (10.0% everyday and 7.8% sometimes) etc. The findings revealed that consumption coping strategies were not equal in severity of their impacts. The severity of coping strategies is a matter of perception. While not eating for a whole day or consuming the seed stock kept for the next

season planting undoubtedly represent severe coping behaviors in nearly any culture (Table 3.39).

Table 3.39 Consumption coping strategies of non- ethnic sample households in CHT

| Coping strategies | Farmer responded (%) | | | |
|---|----------------------|-----------|--------|-------|
| | Every day | Sometimes | Rarely | Never |
| 1. Dietary Change: | | | | |
| a. Rely on less expensive foods | 50.0 | 33.3 | 5.6 | 11.1 |
| 2. Increase Short-term household food availability | | | | |
| b. Borrow food | 25.6 | 40.0 | 21.1 | 13.3 |
| c. Gather wild food or hunt wild animal | - | - | 33.3 | 62.2 |
| d. Harvest immature crops | - | 4.4 | 42.2 | 53.3 |
| e. Consume seed stock held for next season | - | 4.4 | 45.6 | 50.0 |
| 3. Decrease number of people: | | | | |
| f. Send household members to eat elsewhere | 1.1 | 12.2 | 42.2 | 44.5 |
| 4. Rationing Strategies: | | | | |
| g. Cut quantity of food per meal | 43.3 | 22.2 | 16.7 | 17.8 |
| h. Adults took less food in order to feed small children | 28.9 | 33.3 | 20.0 | 17.8 |
| i. Reduce number of meals eaten in a day | 24.4 | 28.9 | 30.0 | 16.7 |
| j. Keep entire day without eating | 10.0 | 7.8 | 28.9 | 53.3 |

Source: Field Survey, 2009

Non-consumption coping strategy comprise selling household assets, selling fuel wood, selling bamboo, selling livestock/poultry, selling fruits, selling timber, taking loan and break-down previous savings. Irrespective of locations and ethnic groups, the highest number of respondents mentioned taking loan (35.9%) as the non-consumption coping strategy followed by selling bamboo (29.2%) and fuel wood (28.4%) (Table 3. 40).

Table 3. 40 Non-consumption coping strategies adopted by sample households in CHT

| Location/ Respondent type | Coping strategies (% farmer responded) | | | | | | | |
|------------------------------|--|----------------|------------|-------------|--------------|-------------|-------------|-------------------|
| | Sale household asset | Sale fuel wood | Loan taken | Sale bamboo | Sale poultry | Sale fruits | Sale timber | Breakdown savings |
| Bandarban: | | | | | | | | |
| Chakma | 9.1 | 78.8 | 39.4 | 54.5 | 9.1 | - | 39.4 | - |
| Marma | - | 50.0 | 61.1 | 11.1 | 63.9 | 13.9 | 19.4 | - |
| Tanchanga | - | 71.4 | 11.4 | 62.9 | 8.6 | 2.9 | 51.4 | - |
| Tripura | 22.2 | 55.6 | 30.6 | 88.9 | 16.7 | 22.2 | 33.3 | - |
| Mro | - | 7.9 | 47.4 | 39.5 | 5.3 | 13.2 | 7.9 | - |
| Bawm | - | 8.3 | 25.0 | 50.0 | 16.7 | 91.7 | 47.2 | 2.8 |
| <i>All ethnic</i> | 5.2 | 45.3 | 35.8 | 51.1 | 20.0 | 24.0 | 33.1 | 0.5 |
| <i>Non-ethnic</i> | - | 60.0 | 50.0 | 43.3 | 10.0 | - | 20.0 | - |
| Khagrachari: | | | | | | | | |
| Chakma | 8.1 | 18.9 | 37.8 | 5.4 | 32.4 | 5.4 | 5.4 | - |
| Marma | - | 11.1 | 16.7 | - | 16.7 | 11.1 | 11.1 | 5.6 |
| Tripura | 6.1 | 42.4 | 15.1 | - | 21.2 | 6.1 | 6.1 | 6.1 |
| <i>All ethnic</i> | 4.7 | 24.1 | 23.2 | 1.8 | 23.4 | - | 6.7 | 6.7 |
| <i>Non-ethnic</i> | 6.7 | 33.3 | 30.0 | - | 13.3 | 3.8 | 7.1 | 5.3 |
| Rangamati: | | | | | | | | |
| Chakma | 22.2 | 13.9 | 44.4 | 16.7 | 47.2 | 36.1 | 33.3 | - |
| Marma | - | - | 62.9 | - | 60.0 | 48.6 | 17.1 | - |
| Tanchanga | - | 33.3 | 38.9 | 13.9 | 25.0 | 44.4 | 33.3 | 36.1 |
| <i>All ethnic</i> | 7.4 | 15.7 | 48.7 | 10.2 | 44.1 | 13.3 | 3.3 | 10.0 |
| <i>Non-ethnic</i> | 10.0 | - | 56.7 | - | 60.0 | 28.2 | 15.6 | 11.0 |
| <i>All ethnic</i> | 5.8 | 28.4 | 35.9 | 29.2 | 5.8 | 12.4 | 14.4 | 5.7 |
| <i>Non-ethnic</i> | 5.6 | 31.1 | 45.6 | 27.8 | 5.6 | 10.6 | 14.2 | 5.4 |

Note: A household adopted more than one strategy, so percentages of individual household would not be necessarily equal to 100. Source: Field Survey, 2009

Chapter IV

CONCLUSION AND POLICY RECOMMENDATIONS

4.1. Conclusions

Chittagong Hill Tracts has an enormous potentiality for agricultural production. Of the total 1,51,960 ha cultivated land, single cropped area is 43.8%, double cropped area 28.1% and triple cropped area 7.4%. The total population of this region is 14,86,700 inhabitants. Livelihoods in this region are still dependent on *Jhum* cultivation and natural forest resources. The important sources of income are intensive valley/plain/fringe land farming, petty business, sale of fuel wood, timber, fruits, livestock, wage earning and weaving. Most of the households in remote places are much worse off than those in other areas. The livelihoods of ethnic minorities are quite different from non-ethnic people in many ways. The ethnic households growing rice in *Jhum* fields and other plain/valley land have comparatively more cereal sufficiency than non-ethnic households.

Food availability in the Hill Tracts has been decreasing with rapidly increasing population and it is a great pressure on the land available for production. Traditional *Jhum* farming was the major livelihood options for ethnic minorities but low yield of *Jhum* crops did not meet their food requirement for more than four months. For the remaining months, they survive by wage earning, selling fuel wood, bamboo, timber, poultry/livestock or fruits; engaged in petty business or taking loan from neighbors/relatives. Food insecurity is apparent in the rural households due to lack of availability of rice, lack of cash and limited work facilities especially in rainy season. The average yield of rice and other *Jhum* crops were estimated to be very low (due to use of local variety, low soil fertility and less or no use of fertilizer, pesticide etc.) compared to improved varieties developed by different research institutions. Most of the *Jhumiya* farmers already shifted from *Jhum* cultivation to fruit gardening. Therefore, their cash earning was higher than others and mixed fruit orchard might be an alternative option for *Jhum* farmers. In most cases rural poor farmers could not meet up initial investment of fruit orchard. It is encouraging that some of the government and non-government organizations came forward to establish mixed fruit orchard by providing cash and free inputs in limited scale.

Average food shortage was recorded to be 84% for non-ethnic and 46% for ethnic households in CHT. So, per capita per day food and calorie intake was estimated to be higher for ethnic than for non-ethnic households.

Crop damaged from drought, rodent threats, flash flood etc. were the major risk/vulnerabilities to livelihoods. About 72% non-ethnic and 24% ethnic households were found landless in the study area. Household size of both ethnic and non-ethnic was found slightly higher than national average. About 46.3% ethnic and 46.5% non-ethnic family members were found to be illiterate in CHT. Agricultural related training received by the farmers was not satisfactory for both ethnic and non-ethnic households. Average farm size was found higher for ethnic (1.34 ha) compared to non-ethnic (0.44 ha) in the study area. A good number of livestock was found to be reared by the ethnic households. The use of mobile phone was found higher with the non-ethnic respondents. Ethnic households were found to receive more credit than the non-ethnics. The benefits received under social safety net program of the government such as VGD, VGF and old age allowance was higher for non-ethnics than ethnics. On the other hand, relief given by the NGOs was higher for ethnic households. Non-ethnic respondents seemed to be more conscious about the use of family planning and sanitary latrine than the ethnic respondents. A large number of family members (49.7% ethnic and 73.3% non-ethnic) were found to suffer from malaria disease in the last year.

About 70.0% non-ethnic and 61.5% ethnic household could 'never' afford to take balanced meals. About 12.4% ethnic and 24.4% non-ethnic respondents were 'always' worried about their next meal in CHT. The causes of food insecurity were low yield in *Jhum* crops, limited land for cultivation, crop damage, rodent threats in *Jhum* crops, limited working facilities and lack of cash. Relying on less preferred food, borrowing food, money or consuming food stock, cutting quantity of food, adults taking less food, reducing number of meals per day and keeping entire day without eating were their consumption coping strategies during food crisis. Selling fuel wood, livestock/poultry, timber/fruits, doing petty business, wage earning etc. were non-consumption coping strategies mentioned by the ethnic and non-ethnic respondents.

On the basis of empirical findings it might be concluded that the food and livelihood security can be ensured at household level by adjusting government policy related to food security in the Hill Tract region. Location specific sustainable agricultural technologies and extensive extension services can also be ensured for food security for rural household in the CHT.

4.2 Policy Recommendations

The results provide significant implications for food security as well as livelihood security in the CHT. No single policy can be prescribed for improving these; instead mixed policies have to be followed. Raising crop productivity and real income of the farmer will be a top strategy for ensuring both food and livelihood security. The following recommendations are made on the basis of findings:

- Shifting cultivation in the remote areas needs to be modernized by introducing modern agricultural practices. In peri-urban areas where road communication and marketing facilities are mostly available, settle farming i.e. mixed fruit orchard might be suitable as an alternative to *Jhum*. The farmers would be able to cultivate rice and other short term vegetables in the fruit orchards during first three to four years when the canopy size of trees are small. In this aspect, government could provide cereal (rice) incentives through social safety net program to the most vulnerable households until they receive benefit from fruit orchard.
- Settle farming (fruit orchard) may be able to generate more income than *jhum* farming in the long-run. The establishment of fruit orchard will require proper management i.e. fertilization, weeding and watering after plantation. Due to lack of cash, poor farmers cannot ensure proper management of fruit orchards. Therefore, the concerned government department could create irrigation facilities by constructing small-scale creek dams and provide other necessary agricultural inputs (fertilizer, insecticide, sprayer etc.) with low cost. Existing fruit gardens need more support in applying fertilizers and insecticides for receiving more benefits which could raise food and nutritional security to a great extent.
- Rodent threat in *Jhum* crops is a current problem in the study areas causing risk to food security and livelihood. To overcome this problem, a special program could be undertaken by the concerned department.
- In order to minimize the crop damage due to drought, drought tolerant crop variety should be developed. Some *Jhum* crops have already been found to be drought resistant but it needs more management oriented package of technology which can be provided by the Department of Agricultural Extension (DAE) and On-Farm Research Division (OFRD) of BARI.
- Limited land available per household is one of the important bottlenecks of food security. To overcome this problem, a reasonable size of land per households could be provided through spot settlement to the landless and marginal households. They should also be provided legal ownership document of land for cultivation or creating settled farming.

- Livestock and poultry is an important sector which can generate income and supply food and nutrition. Therefore, concerned department should come forward with new incentives (i.e. easy loan, free or low cost input supply and providing extension service etc.) to the most vulnerable households.
- During food crisis in the CHT, government program i.e. Food for Work and/or Cash for Work should be strengthened.
- Government should take necessary steps to reduce household size and minimize dependency ratio by creating new jobs and income generating activities. Family planning programme should also be strengthening in this regard.
- The level of education of the family members was not satisfactory in the study areas. To overcome this problem, at least one primary school should be established in each village.
- Institutional credit supply procedure should be made easy and the interest rate should be lowered as much as possible.
- Sanitation status of the respondent households was found to be unsatisfactory. Therefore, concerned department should give more emphasis on this issue. Break-out of malaria disease was another threat to health in the hilly areas. A remarkable number of family members suffered from malaria last year. To overcome this problem, relevant program should be implemented in urban, peri-urban and rural areas of the CHT.
- Various social safety net programs such as VGF, VGD, age old allowances, widow allowances, disabled allowances implemented by the government are reported to be very much helpful to the vulnerable ethnic and non-ethnic households. Therefore, these programmes should be extended in remote areas where lower level of cereal sufficiency of households exists.
- In addition, food production in the CHT should be enriched through application of modern agricultural technologies by the concerned department. Access to food at all times at all households especially poor households should be ensured. Moreover, nutritionally rich food intake could be ensured by motivational awareness program. Increase real income, education and health status can be ensured for sustainable food and livelihood security in the Chittagong Hill Tract region.

4.3 Areas for further research

Based on our findings the following areas may be considered for further research:

1. Investigating indigenous food consumed by the ethnic households and its effect on nutrition;
2. Examining the behaviors of rural household on consumption and production decision in CHT;
3. Assessing food poverty in rural household and the policy implication for CHT;
4. Changing climate and its long-term impact on crop production in CHT;
5. Identifying determinants of income and its socio-economic impact on livelihood security in the CHT;
6. Identifying best alternatives to *Jhum* and its socio-economic impact on food security in CHT.

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Annex-1. Information of selected locations in the study

| Sl. No. | Name of village/Para (Sadar Upazila) | Area of village/Para (sq. km.) | Ethnic/non-ethnic groups | Total households | Total population | Distance to town (k.m) | No. of NGO's worked |
|--------------------------------|--------------------------------------|--------------------------------|--------------------------------|------------------|------------------|------------------------|---------------------|
| <i>Bandarban Hill District</i> | | | | | | | |
| 1. | Talukdar Para | 1.3 | Marma | 37 | 181 | 9-10 | 1 |
| 2. | Dolo Para | 2.5 | Marma & non-ethnic | 177 | 887 | 15-16 | 3 |
| 3. | Kana Para | 1.5 | Marma & Tanchanga & non-ethnic | 46 | 212 | 7-8 | 2 |
| 4. | Dad Vanga Para | 1.3 | Tanchanga & non-ethnic | 26 | 131 | 8-9 | 2 |
| 5. | Dolu jiri Para | 1.4 | Tanchanga | 23 | 103 | 9-10 | 1 |
| 6. | Tiger Para | | Tanchanga & Chakma | 37 | 175 | 10-11 | 2 |
| 7. | Parjaton-Chakma Para/Vandari Para | 2.4 | Chakma & non-ethnic | 58 | 290 | 11-12 | 2 |
| 8. | Faruq Para | 1.5 | Bawm | 108 | 609 | 8-10 | 3 |
| 9. | Laimee Para | 1 | Bawm | 67 | 358 | 10-12 | 6 |
| 10. | Gezmony Para | 1.3 | Bawm | 36 | 349 | 13-14 | 3 |
| 11. | Seron Para | 0.5 | Bawm | 44 | 245 | 14-15 | 5 |
| 12. | Basanta Para | 2.2 | Mro | 17 | 108 | 15-16 | 2 |
| 13. | Noa Para | 5 | Mro | 27 | 152 | 17-18 | 5 |
| 14. | Jardan Para | 1.3 | Tripura | 27 | 172 | 13-14 | 4 |
| 15. | Hativanga Para | 1.5 | Tripura | 35 | 161 | 5-6 | 3 |
| 16. | Sangai Para | 1 | Tripura | 15 | 79 | 6-7 | 1 |

Khagrachari Hill District

| | | | | | | | |
|----|------------------|------------|-------------------------------------|------|------|-------|----|
| 1. | Kamal Chari Mukh | 3.2 | Chakma | 206 | 1635 | 7-8 | 2 |
| 2. | Bhowachari | 5760 acres | Marma, Chakma, Tripura & non-ethnic | 1012 | 4891 | 8-9 | 10 |
| 3. | Headman Para | 1.5 | Marma | 64 | 342 | 10-12 | 2 |
| 4. | Mangal Chan Para | 1.3 | Tripura | 48 | 238 | 9-10 | 1 |
| 5. | Jaduram Para | 1.1 | | 24 | 140 | 8-9 | 1 |

Rangamati Hill Districts

| | | | | | | | |
|----|-----------------------|-----|----------------------------|----|-----|-------|---|
| 1. | Sapchhari Maidda Para | 2.3 | Chakma & non-ethnic | 92 | 386 | 12-13 | 2 |
| 2. | Mron Chari Para | 2.5 | Chakma | 75 | 330 | 14-15 | 1 |
| 3. | Kippa Para | 3.2 | Marma, Chakma & non-ethnic | 89 | 445 | 14-15 | 5 |
| 4. | Tanchanga Para | 3.0 | Tanchanga & Chakma | 70 | 350 | 13-15 | 5 |

Source: Field Survey, 2009

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