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# *Assessment of Indigenous Hill People of Meghalaya, India regarding Household Food Access*

**Deepak Bhagat; PhD[*1] & Shweta Priyamvada; PhD[2]**

*[1] Department of Management, North-Eastern Hill University, Tura Campus, Meghalaya, India-794002; [2] Department of Rural Development, University of Science & Technology, Ri-Bhoi, Meghalaya-793101, India.*

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***Corresponding author***
dip19bhagat@gmail.com
Department of Management, North-Eastern Hill University, Tura Campus, Meghalaya, India.

***Postal code:*** 794002
***Tel***: +91-9774481990

***ABSTRACT***

**Background:** While the broad issue of food security has generally received attention of the researchers, the particularities in hills and mountains has remained neglected. Thus, to provide some insights on food insecurity regarding mountain specificities, the current study aims to evaluate household food access of indigenous hill people in Meghalaya, India. **Methods:** Food access is a measure of household's ability to acquire available food over a given period. In the current study, a sample of 900 people from indigenous population were randomly selected from rural Khasi, Garo and Jaintia Hills of Meghalaya. Household food access was explored with the following indicators: household wealth and income; household dietary diversity score (HDDS), and food consumption score (FCS). Data collection was done during December, 2019 to September, 2020. **Results:** The sample households are characterised by the predominance of marginal farmers (93% to 97%). Most of them were in the category of borderline food security with the FCS of between 21.5 to 35.0. Starchy staples were considered the main component of their diet. Their dietary diversity was significantly correlated with income (correlation coefficient=0.22) and wealth (correlation coefficient=0.38) at 0.01 level of significance. **Conclusion:** As dietary diversity at household is related to income and wealth, scarcity of income and wealth regarding indigenous hill population was an obvious reason for poor dietary diversity and the resultant poor dietary quality at the household level. To increase local food production and improve dietary diversity of indigenous hill people, revitalizing and strengthening local food systems is of great significance.

**Key Words:** *Food insecurity; Food availability; Diet; Economic status; Rural population*

## Introduction

Mountains cover 22% of the world's land surface and are home to some 915 million people, accounting for 13% of the global population (Food and Agriculture Organization, 2015). Currently, around 50 million people live in remote rural mountain areas where their ability to access basic health, education, water, and supply services is limited; their trading capacity is constrained, and around 17 million of them are also vulnerable to food insecurity (Food and

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Agriculture Organization and United Nations Convention to Combat Desertification (UNCCD), 2019).The average calorie intake in mountain states of India tends to be lower than the national average, particularly in Manipur, Meghalaya, and Nagaland) (Ministry of Health and Family Welfare, 2017). The hills and forested tracts of India are in general the dwelling places of tribal groups (Behera and Nayak, 2013) whose inhabitants in these poorly resource- endowed areas are under-nourished or suffer food insecurity (Mujumdar, 2006). The tribal communities of northeast India are also living in relative isolation in distant hills and in spatially remote areas (Misra, 2011). They face chronic food insecurity and the food produced roughly meets half of the population's requirement (Hussain, 2004, Mohapatra, 2006).

A review of the existing literature highlighted that while food security has generally received the attention of researchers, the particularities in mountain and hill regions remained neglected (Jenny and Egal, 2002). Available data often refer to the national level, or are estimates for mountainous areas (Kreutzmann, 2001, 2006) which remains unsubstantiated because measuring food security, which is an elusive concept, remains difficult (Barrett, 2010). Similarly, there appears to be poor data regarding specific tribes of northeast India, in general, and Meghalaya, in particular (Chyne *et al.*, 2017). The above scenario calls for research to investigate household food access dimension of food insecurity in mountain environments of Meghalaya. Food access is a measure of household's ability to acquire the available food over a given period.

## Materials and Methods

*Study area:* The present study was conducted in Meghalaya plateau, located in the north eastern part of India. It has an area of 22,429 sq km (0.68% of the geographical area in the country) and lies between 24°58'N to 26°07'N latitude and 89°48' E to 92°51'E longitude. Most of the area under Meghalaya plateau comes under UNEP's class 4, class 5 and class 6 type of mountainous areas based on the combination of the three criteria of elevation, slope, and local elevation range (Behera and Nayak, 2013, UNEP and WCMC, 2002). Meghalaya is predominantly a tribal state. The population comprises three major indigenous tribal communities of the Khasis, Jaintias or Pnars, and the Garos. All three major communities are matrilineal. They reckon their descent through a female line. Necessary data for the study were collected from the indigenous hill tribal population of Meghalaya living in rural part of Khasi, Garo, and Jaintia Hills. As for objectives of this study, the villages with only tribal population were short-listed for inclusion in the sample.

*Sampling and data collection:* Regarding sampling procedure, based on "Comprehensive Food Security and Vulnerability Analysis (CFSVA) guidelines" designed by World Food Programme of United Nations (World Food Programme, 2009a) , a (stratified) two-stage cluster sampling was used. From the identified hills, 30 tribal villages were selected, and then, from each village, 30 households were selected, making a total of 900 sample households selected for the study. The present study was initiated on April 1$^{st}$, 2019. A pilot survey was carried out from August, 2019 to November, 2019, and actual data collection began from the first week of December, 2019 and completed in the last week of September, 2020.

*Household food access:* Food access is the evaluation of a household's ability to have food supply over a given period. Access is determined by the ability of households to obtain food from their own production and stocks, from the market, and from other sources. These factors are, in turn, specified by resource endowment of the household, which determine the productive activities they can pursue in meeting their income and food security objectives (Riely *et al.*, 1999). Indicators of food access typically focus on economic characteristics at the household level (World Food Programme, 2008). Food access indicators, thus, should always be defined according to the economic context (World Food Programme, 2008).



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*Indicators of household food access:* Based on other studies (Burchi *et al.*, 2011, Lele *et al.*, 2016, Riely *et al.*, 1999, World Food Programme, 2008), the household food access of indigenous hill people in Meghalaya were explored with the following indicators : (i) household wealth, livelihood, and income; (ii) household dietary diversity score (HDDS), and (iii) food consumption score (FCS).

Household wealth is commonly evaluated in food security assessments. It gives an idea of a family's ability to access food, the severity of food insecurity, and provides information about the economic situation of the food insecurity (World Food Programme, 2009a).Wealth index in the present study was prepared as per "VAM Guidance Paper on Creation of Wealth Index" developed by World Food Programme (World Food Programme, 2017) which aims at complementing the CFSVA guidelines with a practical step-by-step guidance on how to create one. The data on asset ownership and housing characteristics are combined into a proxy indicator "wealth index", which is created using principal component analysis (PCA). First principal component explains the largest proportion of total variance, and it is used as wealth index to represent the household's wealth. The created index is a continuous variable which can be used in correlations or regression models. The higher the score of the index, the wealthier the household will be (World Food Programme, 2017).

HDDS and FCS are often considered as indicators that reflect both quantity and quality of food access; they are used as proxy indicators of household access to food. Data collected for both indicators can also be used to consider dietary patterns and the consumption of specific foods, and FCS and HDDS are used for monitoring economic access to food and surveillance at decentralized levels; moreover, FCS is used for classifying the households with food insecurity, while the HDDS is used for monitoring dietary quality (World Food Programme, 2009b) .

*Ethical considerations:* This study received ethics approval from the Ethics Review Committee of North Eastern Hill University, Tura Campus, Meghalaya, and the informed consent of the respondents was also obtained.

*Data analysis:* Statistical analysis was performed with SPSS. The normality of data was analysed by Kolmogorov-Smirnov test. Kruskal-Wallis H test was performed to test whether there were any statistically significant differences between wealth index of the households regarding the three indigenous hill communities of Meghalaya. The test also examined whether there was any statistically significant difference between source-wise income For total income comparisons, the log-transformed data which followed a normal distribution were found, and thus, one-Way ANOVA was used. In general, the test examined whether there were any statistically significant differences between the mean FCS of households with regard to the three hill communities of Meghalaya.

## Results

*Wealth index of indigenous hill households in Meghalaya:* **Table 1** presents the wealth index of the sample. In construction of wealth index, along with production and transport assets (viz. shovel/spade, sickle, fish net, pounding mill, etc.) and household assets (sleeping mats, bed, table, stove gas, etc.), variables like access to improved water source and possession of livestock were also considered. Assets like weaving tools, motorcycles, and mosquito-nets were excluded while constructing wealth index, as they were owned by more than 95% or less than 5% of the sample based on (World Food Programme, 2017). This was due to the fact that the wealth index was used to capture households with different wealth status. The variable of possession of land was also excluded on the same ground. Fish net was applicable only in *Garo* tribe. Overall, the mean wealth index was observed to be 0.048 in quintile 1; 0.0109 in quintile 2; 0.239 in quintile 3; 0.472 in quintile 4 and 0.739 in quintile 5. The lowest wealth index belonged to Jaintia Hills (0.033; quintile 1) and the highest, to Khasi Hills (0.776; Quintile 5). The mean wealth index in Jaintia Hills was 0.27 and in Khasi Hills, it was 0.36. The



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wealth index in *Garo* tribe households was 0.33. There was a statistically significant difference ($P$<0.00001) between the wealth indexes of households regarding the indigenous hill communities.

**Table 1.** Wealth index of indigenous hill households of Meghalaya.

| Quintiles | Households | | | |
|---|---|---|---|---|
| | Jaintia tribe | Khasi tribe | Garo tribe | Total |
| Quintile 1 | 63 (21.00, 0.033)[a] | 62 (20.67, 0.089) | 37 (12.33, 0.046) | 186 (20.67, 0.048) |
| Quintile 2 | 62 (20.67, 0.057) | 70 (23.33, 0.160) | 81 (27.00, 0.126) | 173 (19.22, 0.109) |
| Quintile 3 | 52 (17.33, 0.136) | 50 (16.67, 0.235) | 56 (18.67, 0.284) | 183 (20.33, 0.239) |
| Quintile 4 | 64 (21.33, 0.444) | 58 (19.33, 0.544) | 49 (16.33, 0.400) | 178 (19.78, 0.472) |
| Quintile 5 | 59 (19.67, 0.683) | 60 (20.00, 0.776) | 77 (25.67, 0.687) | 180 (20.00, 0.739) |
| Total Households | 300 | 300 | 300 | 900 |
| Mean±SD | 0.27±0.27 | 0.36±0.26 | 0.33±0.24 | 0.32±0.26 |
| CV (%) | 101.85 | 74.72 | 75.45 | 83.44 |
| K-S test statistic (D) | 0.263 | 0.219 | 0.191 | 0.174 |
| P-value | < 0.001 | < 0.001 | < 0.001 | < 0.001 |

[a]**:** Figures in parenthesis against different quintile indicate the percentage of total households among different indigenous communities (PC) and their average wealth index (WI), respectively).

*Households' livelihood and income sources:* Based on **Table 2**, all the households derived their income from natural resources, but in monetary terms, it accounted for only 2.08% of their total income. Around 84.78% of the sample reported unskilled labour, which was basically wages derived from engagement in the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) as their income source, which added 23.84% to their overall income. Around 74.56% of the families reported agriculture as their income source, a 21.32% contribution to their overall income. Approximately, 52.89% of the participants reported livestock as their income source, with a 12.65% contribution to their overall income. No significant difference ($P$=0.93) was observed between the mean income of the three indigenous hill communities of Meghalaya.

*Household dietary diversity score (HDDS):* This score reflects, in a snapshot form, the economic ability of a household to access a variety of foods. A standard list of 16 food groups, the same for any country/context, is used to gather data on the food consumed in the past 24 hours. Data for each group is of a bivariate type (yes/no). To calculate HDDS, the 16 food groups are aggregated into 12 main groups. All the food groups have the same importance (relative weights equal to 1), and each group, when consumed, provides 1 point. HDDS is the simple sum of the number of consumed food groups (theoretically from 0 to 12). 76.67 of the participants had medium dietary diversity, 14.67%, a high dietary diversity, and 8.67%, experienced the lowest dietary diversity.



[ DOI: 10.18502/jnfs.v9i2.15417 ]

**Table 2.** Yearly income pattern of the indigenous hill households.

| Income sources | Average income of the reported households (in rupees) | | | | P-value[a] |
|---|---|---|---|---|---|
| | Jaintia Tribe | Khasi tribe | Garo tribe | Total | |
| Agriculture (74.56) | 13825.54 (25.25) | 18555.07 (25.95) | 13804.06 (12.69) | 15420.81 (21.32) | <0.001 |
| Livestock (52.89) | 12770.08 (12.45) | 11828.67 (10.93) | 13986.91 (14.60) | 12902.88 (12.65) | 0.04 |
| Brewing (3.89) | 6200.00 (0.57) | 6150.00 (0.38) | 6300.00 (0.39) | 6214.29 (0.45) | 0.88 |
| Fishing (32.56) | 260.23 (0.14] | 248.70 (0.12) | 258.20 (0.21) | 256.31 (0.15) | 0.78 |
| Unskilled labour (MGNREGA) (84.78) | 15175.81 (27.81) | 15155.88 (22.13) | 15166.19 (21.57) | 15166.73 (23.84) | 0.99 |
| Skilled labour (19.22) | 20126.25 (9.94) | 36535.06 (17.33) | 40395.64 (19.57) | 32230.47 (15.61) | *< 0.001* |
| Handicrafts/artisanal work (3.56) | 6107.69 (2.45) | 5432.84 (2.24) | 7727.27 (2.64) | 6342.25 (2.44) | *0.001* |
| Natural resources (100.00) | 1098.37 (2.03) | 1117.80 (2.07) | 1150.67 (2.14) | 1122.28 (2.08) | *0.31* |
| Petty trading (43.00) | 14974.36 (10.81) | 15000.00 (8.59) | 12655.37 (13.91) | 13919.89 (11.10) | 0.001 |
| Other commercial activities (17.67) | 8020.41 (2.43) | 6500.00 (1.64) | 11833.33 (5.07) | 9283.02 (3.04) | 0.004 |
| Remittances (12.00) | 9351.35 (2.14) | 11176.47 (2.34) | 13108.11 (3.01) | 11212.96 (2.50) | 0.77 |
| Salaries (5.56) | 32769.23 (2.63) | 33750.00 (4.99) | 33692.31 (2.72) | 33480.00 (3.45) | 0.92 |
| Begging/assistance (34.11) | 839.33 (0.46) | 815.60 (0.63) | 935.48 (0.54) | 858.79 (0.54) | 0.14 |
| Government allowance/pension (6.89) | 6857.14 (0.89) | 5615.79 (0.66) | 6772.73 (0.93) | 6446.77 (0.82) | 0.26 |
| Mean income | 54018.19 | 54105.28 | 53661.56 | 53928.34 | |
| SD | 14986.014 | 13650.170 | 12852.789 | 13843.54 | |
| CV (%) | 27.74 | 25.23 | 23.95 | 25.67 | |
| K-S test statistic (D) | 0.130 | 0.087 | 0.086 | 0.093 | |
| P-value | 0.0001 | 0.02 | 0.02 | <0.001 | |

**Note:** Figures in parenthesis against different income sources indicate the percentage of contribution to total income respectively.
[a]: One way ANOVA.

**Table 3.** Household dietary diversity of indigenous hill households.

| Food groups | Household heads | | | |
|---|---|---|---|---|
| | Jaintia tribe | Khasi tribe | Garo tribe | Total |
| Lowest dietary diversity (≤ 3 food groups) | 27(9.00) | 30(10.00) | 21(7.00) | 78(8.67) |
| Medium dietary diversity (4 and 5 food groups) | 225(75.00) | 220(73.33) | 245(81.67) | 690(76.67) |
| High dietary diversity (≥ 6 food groups) | 48(16.00) | 50(16.67) | 34(11.33) | 132(14.67) |
| Total households | 300 | 300 | 300 | 900 |

In addition to calculating mean scores of dietary diversity, it is important to know which food groups are predominately consumed at different scores. This provides information on the foods eaten by those with the lowest dietary diversity, and on which foods are added by those with a higher score.



[ DOI: 10.18502/jnfs.v9i2.15417 ]

The households in the lowest dietary diversity were used to taking cereals, white roots and tubers, green leafy vegetables, and occasionally, meat and their fermented products. The households with medium dietary diversity mostly consumed cereals, white roots and tubers, green leafy vegetables, meat and their fermented products; indigenous fruits were also locally available. The households in high dietary diversity had cereals, white roots and tubers, green leafy vegetables, meat and their fermented products, locally available indigenous fruits, oil, fish, egg, spices, condiments, and beverages.

*Food consumption score (FCS):* FCS is used as a proxy indicator of the household's access to food. There are positive and statistically significant associations between calorie consumption per capita and FCS. FCS has been a reliable indicator of food insecurity in all CFSVAs (World Food Programme, 2007). **Table 4** shows food consumption score for indigenous hill households of Meghalaya.

**Table 4.** Food consumption score of indigenous hill households.

| Food consumption groups | Household heads | | | |
|---|---|---|---|---|
| | Jaintia tribe | Khasi tribe | Garo tribe | Total |
| Poor food consumption (FCS between 0 to 21) | 24(8.0) | 36(12.0) | 24(8.0) | 84(9.33) |
| Borderline food consumption (FCS between 21.5 to 35) | 237(79.0) | 217(72.3) | 233(77.6) | 687(76.3) |
| Acceptable food consumption (FCS > 35) | 39(13.0) | 47(15.6) | 43(14.3) | 129(14.3) |
| Total households | 300 | 300 | 300 | 900 |
| Mean FCS±SD | 31.06±5.03 | 31.21±5.49 | 31.69±5.05 | 31.32±5.19 |
| Coefficient of variation (%) | 16.20 | 17.61 | 15.94 | 16.59 |
| K-S test statistic (D) | 0.262 | 0.266 | 0.243 | 0.257 |
| P-value | 0.001) | < 0.001) | < 0.001) | < 0.001) |

According to **Table 2**, most of the subjects were in borderline food security category with the FCS of between 21.5 to 35.0. Overall, 76.33% (with an average FCS of 31.62) of families were in borderline food security category. In addition to this, overall, 9.33% (with an average FCS of 19.32) of the households were in poor food security category. Those with an acceptable food security level had the FCS above the borderline level. Kruskal-Wallis H test also demonstrated that there was not any statistically significant difference between the mean FCS of the hill communities of Meghalaya ($P$= 0.15).

**Table 5** presents the correlation between food consumption score with income and wealth index of the sample. A positive and significant correlation was observed between their food consumption score and income (correlation coefficient=0.22) at 0.01 level of significance. A positive and significant relationship was also observed between their food consumption score and wealth index (correlation coefficient=0.38) at 0.01 level of significance. Thus, it can be concluded that the poor dietary diversity and the resultant quality at the household was primarily because of their low level of income and wealth.



[ DOI: 10.18502/jnfs.v9i2.15417 ]

**Table 5.** Correlation between food consumption score with income and wealth index of indigenous hill population.

| Tribes | Average food consumption score | Average income (Rs.) | Average wealth index | Pearson correlation coefficient[a] | |
|---|---|---|---|---|---|
| | | | | With income | With wealth index |
| Jaintia tribe | 31.06 | 54018.19 | 0.27 | 0.30 | 0.31 |
| Khasi tribe | 31.21 | 54105.28 | 0.36 | 0.20 | 0.42 |
| Garo tribe | 31.69 | 53661.56 | 0.33 | 0.17 | 0.43 |
| Total | 31.32 | 53928.34 | 0.32 | 0.22 | 0.38 |

[a]: Correlations were significant at 0.01 (2-tailed).

## Discussion

Though food security studies have attracted the interest of researchers and policy makers, there is no food security studies about mountainous areas. Available data often refer to national or other scales for mountainous areas (Kreutzmann, 2001, 2006). It is the same for Meghalaya (Chyne *et al.*, 2017), which is characterised by difficult terrains and the predominance of small and marginal holdings.

HDDS revealed the economic capability of a household to access a variety of foods, suggesting that most of indigenous households had medium to lowest dietary diversity. Cereals, tubers, and root crops (maize, rice, sorghum, millet, bread and other cereals, cassava, potatoes, and sweet potatoes) i.e. the starchy staples were observed to be the main component of diet of indigenous hill households of Meghalaya. Lack of dietary diversity was observed from little intake of pulses, vegetables, fruits, milk, sugar, and oil. Contrary to the general perception of heavy intake of animal products in the diet, meat and fish (beef, goat, poultry, pork, eggs, and fish) were not even taken twice a week. According to the studies, dietary diversity was associated with socio-economic status and household food security (Hatløy *et al.*, 2000, Hoddinott and Yohannes, 2002). Dietary diversity has long been recognized as a key element of diet quality (Ruel *et al.*, 2013). Thus, the current study not only showed poor dietary diversity among the indigenous hill households of Meghalaya but also poor diet quality among them.

FCS, a proxy indicator of household access to food, is a reliable indicator of food insecurity in all CFSVAs (World Food Programme, 2007) The families with an acceptable food security level has a FCS of above borderline level. As FCS and calorie consumption per capita are positively and significantly correlated (World Food Programme, 2007), the poor FCG may correspond with extreme undernourishment, and even some with "acceptable food consumption group" may have a consumption of below 2,100 kcal per capita per day. In short, most of the indigenous hill households of Meghalaya may be highly vulnerable to food insecurity.

There may be many possible determinates of dietary diversity. However, there is strong evidence that dietary diversity at household level was related to income and wealth (Hoddinott and Yohannes, 2002, Ruel, 2002, World Food Programme, 2007). Similar observations can be interpreted from the present study, where a positive and significant correlation was observed between food consumption score and the income of the participants. There was a positive and significant correlation between food consumption score and wealth index of indigenous hill population in Meghalaya. As dietary diversity at household was related with income and wealth, low amount of income and wealth caused poor dietary diversity and quality of the families. Regarding the limitations of this study, gender dynamics of food security was not considered.

## Conclusions

Small and marginal farmers together constituted more than 99% of the households from the indigenous hill communities of Meghalaya in this study. Most of the participants 76.33% suffered from borderline food security category (FCS between 21.5 to 35.0). Only 14.33% enjoyed an acceptable food security with an FCS of marginally



[ DOI: 10.18502/jnfs.v9i2.15417 ]

above the borderline level. Their diet mostly consists of starchy staples (viz. cereals, tubers, and root crops). The poor income and wealth of the indigenous sample are significant reasons for the poor dietary diversity at the household level. It is recommended that local food systems should be revitalized to increase food production, decrease dependence on external assistance, and improve the dietary diversity of the indigenous hill people from Meghalaya.

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## Authors' contributions

Bhagat D designed and conducted the research. Bhagat D and Priyamvada S analysed data and wrote the paper. Bhagat D had primary responsibility for final content. All the authors read and approved the final manuscript.

## Conflict of interest

The authors declared no conflict of interest.

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## References

**Barrett CB** 2010. Measuring food insecurity. *Science*. **327 (5967)**: 825-828.

**Behera R & Nayak D** 2013. Population growth, agricultural land use change and implication for food security in Meghalaya Plateau, India. In *Paper presented XXVII IUSSP International Population Conference*, pp. 26-31.

**Burchi F, Fanzo J & Frison E** 2011. The role of food and nutrition system approaches in tackling hidden hunger. *International journal of environmental research and public health.* **8 (2)**: 358-373.

**Chyne DAL, et al.** 2017. Nutritional status, food insecurity, and biodiversity among the K hasi in M eghalaya, N orth-East I ndia. *Maternal & child nutrition.* **13**: e12557.

**Food and Agriculture Organization** 2015. Mapping the Vulnerability of Mountain Peoples to Food Insecurity. FAO Rome, Italy.

**Food and Agriculture Organization & United Nations Convention to Combat Desertification (UNCCD)** 2019. Vulnerability to food insecurity in mountain regions: Land degradation and other stressors. In

**Hatløy A, Hallund J, Diarra MM & Oshaug A** 2000. Food variety, socioeconomic status and nutritional status in urban and rural areas in Koutiala (Mali). *Public health nutrition.* **3 (1)**: 57-65.

**Hoddinott J & Yohannes Y** 2002. Dietary diversity as a food security indicator. International Food Policy Research Institute: Washington, D.C. U.S.A.

**Hussain M** 2004. Food security and north-east. *Economic and political weekly.* **39 (41)**: 4515-4516.

**Jenny AL & Egal F** 2002. Household food security and nutrition in mountain areas: an often forgotten story. Nutrition programmes service, FAO-ESNP, Rome.

**Kreutzmann H** 2001. Development indicators for mountain regions. *Mountain research and development.* **21 (2)**: 132-139.

**Kreutzmann H** 2006. People and mountains: perspectives on the human dimension of mountain development. *Global environmental research english edition.* **10 (1)**: 49.

**Lele U, et al.** 2016. Measuring food and nutrition security: An independent technical assessment and user's guide for existing indicators. Food Security Information Network, Measuring Food and Nutrition Security Technical Working Group: Rome.

**Ministry of Health and Family Welfare** 2017. India National Family Health Survey NFHS-4 2015–16. pp. 1255-1259: India.

**Misra T** 2011. The Oxford anthology of writing from north-east India, poetry and essays.



[ DOI: 10.18502/jnfs.v9i2.15417 ]

**Mohapatra A** 2006. Agrarian developments and food security in the North-East region In *Agriculture, food security nutrition and health in North East India.* (ed. D. Basu, B. Kulirani and B. Ray). Mittal Publications: New Delhi.

**Mujumdar N** 2006. Indian Agriculture in the New Millennium: Changing Perceptions and Development Policy. Academic Foundation.

**Riely F, Mock N, Cogill B, Bailey L & Kenefick E** 1999. Food security indicators and framework for use in the monitoring and evaluation of food aid programs. Nutrition Technical Assistance Project (FANTA): Washington, DC.

**Ruel MT** 2002. Is dietary diversity an indicator of food security or dietary quality? A review of measurement issues and research needs. *Food and nutrition bulletin.* **24 (2)**: 231-232.

**Ruel MT, Harris J & Cunningham K** 2013. Diet quality in developing countries. In *Diet quality* (ed. P. Victor R, H. Lan-Anh and P. Vinood B), pp. 239-261. Springer.

**UNEP & WCMC** 2002. Mountain watch: environmental change & sustainable development in mountains. . Cambridge, UK: UNEP World Conservation Monitoring Centre.

**World Food Programme** 2007. Measuring and interpreting malnutrition and mortality. World Food Programme (WFP) and the Centers for Disease Control and Prevention (CDC).

**World Food Programme** 2008. Food consumption analysis: calculation and use of the food consumption score in food security analysis. World food programme: Rome, Italy.

**World Food Programme** 2009a. Comprehensive food security & vulnerability analysis guidelines.: Rome, Italy: World Food Programme (WFP) & Food Security Analysis Service. .

**World Food Programme** 2009b. Food Consumption Analysis: Calculation and Use of the Food Consumption Score in Food Security Analysis: Technical Guidance Sheet. Vulnerability Analysis and Mapping Unit, World Food Programme Rome.

**World Food Programme** 2017. Creation of a Wealth Index: VAM guidance paper



[ DOI: 10.18502/jnfs.v9i2.15417 ]