GENDER PERSPECTIVE ANALYSIS OF FARM HOUSEHOLDS IN RESPECT TO FOOD SECURITY IN NORTH EASTERN INDIA

Ph.D. Thesis

By

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DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE
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GENDER PERSPECTIVE ANALYSIS OF FARM HOUSEHOLDS IN RESPECT TO FOOD SECURITY IN NORTH EASTERN INDIA

Thesis

Submitted to the

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By

Kankabati Kalai

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CERTIFICATE-I

This is to certify that the thesis entitled **"Gender Perspective Analysis of Farm Households in respect to Food Security in North Eastern India"** submitted in partial fulfillment of the requirements for the degree of **Doctor of Philosophy in Agriculture** of the Indira Gandhi Krishi Vishwavidyalaya, Raipur, is a record of the bonafide research work carried out by **Kankabati Kalai** under our guidance and supervision. The subject of the thesis has been approved by Student's Advisory Committee and the Director of Instructions.

No part of the thesis has been submitted for any other degree or diploma or certificate course. All the assistance and help received during the course of the investigations have been duly acknowledged.

Co-Chairman **Chairman**

Date: 19/07/19

THESIS APPROVED BY THE STUDENT'S ADVISORY COMMITTEE

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CERTIFICATE – II

This is to certify that the thesis entitled **"Gender Perspective Analysis of Farm Households in respect to Food Security in North Eastern India"** submitted by **Kankabati Kalai** to the Indira Gandhi Krishi Vishwavidyalaya, Raipur, C.G. in partial fulfillment of the requirements for the degree of **Doctor of Philosophy in Agriculture** in the Department of Agricultural Extension has been approved by the external examiner and Student's Advisory Committee after oral examination.

02/12/15

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Director of Instructions _____

Dedicated

To

My Beloved Parents

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Place: Raipur

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LIST OF NOTATIONS/SYMBOLS

%	Percentage
et al.	et alia
ha	Hectare
Kg	Kilogram
MT	Metric ton
₹	Rupee
$\bar{X}$	Mean
>	More than
<	Less than

LIST OF ABBREVIATIONS

A	Asset
AAY	Antyodaya Anna Yojana
ABS	Access to Basic Services
AC	Adaptive Capacity
APL	Above Poverty Line
BPL	Below Poverty Line
CRD	Community and Rural Development
df	Degree of freedom
F	Frequency
FAI	Food Availability Index
FAO	Food and Agriculture Organization
FIG.	Figure
GHI	Global Hunger Index
IFPRI	International Food Policy Research Institute
IGKV	Indira Gandhi Krishi Vishwavidyalaya
KMO	Kaiser-Meyer-Olkin Test
MNREGA	Mahatma Gandhi Rural Employment Guarantee Act
NCEAR	National Council of Applied Economic Research
NFSA	National Food Security Act
NGO	Non Governmental Organization
NSSO	National Sample survey Office
R	Resilience
S	Sensitivity
SNN	Social Safety Net
TPDS	Targeted Public Distribution System
TV	Television
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USDA	United State Department of Agriculture

THESIS ABSTRACT

a) Title of the Thesis : Gender perspective analysis of farm households in respect to food security in North Eastern India

b) Full name of Student: Kankabati Kalai

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ABSTRACT

The present investigation was conducted in the North-Eastern region of the country from the end of 2017 to the end of 2018. The region exhibits a unique diversity in topography, ethnicity, biodiversity and livelihood. Agriculture is basically sustenance and shifting cultivation is way of their life in the region. The present ex-post facto investigation was undertaken to unravel status of farm household toward food security through gender lens and was carried out in Tripura and Meghalaya, based on the ethnic group in the states to explore and understand the gender differences in food security and resilience to food insecurity, factor contributing to food security and constraints faced by the farm households in achieving food security and seek suggestion in overcoming the constraints prevailing. Two districts from each state were selected randomly, based on the ethnic group. Dhalai and Sepahijala were the two districts selected from Tripura, while East Khasi hills and South-west Garo hills were the other two districts selected from Meghalaya. In total 8 blocks and 16 villages of which two blocks from each district and two villages from each rural development and from each selected villages 10 households having both primary men and women were prioritized and selected randomly. Sample size of the study ends with 160 households and 320 respondents. Data was gathered through personal interview using pre-tested interview schedule. Salient findings were i) The farm households in the study area were mostly headed by men. The household head were medium age groups and having formal education between 5^{th} to 10^{th} standard. Households were mostly leading a nuclear family having family size between four to six number and one to 3 children. In addition annual household income ranges from ₹. 55000 to 88000 /- and average annual household expenditure of ₹. 129766. ii) Only 33.75 per cent of the households were food secure; one-third of the households were food secure in the Tripura (33.75 per cent) and Meghalaya (33.75 per cent). Men headed households were slightly more food secure than women headed households. iii) Only 38.8 per cent of the households were found to be resilient to food insecurity in the overall households. While in comparative study percentage of resilient household was spotted more in Meghalaya (42.50 per cent) and slightly

in men headed households (38.89 per cent) compared to Tripura (35.00 per cent) and women headed households (38.24 per cent) respectively. iv) Significant difference between men and women was observed in socio-personal, socio-economic attributes, dimensions of food security and resilience to food insecurity. v) Furthermore seven independent variables, have positive significant relationship, while the variable, food source has negative significant association with extent of food security, whereas resilience to food insecurity has also positive significant correlation with seven independent variables. vi) Climatic change and variability, weak support services, high food price and political problems were found to major problem among the farm households.vii) Need for safe guard against toward crop failure/livestock diseases was suggested by majority of farmer in overall result and men headed household. Whereas, training for boosting additional income for women was more, as suggested by head of women headed household. Based on the findings the following recommendations were made: i) There is significant need to focus on the households to improve their household income through government's intervention in assisting farmers to loom up more market oriented agriculture, climate smart agricultural practices and investment in infrastructure. ii) To strengthen resilience to food insecurity government and policy makers required to look upon all the dimensions of resilience to food security. iii) Provisioning of training for cottage industries to improve the income of women and build confidence among women to improve decision making ability in household can help in closing differences between men and women. iv) Providing timely veterinary health care services network for preventive and curative measures of livestock which also as a result can improve backyard livestock production.

Keywords: Food security, resilience, North-Eastern, Gender, Tripura, Meghalaya.

शोध सारांश

अ.	शोध का शीर्षक	पूर्वोत्त भारत में खाद्य सुरक्षा के संबंध में खेत गृहस्थी का लिंग परिप्रेक्ष्य विश्लेषण
ब.	छात्रा का पूरा नाम	कंकाबती कलई
स.	प्रमुख विषय	कृषि विस्तार
द.	मुख्य सलाहकार का नाम एवं पता	डॉ. आर.एस. सेंगर प्राध्यापक एवं विभागाध्यक्ष, कृषि विस्तार विभाग कृषि महाविद्याल इं.गा.कृ.वि. रायपुर छ.ग. 492012
ई.	सह–प्रमुख सलाहकार का नाम एवं पता	डॉ. लौखम देवरानी सह प्राध्यापक सामाजिक विज्ञान के स्कूल स्नातकोत्तर अध्ययन महाविद्यालय केन्द्रीय कृषि विश्वविद्यालय (इंफाल) बारापानी (मेघालय) 793103
फ.	उपाधि जिससे सम्मानित किया जाना है।	कृषि (कृषि विस्तार) में पी.एच.डी.

Kankabati Kalai
छात्रा के हस्ताक्षर

मुख्य सलाहकार के हस्ताक्षर

सह–सलाहकार के हस्ताक्षर

दिनांक: 19/07/19

विभागाध्यक्ष के हस्ताक्षर

'शोध सारांश

वर्तमान जांच देष के पूर्वोत्तर क्षेत्र में 2017 के अंत से 2018 के अंत तक आयोजित की गई थी। यह क्षेत्र स्थलाकृति, जातियता, जैव विविधता और आजीविका में एक अद्वितीय विविधता प्रदर्षित करता है। कृषि इनकी मुख्य जीविका है और खेती को स्थानांतरित करना इस क्षेत्र में उनके जीवन का तरीका है। खेत गृहस्थी में खाद्य सुरक्षा का स्थिति लिंग दृष्टि के माध्यम से जनकारी के लिए, खाद्य सुरक्षा और खाद्य असुरक्षा के लिए लचीलापन; रेजिलियेनस टू फूड इनसिक्योरिटी में लैंगिक अंतर का पता लगाने और समझने एवं खाद्य सुरक्षा स्थिति पाने के लिए उनकी क्या–क्या समस्याएं हैं एवं किसानों से उसका निराकरण का सुझाव क्या हो सकता है यह जानने के लिए एक्स–पोस्ट फेक्टो जांच किया गया था उद्देष्यपूर्ण दो राज्यों – त्रिपुरा और मेघालय में। जिसके लिए दोनों राज्यों से दो–दो जिलों को चुना गया जो कि जातिय आधार पर चुना गया। त्रिपुरा के दलाई, सिपाहीजला जिलों को चुना गया तथा मेघालय के ईस्ट खासीहिल और साऊथ वेस्ट गारोहिल जिलों को चुना गया, तथा प्रत्येक जिलों में से दो–दो ब्लाक, एवं प्रत्येक ब्लाक से दो–दो गांवों को चुना तथा प्रत्येक गावों से 10–10 परिवार जो कि षादीषुदा हैं के परिवारों में से एक महिला एवं एक पुरुष को चुना गया था जिसमें 160 महिलायें एवं 160 पुरुषों कुल 320 लोगों में इंटरव्यू किया गया जहां कुल 160 परिवार भी थे। मुख्य निष्कर्ष :–

- अध्याय में पाया गया की खेत गृहस्थी में ज्यादातर पुरुषों का नेतृत्व था। अधिकांष मुखिया मध्यम आयु वर्ग के थे और कक्षा 5वीं से 10वीं कक्षा के बीच औपचारिक षिक्षा प्राप्त की थी। प्रत्येक परिवार में करीब 4–6 के बीच संख्या मिली जिसमें 1 से 3 औसत बच्चे परिवार में थे एवं एक़ांकी परिवार ज्यादा पाया गया था। प्रत्येक परिवार की वार्षिक आमदनी 55000/– रु. से 88000/– थी। जिनकी औसत आमदनी 145556/– रही तथा उनकी वार्षिक औसत खर्चा 129766/– पाया गया।
- त्रिपुरा एवं मेघालय में 33.75 प्रतिषत परिवारों में खाद्य सुरक्षा पायी गयी। जिसमें महिलओं के नेतृत्व वाले परिवारों से पुरुषों के नेतृत्व वाले परिवार में खाद्य सुरक्षा अधिक पायी गयी। कुल परिवारों के 38.8 प्रतिषत लोगं में खाद्य सुरक्षा के प्रति असुरक्षा के प्रति लचीलापन था। त्रिपुरा (35.00 प्रतिषत) एवं मेघालय (42.50 प्रतिषत) में पाया गया की गेघालय में लचीलापन ज्यादा पाया गया। महिलाओं (38.24 प्रतिषत) की तुला में पुरुषों (38.89 प्रतिषत) के नेतृत्व वाले परिवार में थोड़ा अधिक लचीलापन पाया गया।
- पुरुषों और महिलाओं के बीच महत्वपूर्ण अंतर – सामाजिक–व्यक्तिगत, सामाजिक–आर्थिक विषेषताओं, खाद्य सुरक्षा और खाद्य असुरक्षा के प्रति परिपक्वता देखी गयी।
- सात स्वतंत्र चर का सकारात्मक महत्वपूर्ण संबंध था, जबकि चर, खाद्य स्त्रोत में खाद्य सुरक्षा की सीमा के साथ नकारात्मक महत्वपूर्ण संबंध थे। खाद्या सुरक्षा के प्रति परिपक्वता सात स्वतंत्र चर के साथ सकारात्मक महत्वपूर्ण संबध भी थे।
- फार्म हाऊसों में जलवायु परिवर्तन और परिवर्तनषीलता, कमजोर समर्थन सेवाएं, उच्च खाद्य मूल्य और राजनीतिक समस्याएं प्रमुख समस्या पाई गई।
- फसल की विफलता/ पषुओं की बिमारियों के खिलाफ सुरक्षित पहरे की आवष्यकता को समग्र परिणाम में किसान और बहुसंख्यक घरेलू प्रमुख किसानों व्दारा सुझाया गया था। जबकि, महिलाओं के

नेतृत्व वाले परिवार में महिलाओं की अतिरिक्त आय को बढ़ावा देने के लिए महिलाओं को प्रषिक्षण देकर अधिक से अधिक प्रषिक्षित कर उनकी आय को बढ़ाया जा सकता है।

निष्कर्ष के आधार पर निम्न सुझाव किये गये :–

1) किसानों को अधिक बाजार उन्मुख कृषि, क्लाईमेट स्मार्ट, कृषि पर आधारित और बुनियादी ढांचे में निवेष की सहायता के लिए राज्य एवं केन्द्र सरकार के हस्तक्षेप के माध्यम से अपनी घरेलु आय में सुधार करने के लिए घरों पर ध्यान केन्द्रीत करने की महत्वपूर्ण आवष्यकता है।
2) खाद्य असुरक्षा के लचीलेपन को बढाने एवं मजबूत बनाने के लिए नीति निर्माताओं एवं सरकार को सभी खाद्य असुरक्षा के लिए लचीलापन के सबी आयाम को ध्यान में रखते हुए ही पॉलिसी बनाना चाहिए।
3) कुटीर उद्योगों को बढ़ावा देने प्रषिक्षण की व्यवस्था महिलाओं की आय में सुधार लाने और महिलाओं में आत्मविष्वास पैदा करने लिए घरों में निर्णय लेने की क्षमता में सुधार करने के लिए पुरषों और महिलाओं के बीच मतभेदों को दूर करने में मदद कर सकती है।
4) समय–समय पर पषुओं के निवारक एवं उपचारात्मक उपायो के लिए पषु चिकित्सा, स्वास्थ्य सेवा नेटवर्क प्रदान करने से पिछडे उत्पादन में सुधार किया जा सकता है।

कुंजी षब्द – खाद्य सुरक्षा, लचीलापन, पूर्वोत्तर, लिंग, त्रिपुरा, मेघालय।

CHAPTER - I
INTRODUCTION

"The first essential component of social justice is adequate food for all mankind. Food is the moral right of all who are born into this world."

– Norman Borlaug (Nobel Laureate)

Hunger has been rising for the past three years in straight. Globally, around 821 million people were not getting adequate food and suffers from long term food scarcity (FAO *et al.*, 2018) and every year children exceeding three million (3.1 million, which is half of the deaths children) lose their life as a result of poor nutrition before they reach their fifth birthday (UNICEF, 2018). India has also observed similar condition, each year, half of 1.3 million deaths of children in the country below five years is due to malnutrition (Aijaz, 2017). The country is habitant to over 190 million of malnourished (FAO, 2019) which is around 14.8 per cent of the population. Furthermore, in 2018 according to GHI (Global Hunger Index) and Food availability Index (FAI) by Oxfam, India ranks 103rd and 97th, apiece (Jitendra, 2018). On the other hand, in recent years India has become first or second largest producer of several crops and attained grain adequacy, where the production has jumped from 217 million tonnes in the year 2006-07 to 275.11 million tonnes in the country during 2016-17 (Jitendra, 2018), nevertheless of hike in production, several developments in the entire sector, sustainable economic growth and agricultural development over last decades, still the certain scenario exists. According to agricultural statistic, and Ministry of Agriculture and Farmers' Welfare in 2016, the country's net availability of food grain was 177.9 kg per year per person which is even much lesser than country like Bangladesh (200 kg/person/year) against country's production of 275.11 million tonnes. However, even the gap of 30 and 20 per cent, between existing and approved dietary energy intake has remained the same over the year in rural and urban respectively though there is increase in per capita income of the country (Jitendra, 2018).

For India food security remain in the top list of development priorities. Indeed, India has come across several revolutions to be self-sufficient but its poor performance to reduce hunger and malnutrition has created a negative picture (Rao, *et al.* 2017). Around 65 per cent of the cropped area in India is rain-fed and low productivity is accepted to be the biggest issue prevailing in agriculture (Chakrabarty, 2016). On the other hand, there is also ample evidence of agrarian crisis, resulting to farmer suicides (Sainath, 2014), large-scale migration of men to nonfarm jobs for the sake of the survival of the family and which by default has engaged women more in agriculture and allied activities (Rao 2011). Irregular job and uncertain remittances from men have bounded women in agriculture and other forms of rural labour which remain as ultimate hope for food availability and access in rural areas mainly for impoverished, women and children (Patnaik, 2008). At the household level, apart from changes in income, gender relations have also begun to be significant determinant in framing food security (Rao, 2012).

Food security is ensuring that each person in any respect have physical and economic access to the essential food that they required (FAO, 1983). Food security and gender inequality have a strong link. As position of women in society, role of gender and gender division of labour hampers the status of food, nutrition security, and diversity of diet, mostly health of children and wellbeing of household member in household level (Ellena and Nongkynrih, 2017). In general men were likely to have more accessibility toward productive resources which includes productive land, extension and credit services (UNDP, 2012). Gender inequality both in the household and individual level places women at disadvantage compared to their men counterparts as they are last to eat and considered less important (Mukherjee, 2010) whereas men who have power in production decision and work more in field are more food secure in the households (Palacios and Mehta, 2011). In household level, men's responsibility were always basically securing household income either by cash crop production (FAO, 2016a; Krishnaraj, 2005) or by being agriculture labour, while women remained responsible for securing food and nutrition of the household members (FAO, 2001; Krishnaraj, 2005; UNDP 2012) and they also participate in community-level

activities in developing countries (FAO, 2016a) which support agricultural development (UNDP, 2012) by engaged in raising small livestock, growing and preparation of food which were mostly consumed (FAO,2016b).Women ensure a diverse diet which is mostly carried out by home food processing that also minimizes losses and provide marketable product (FAO, 2017). The chance of child survival rises by 20 per cent when the women control the household budget and also has a positive and significant impact on the calorie intake of the household (Ellis, 2000). Moreover, women are more likely to spend their incomes on foods and children's need (FAO, 2017). Children of literate mother, who have attained primary education at least five year, are 40 per cent more likely to live beyond the age of five in Africa (FAO, 2016b). These indicate that women play vital role in attaining three pillars of household food security and crucial roles in the production of important food staple crops (Brown, 2009) (FAO, 2001) (Ibnouf, 2011). Women are more capable than men to improve their household's food security when they have access to and control over resources such as land and income (Ibnouf, 2009). Whereas the relative bargaining power of women within the household is also mostly related to the resources she owned which she received as gift during her wedding, compared to her better half. In the context of no female ownership of productive resources, food security is negatively impacted and is both, a cause and effect of the subordinated status of women (Quisumbing & McClafferty, 2006). Income handled by women is believed to boost household food intake rather than handled by men counterparts. Moreover, in spite of having lower income compared to men, women have a habit of contributing more to household income, in both absolute and proportional terms, by retaining less for their personal use than men. Furthermore, even if in month when both have little earning, still men continue to contribute a lower proportion of what they earn (Mencher, 1988).

It is evident that women are responsible for food security across culture and actively participated in agriculture and growing crops for household consumption. But their work which were both productive and reproductive, have been underrated and their major contributions toward agriculture and security of food, merely appropriately appreciated (Quisumbing 1995). Their involvement in some activity

may also have increased income but they lack bargaining power (Singh, 2003). And which also lead them to be engaged in particular activities or any other form of work just only for sake of their survival instead of intensifying sense of their well being (Rao *et al.* 2017). Moreover, women's labor time is also another factor which has a strong link with food security. During peak season of crop production women hardly get time and comfort extreme time poverty and often unable to take proper care of their family and children (Kadiyala *et al.* 2014; Kumar and Hotchkis 1988), which involves, food remained uncooked if fuel (firewood) were not collected and stored in advance (Kumar and Hotchkiss, 1988). In India policy related to food and nutritional security has been gender blind (Rao *et al.* 2017) earlier. But many policies being gender sensitive now could not bring justice to gender due to implementation error. If food security need to achieve in both household and individual level instead of aiming only toward women and frequently overload them with the duty for food security of the household, there is need for policy approaches to persuade and increase mutuality and also sharing between men and women in households and communities, and empower them to negotiate effectively in regard to state institutions, markets, and society (Rao *et al.* 2017).

However, in the Northeastern states of the country women, especially, the tribal women are said to be relatively more empowered. The states in North East region are inhabited by around 200 different tribes (Chyne, *et al.* 2017). Agriculture is the main occupation of majority of the population and is basically of sustenance nature. However, in 2014 the region had deficit of 2.51% food grain which was 8.45 Mt for its 47.9 millions of populations (Roy *et al*. 2015). The study is conducted in two states of the region viz., Meghalaya and Tripura. In the state Meghalaya, the large majority of the population belongs to ethnic group *Khasi*, *Garo*, and *Jaintia*. These tribes are one of the 'largest matrilineal cultures' in the world. However, this matriliny is not translated into matriarchy. Important decisions at household or at community level are taken by the men folk. The representation of women in the traditional village councils is almost negligible. *Dorbar Shnong*, which is the rudimentary political arm of the *Khasis*, is men-centric and women were not permitted to hold office (Bhaumik, 2013). But still

women of the state perceived that they handle money related matter better than their men counterparts and enjoys economic liberty (Kirkpatrick, 2015). Meghalaya women have second highest land ownership after Lakshadweep and followed by other states (Tripathy, 2018). In 1997 the Government of Meghalaya has implemented the targeted public distribution system (TPDS) to improve the status of poor. Around 48.70 per cent families belong to below poverty line (BPL) category, according to the census conducted by Community and Rural Development Department (CRD), Govt. of Meghalaya in 2002 (Nongkynrih, 2015). In spite of implementation of TPDS long before still the state has highest number of undernourished children amongst northeastern states (Public service commission notes, 2017). Around 43.8 per cent of children of Meghalaya have stunted growth, which is related to maternal-under nutrition (Public Service Commission Notes, 2017). Among the *khasi*s, boys were more malnourished than the girls (Chyne, *et al.* 2017). Above 50 per cent of *Khasi* household (63.00 per cent) were moderately food insecure and only 19 per cent of the households were food secure (Chyne, *et al.* 2017). The state has a gap of 49.21 per cent food grain for population of 3,115,171, against production of 278.8 (000 tonnes) and requirement of 549 (000 tonnes) in 2014 (Roy *et al.* 2015).

On the other hand, Tripura is princely state and is home to 19 tribes. But the percentage of indigenous people is 31.76 per cent compared to 68.24 per cent non-tribal people according to census 2011. Out of 170238 total workers of Tripura, 59.30 per cent of women were involved in agriculture (Ghosh and Ghosh, 2014). Tribal women are more empowered than non-tribal women in the state (Kalai and Devarani, 2015). In tribal households, women were more empowered than the male counterparts, but in non-tribal households, the men were more empowered (Kalai and Devarani, 2018). Though the societies here are patriarchal in nature, women were provided a place of considerable socio-economic importance till early 19th century (Ghosh and Choudhuri, 2011). Even if not equal, women were less dependent on their male counterparts **(**Ganguly, 1993). But since the late 19th century, continuous assimilation and acculturation with immigrant *Bengalis* in the state has brought socio-cultural and economic change in tribal society. Women became more marginalized with settled agriculture and

the onset of ploughs and also reduced family income **(**Ghosh and Choudhuri, 2011). Majority (82.00 per cent) of the farmers in Tripura belong to marginal category according to agricultural census 2011, having average land holding of 0.97 hectare. The state has a gap of 1.11 lakh tons of food grain against production of 7.68 lakh tons and requirement of 8.79 lakh tons during the year 2014-15 (Tripurainfo, 2019). Among the Northeastern states, Tripura became the first to implement the National food security act (NFSA) in 2016, which was based on Tripura food security rules. Before the act, which was under public distribution system the households were divided into two groups above poverty line (APL) and below poverty line (BPL), where due to targeting mistake most of the poor household fallen under APL (above poverty line) category and were eliminated from the system of food security. But after the act the poor households were categorized under Antyodaya Anna Yojana (AAY) and rise in coverage under public distribution system was observed. Furthermore, food security in Tripura has begun to hold a place in electoral agenda (Maji, 2017).

Statement of the problem:

Food is basic need of human life and food security refers to the ensuring food for all. While, nationwide food availability also does ensure security of food for entire population in the country.

1. Though India has made tremendous developments, issues of growing population, poverty, food insecurity is still prevalent to a large extent.
2. In North-Eastern region of the country lags much behind other states of the country in overall development and agriculture. The region exhibits a unique diversity in topography, ethnicity, biodiversity and livelihood. Agriculture is basically sustenance and shifting cultivation is way of their life. Women in the region are said to be better placed than their mainland Indian counterparts.
3. Gender differences in food security are well emphasized by national and international experts.
4. This empirical study can help unravel the intra-household differences in food security dimensions between women and men in farm households in the region.

5. Understanding the gender dynamics and relations of the agricultural households in respect to food security is the key to formulate effective social, technological and policy interventions.

So, keeping the above points in view Gender perspective study was undertaken in Tripura and Meghalaya, based on the ethnic group in the states to explore and understand the gender differences in food security and resilience to food insecurity, factor contributing to food security and constraints faced by the farm households in achieving food security and seek suggestion in overcoming the constraints prevailing, so as to search out appropriate answer to the following research key questions:

- What is the extent of food security in agricultural households in the study area?
- How far agricultural households are resilient to food insecurity?
- What are the different gender roles in promoting food security and resilience to agricultural households?
- What are the factors contributing to level of food security?
- What are the different constraints faced by gender in achieving food security?

Objectives of the study

1. To assess the level of food security of the rural households.
2. To find out the resilience to food insecurity of the households.
3. To carry out gender analysis of various dimensions of food security and resilience in the households.
4. To find out the factors contributing to the level of food security.
5. To explore the constraints in achieving food security and seek suggestions from the households to overcome the constraints.

Scope and Significance of the study

The present investigation was exploratory study of gender perspective to food security and resilience to food insecurity in farm households of North East, India. It also focused gender studies both in household and individual level in various dimensions of food security and resilience. It highlights the personal

characteristics/attributes of respondents and status/characteristics of farm household in the study area.

The significance of the study based on the outcomes are:

- Unlike the other gender studies which is mostly consider gender of the household head as proxy for studying gender perspective, the present study focused on individual level which is micro level study of both men and women in respect to food security and resilience in farm household
- The investigation can give brief idea related to food security status of farm household and also gender differences in the dimensions of food security and resilience to food insecurity.
- Throws lime light towards factors contributing to the level of food security and resilience to food insecurity.
- Develop an understanding on components contributing to resilience to food insecurity in the farm households which can be helpful for the authorities with the information and areas which need to be focused to improvement.
- Comes up with the result which throws lime light, the importance in inclusion of both men and women in any developing activities.
- Brings with the differences in dietary diversity.
- It has potential in providing brief idea for interested researcher from the documented result and experience while undertaking any gender related studies.
- Provide with valuable information and constraints faced by the farm households in achieving food security. These constraints would help to felicitate state governments, policy maker and planner in adopting and provide appropriate mitigation strategy in improving food security status and resilience (food insecurity) in farm households.

Limitation of the study

The present study, like the other research studies in social sciences has also encountered with several limitations. These limitations were enlisted as follows:

1. The present researcher had to complete whole the process of data collection, data tabulation, analysis, and documentation of the research finding within the speculated time period.

2. Due to limited time, resources, and mobility restrictions, entire states of North East were not covered. The area of investigation was restricted to only two states (Tripura and Meghalaya) of North East. Therefore generalization of the results of entire Northeast states may not be totally appropriate.
3. As the research was based on gender, food security and resilience both household and individual level, it covered some sensitive question based on the topic, of which some of the respondents were reluctant and hesitated to give correct and authentic responses.

   There is also possibility of data error as the primary data were collected based on the views kept forward by the respondent, where recall error from their part might always exists
4. With much sincerity during data collection and securitize raw data before analysis, still the possibility of occurrence of some minor errors cannot be omitted completely.

   Apart from all the limitation mentioned above, due attention and immense effort was given, to make the study as organized and systematic as possible from researcher's part.

Layout of the Study

The complete study has been divided into five chapters.

- Chapter II deals with the review of earlier relevant studies.
- Chapter III is devoted to the details of the area under study, plan for sampling, variables (dependent and independent) under study, data source and nature, systematical techniques adopted in attaining the objectives.
- Chapter IV presents the results under appropriate sub-heads and consists of discussion based on the result and findings of the study.
- Chapter V dealt with the summary of the overall results and conclusion of the study.

CHAPTER-II
REVIEW OF LITERATURE

Review of literature is complete summary of past research work on certain topic. This chapter deals with review of literature in order to establish the importance of study and to develop a proper understanding of research problem for study. It is extremely important on the part of the researcher to review the significant results found, methodology and theories by previous researcher. So, based on the set objective and variables selected for the study the relevant literature reviewed are organized and presented under following sub headings:

2.1 Abstraction of food security

2.2 Measuring food security

2.3. Factors contributing to food security

2.4. Resilience to food insecurity of household

2.5. Measuring resilience to food insecurity and factors contributing to resilience in food insecurity

2.6. Gender, food security and resilience to food insecurity

2.7. Constraints in achieving food security

2.1. Abstraction of food security

United Nation (1975) outlined food security as "availability in any respect times of adequate world food provides of basic foodstuffs to sustain a gentle enlargement of food consumption and to offset fluctuations in production and prices".

FAO (1983) referred food security as "ensuring that each person in any respects each physical and economic access to the essential food that they required".

World Bank (1986) remarked food security as when entire people at an entire time have access to adequate food for living an active, healthy life".

FAO (1996) had conceptualized food security as a state which can be attained in all the level at all the time when an individual has tangible, economic adequate attainment of safe and health-giving food to fulfill dietary wants and also food biases to lead a full and healthy life.

Dietchler *et al.* (2010) stressed that food security is traditionally conceptualized as having only three dimensions: food availability, food access, and food utilization or consumption.

FAO (2010) referred food security at the social unit level, as a power of social unit to secure, sufficient food for meeting dietary requirements of the entire household, whether by producing their own or through procurement.

Thus, from the literatures it is observed that food security is a state when individual has access to their preferred, nutritious and adequate food in all the level at all the time to lead healthy life.

2.2. Measuring food security

Bickel *et al.* (2000) developed a module for measuring food security in the United States has been used. The module consists of 18 numbers of questions. The food security scale is based on the responses to questions Q2 to Q16.

Usfar *et. al* (2007) have applied United State's Food/Hunger Survey Module (US-FSSM) in their study to measure food security in the household, both in a rural and urban area. The module consists of 18 questions to which responses of the households were scored. In addition, the questions were scored based on positive (Yes=1) and negative responses (No=0) and the total scores were classified into four groups, *viz.* a score between zero and two as food secure; food insecure without hunger when the score was between 3 and 7; insecure without hunger when score between 8 and 12; when score was between 13 and 18 the household was taken as food insecure with hunger.

Smith and Subandaro (2007) mentioned that food security was measured using food data collected as part of household expenditure survey (HESs), the main focus of the survey was basically to check the total household expenditure as a substitute for income. They have considered six indicators (per capita availability of dietary energy, percentage of food energy deficient people, dietary diversity, energy obtained from stable in per cent, per capita quantity of food consumed by an individual and household expenditure contributed toward food in per cent) for measuring food security.

Mallick and Rafi (2010) have chosen both the ordered probit and generalized threshold models for their study in Bangladesh to compare the food

security status in women-headed and men headed household among the non-tribal and tribal ethnic group of the country. They also found that there were no significant differences between women headed and men headed household in food security in Bangladesh especially among the tribal ethnic groups of the country.

Zahid and Ahmed (2013) in their study measured household food insecurity by using 24 hour calories consumption method, in which they have computed the daily calorie need by each member of household based on the recommendation by FAO in 1996 where gender and age of that person was taken into consideration for caloric need and then each of the households was summed up. Further, calories consumption for each household was obtained through the utilization of food items by each household. They also defined the state of food insecurity using dummy variable $l_{i,}$ *viz*. l_i is equal to 'one' "If household consumed calories are less than the minimum required calories (insecure household)", l_i is equal to 'zero' for the secure household.

Ifeoma and Agwu (2014) in their investigation to determine the food security status of farming household, have used food security index and have categorized the household in two groups based on the score of the index: food secure (when the score was more than one) and food insecure (when the score was less than one). They computed the food security with the formula, per head expenditure of food for the i^{th} household divided by two-third of mean per head expenditure of food of entire households.

Vaitla *et al.* (2017) in their study they tried to elicit the best and improved measure for food insecurity for which they selected four commonly used food security indicators: reduced Coping strategy index, Food Consumption Score, Household Dietary diversity score and household hunger scale. They examined the correlation among the indicators using large data set from ten different countries and further they also applied exploratory factor analysis to check for more information and the dimensionality of the selected indicators.

Akadari *et al*. (2018) utilized tobit and pobit model for estimation of food security in Ethiopia and Nigeria. They spotted that among the agricultural households, men headed household was more food secure, than women headed household in both the countries. They also found significant differences between

the determinants of men and women headed household and also concluded that agricultural households were more food secure than non-agricultural households.

From the literature reviewed it is reveal that different framework, index and modules were developed and have been used by researchers for measuring food security of household. But for this present study to measure extend of food security module by Bickel *et al.* (2000) was used. This particular module has been used over the other module because even though the module has several long and repetitive questions but it takes less than four minutes of survey time and also its different indicator questions has an ability to capture and differentiate different level of severity of food insecurity and hunger.

2.3. Factors affecting/contributing to food security:

Frongillo *et al.* (1997) found that household savings was a variable affecting household food security. In addition, Rose *et al.* (1998) in their study reported that homeownership also influenced household food security.

Maphosa *et al*. (2014) from their study in Zimbabwe concluded that the use of irrigation technology, treadle pump has positive impact and help in boosting food security in farm household though it has treat to environment.

Gundersen and Gruber (2001) reported in their study that access to credit affects food security. Ribar and Hamrick (2003) also found that access to credit is the factor affecting food security.

However, Kidane *et al.* (2005) highlighted that education is the only factor which is affecting food security.

Amaza *et al.* (2006) from their study reported that household with larger farm size are more food secure than those with smaller sizes.

According to Akpan (2009) dishonesty, ignorance of the agricultural sector, an inconsistency of policy, and enormous debt, etc was the major factor affecting food security.

Infrastructural availability was found to be important correlate to food security according to Khan and Gill in their study (2009).

Premanandh (2011) in his study reviewed that population explosion, shrinking of arable lands, water scarcity, climatic variability; food availability and lack of food accessibility were the major factors affecting food security. While in

the same year Guo (2011) commented that household goods are one of the important determinants which influence household food security.

Maharjan and Joshi (2011) stressed that *de-jure* and *de-facto* female-headed household had probability of being food insecure.

Owusu *et al.* (2011) mentioned that nonfarm activities was important for achieving food security in the household.

Bogale (2012) shed light from the study that the family size, size of cultivated land, soil fertility, access to irrigation, number of visits by extension personnel, use of fertilizer and better seeds were the elements contributing to food security.

Ali and Khan (2013) explored from their study that ownership of livestock was a factor influencing food security.

Loopstra and Tarasuk (2013) found that loss of jobs and the extent of low income was affecting food security in their study.

According to Bashir *et al.*, (2013) family structure and monthly earning were the two positive factors contributing to food security.

Zahid and Ahmed (2013) from their study conducted in Pakistan found that family size, education and income played important role in achieving food security in farm household.

Mango *et al.*, (2014) spotted allowance, retrieval of market information and household head's age were the variables contributing to food security.

Kassie *et al.* (2014) highlighted that sex of the household head was important in attaining household food security.

Chang *et al.* (2014) revealed that financial constraints are a factor which is affecting food security.

Abdullah *et al.* (2019) from their investigation shed a light that socio-personal (age, sex, education, diseases) and socio-economic variables (inflation, allowance, assets, and unemployment) were important determinants contributing to food insecurity of the household.

It is evident from numerous findings and literature reviewed that there is no universal factor which affects food security of the household either positively or negatively. Eminent organizations, institutions, scientist, researcher and scholars

had come up with different factors, which has major role in improving food security in different region and situation. But factors *viz*. education, annual income, access to credit, assets and size of family were commonly recorded to have positive contribution. For this study it is important to spot the factors which affects food security as improving those variables can improve status of household food security to some extent.

2.4. Resilience to food insecurity of household

FAO (2010) conceptualized resilience to food security as "the ability of a household to keep with a certain level of well-being by withstanding shocks and stresses,"

Barrett and Constas (2012) conceptualized resilience as the capacity of a household to maintain an undeniable degree of wellbeing (to be food secure) by resisting shocks and inflections, and retool while experiencing change so that crucially the same function, structure, and identity are kept.

USAID (2012) has elucidated resilience as "the capability of people, households, communities, countries, and systems to alleviate, adapt to and recover from shocks and stresses in a fashion that minimizes chronic vulnerability and facilitates in to growth".

Ciani and Romano (2014) found that large landowners have the highest resilience value followed by small-medium landowners and wage workers. They also argued that low ownership of assets has a tendency to incline toward the low ability of household in managing shocks; furthermore, they also mentioned that access to agricultural resources, *Viz*. land is important for resilience to food insecurity in the household.

Smyth and Sweetman (2015) concluded that resilience is observed to have remained within household and communities when the individual has access to physical, social, cultural and other resources equitably.

FAO (2018) outlined resilience as the capacity to check disaster and crisis, also, in addition, to foresee, occupy, and revive from those in a timely, effective and sustainable form. It comprises of safeguarding, restoring and upgrading livelihood system which is in endangered and affect agriculture, sustenance, security of food and safety.

The word resilience has a history of being used in several disciplines viz. arts, engineering, psychology, etc (Alexander, 2013). It has different meaning and connation in different discipline (Jones and Tanner, 2015) but the use of resilience considered being new in social science discipline (Dhraief, *et al.* 2019) and in recent years the word has became to be scholarly and policy debates related to food security (D'Errico, 2016).

It can be summarized from the present literature reviews that resilience is a state or the capacity of household to bounce back to their previous state even after any shock or stress. Furthermore, resilience is observed to remain within household and community if individual has access to physical, social, cultural and other resources equitably. Resilience is multi dimensional and is contributed by several components. Ownership of natural resources or land by the household plays vital role in having high level of resilience to food insecurity. Finding out resilience to food insecurity for present study is important as farming in northeastern state is highly dependent on climate and on the other hand climate in this region is erratic in nature. As a result farmers are the victims of this climatic variability. So, exploring the status of resilience to food insecurity among the farming household can help government and concerned department toward building and strengthening resilience to food insecurity in farming household.

2.5. Measuring resilience to food insecurity and factor contributing to resilience in food insecurity

Alinovi *et al.* (2010a) developed a resilience index and applied the index on the survey data of Palestine household to measure resilience to food insecurity. In the Index six components (stability, social safety net, access to public services, assets, income and food access, and adaptive capacity) were included. They have estimated (from observed variables) each component separately using multivariate techniques before estimating resilience index, as the components were not directly observable and considered as latent variable. The index is represented with the following formula:

RI = f (IFA, APS, SSN, S, AC, A). Where, RI= Resilience Index, IFA= Income and food access, APS= Access to Public Services, SSN= Social Safety Net, S=Stability, and A=Asset.

Alinovi *et al*. (2010b) tired to experimentally examine the aftermath of various sustenance tactics in respect to the resilience of household to food insecurity among the households in Kenya based on certain background. Further, it also shed light that the means of the household to overcome and combat economic disturbances were dependent on the choice available with respect to ability, resources (including physical and social assets) and actions. In order to explore the significant determinants for each sustenance tactic and compare various sustenance tactics, an updated framework developed by Alinovi *et al*. in 2008 for resilience analysis was used with modification, in the updated framework they have considered only six components and resilience is represented with the formula R= *f* (IFA, A, APS, SSN, S, AC), where IFA= Income and food access, A= Assets, APS= Access to public services, SSN=Social Safety Net, S= stability and AC= Adaptive capacity. While for the study in Kenya they have considered eight components, in which they have divided Assets as Agricultural production assets and non-productive assets and also added component agricultural practice and technology, whereas the modified resilience is presented with formula as given, R= *f* (IFA, AA, NAA, APT, ABS, SSN, S, AC), where, IFA= Income and food access, AA= Agricultural production assets, NAA=Non-productive assets, APT=Agricultural practice technology, ABS=Access to Basic services, SNN=Social Safety Net, S= Stability, AC=Adaptive Capacity. The result of the analysis showed that the large-scale farmers' group was resilient to a greater extent, while the group of pastoralist was resilient to a small extent. However, the significant determinants of resilience also varied in each sustenance group. Those variations were also admissible with regard to the implication of policy, taking into account the variation between the eventual determinants of each component. They also spotted that SSN (social safety net) was twice than other two groups (large scale farmer, pastoralists) in a wage-employee group, which was related to poverty in urban, whereas lack of productive resources (land, livestock, etc.) also dramatically decreased the coping capacity of urban poor.

Negussie (2010) tried to determine resilience to food insecurity of household in a dynamic situation in rural Ethiopia through the data obtained from the household survey, in which he pondered resilience as undiscovered variable

and determined through Principal Component Analysis. And for running principal Component analysis he has considered four observed variables (education, access to food, social network, and working capital) in the study.

Oluoko-Odingo (2011) tried to highlight findings from Kenya that Poverty-stricken population is more vulnerable and less resilient toward stress and disaster as they have low capacity and minimal assets needed for returning back to state after disaster strike. Moreover, he argued that that climatic change has a possibility to impact on the poverty-stricken population to a large extent as it has minimal effect if not totally on the availability of food, resources of water, health, and access to services (infrastructural) amongst the vulnerable and poverty-stricken households. Based on food security, impoverishment was the important determinant contributing toward insecurity of food, in addition, it was revealed that experience and health status of farmer came out to be a crucial factor to fight against insecurity amongst small-scale farmers. He also concluded that insecurity (food) and impoverishment can be dealt with when policies are stressed for increasing production of food through appropriate environmental conservation procedure for adapting to climate change and also through encouraging sustainable livelihood system.

Schwarz *et al.* (2011) based on their vulnerability and resilience study in Solomon Island; enlisted that three social processes (joint actions from individual support, better leadership, and togetherness of community) were the determinants which have affected the perception of the people toward the ability of their community in building resilience. Furthermore, they also found both in the individual and social level that variable, risk perception, precedence, trust, experiences, and comprehension were the major factor in determining how the adaptation has taken place. In addition, they also recommend from their investigation, increasing concern toward a combination of internal (local) and external (global) contingencies to greater extent and shocks, such as abrasion of their social values and fear for climatic changes.

Tendall *et al*. (2015) discussed the part of resilience that could play in addressing the challenges related to food system and factors threatening the security of food supplies in the arena of increasing complication and

unpredictability. These factors included various actions of global change which were a change in climate, increased urbanization and rise in population; sudden shocks (natural calamity), crunch in finance and politics; and also sudden respond of food systems by itself to the action and events. The author also tried conceptualized resilience from a holistic perspective, as encircling the complication of entire food systems, which includes various actions and processes (economic actions, biophysical, and social) running at numerous scales. This also presented the chance to eliminate inadequacies and boost capacities toward food system and at the same time be a concern with unpredictability in coming days.

Temesgen *et al*. (2016) carried out study to examine household capacity likelihood to regain from any kind of shocks related to climate. To examine, they have used seven components (Agricultural Inputs and Technology, Social Safety Nets, Access to Public Services, Access to Food and Income, Assets, Stability, Adaptive capacity) of resilience for resilience analysis. Resilience index is represented with the function of all the considered components). Each of the components considered as latent variables was estimated using different multivariate technique and the outcome was taken as covariates for measuring resilience index. They have retained three factors as a result of factor analysis; in the first factor, they found that the entire component except for access to public services was observed to have positively significant relation with the resilience. While in second factor, adaptive capacity reflects the positive characteristics of food security. The result also showed that poor household has inadequate access to basic services and frequently a victim of illness and diseases both human and livestock. Further, they also recommended that households need to be provided with the means for boosting agricultural production, income-generating business, adequate access to assets, upgraded quality public services, social safety nets, and adaptive capacity.

Boukary *et al.* (2016) to measure resilience and find the factor which was disturbing in achieving resilience to household food insecurity in Niger developed a resilience index where they have used principal component analysis and also structural equation modeling to determine the determinants later. In the resilience index they have included four components and the resilience is expressed with the

given formula R= f (A, AC, SNN, CC), where A=Assets, A=Adaptive Capacity, SNN=Social Safety Net and CC=Climate change. From the study they observed that resilience to food insecurity was positively significantly affected by asset possession and social safety net. While on the other hand the component has negatively significant effect. Furthermore they also recommended that focusing on increasing household assistance, help in gathering resources which may improve asset possession and weather forecast or warning can improve resilience to household food insecurity.

Goshu (2016) in his doctoral thesis applied FAO's RIMA (Resilience Index and Measurement analysis) to measure resilience and find the determinant which affects resilience. He has carried out multi stage analysis where in first stage estimation of latent variable was done through principal component analysis and optimal scaling technique where as in the second stage SEM (Structural equation modeling) was carried out to spot out the determinants of resilience of food security to rural household. From the study he found that as much as eight components IFA (Income and food access), assets of household, technological level of household, ABS (Access to basic services), AC (Adaptive capacity), EC (Economic connectivity), and SNC (Social network and capital) were observed to have positive significant relation with the resilience at 1% level of significance. Furthermore, he also commented that sensitivity have negative insignificant effect on resilience.

Fall (2018) examined determinants and analyzed using principal component analysis and regression model that influenced resilience based on a survey from 140 rural farm households of Senegal. From the study, he spotted four variables out of fifteen variables considered for the study to be significant with the resilience, out of which the variable organic fertilizer and other income sources were positively significant at 0.05 level; while, the age of household head and assistance target was negatively significant with resilience. The result also means that an increase in non-agricultural by an active member of the family increases resilience while a household with aged household head had to go through food insecurity. Based on the finding he also suggested that improving off-farm

activities, increase diversity of income, increases decision making power of youth and access to organic fertilizer can improve resilience.

D'Errico *et al*. (2018) for their study in Tanzania and Uganda, firstly they have estimated the resilience capacity Index of FAO in which they have incorporated both structural equation modeling (SEM) and factor analysis. Furthermore, they also tried to determine the positive relation of resilience with the outcomes of food security in future and also the convalescence capacity after any disturbance/shock has occurred. From the study they also found that among the components they have considered, adaptive capacity was contributing more to the resilience of the household. In addition to that they also revealed resilience of the household was having significant correlation with the status of household food security in future and also household having higher score in resilience capacity index were well prepared to take in and acclimatize to disturbance/shock.

Dhraief *et al.* (2019) in their study, to measure resilience to food insecurity, developed a resilience index. They have considered six components (adaptive capacity, asset possession, social safety net, income and food access, stability, and climate change) which are latent in nature. Before estimating resilience index they have estimated each latent variable separately (using factor analysis, optimal scaling technique) with known observed variables. Resilience Index is represented with the given formula

RI = f (AC, AP, SSN, IFA, S, CC).

Where, RI= Resilience Index, AC=Adaptive Capacity, AP=Asset Possession, SSN= Social Safety Net, IFA= Income and food access, S=Stability, and CC= Climate Change.

Ado *et al.* (2019) in their study in Niger tried to explore livelihood strategies and resilience to food insecurity among the farm household. To develop resilience index for the study they have used principal component analysis and also regression analysis was applied to spot the positively significant factors which determined resilience of the household. For their study they have considered five components of their interest (access to basic services, adaptive capacity, assets, social safety nets, & income and food access). And their finding highlights that the household belonging to pastoralist-extensive agriculturists are more resilient than

the other household groups they have spotted in the study. In contrast household having wage labour as main occupation are least resilient. Their result also revealed that among the components of resilience three components (Income and food access, household assets and adaptive capacity of household) had positive significant correlation with the resilience to household food insecurity. Furthermore, they also spotted that the important variables *viz.* size of household, production of crop, experience in farming, cropping strategies and size of livestock which helped in determining resilience to household food insecurity.

From the above literature it can be encapsulated that to measure resilience to household food insecurity, resilience indices with different components according to need and interest were developed. Resilience was estimated using multi stage technique, where the selected components were estimated separately using principal component analysis and optimal scaling technique. Furthermore most of the scholars and researchers followed the technique used by Alinovi *et al*. in 2008 for developing resilience to household food insecurity index. However to measure the determining factor to resilience, correlation, regression and SEM (structural equation modeling) was observed to have been used. There are several factor which contribute significantly to resilience and also differs region to region and country. Even for the present study, to measure resilience to household food insecurity, techniques used by Alinovi *et al.* in 2008 have been applied with some modifications.

2.6. Gender, food security and resilience to food insecurity

FAO (2001) reported that women play an important and pivotal role in securing and preparing food in the family. They were considered to have primary responsibility toward nutrition information in household and care of children.

Penders and Staatz (2001), Smith and Haddad (2002), & Webb and Lapping (2002) commented on the important role that women's health and education can play in food security though they also stressed that their effect differs based on time, place and social group.

Krishnaraj (2005) stressed that women are guarantors of food security at the household and societal-level. Traditionally, subsistence crops are grown for

personal consumption fall in women's domain, while commercial crops fall into men's domain

A study done by Ibnouf (2009) found that women are more capable than men to improve their household's food security when they have access and control over resources such as land and income.

Brown (2009) in his study cited that women play an important role in achieving three pillars of household food security and also plays major roles in the production of major food staple crops. He also revealed that out of data available of 47 countries, only three countries (Cape Verde, Mali, and Ghana) have men labour force greater than women in agriculture. Large number of women was found to involve in post-harvest activities.

Palacios and Mehta (2011) reported from the study in the Mewat district of India that men who have power in production decision and work more in the field are more food secure in households. They also spotted women does not own land and also increase in income or household food security does not improve the food security of women in the individual level. They also highlighted that regarding the individual food security of women, male education is correlated with women eating more compared to their husbands, and the presence of an income earning women is more common in households where women consume relatively more.

According to Ibnouf (2011) preparation of food, processing of it and preservation was the sole responsibility of women. In addition, she also sheds light that women play vital and positive role in ensuring food security of household compared to their men counterparts, whereas men were found to more possibility in migration either seasonally or erstwhile permanently. Furthermore, she also recommended that for any holistic approach, plan, and policies gender issues should be taken into account to attain food security.

Felker-Kantor and Wood (2012) in their study from Ethiopia and Nigeria highlighted that there were remarkable differences in the casual factor of food security in between men and women headed household in both the country. They also found that men headed household were food secure than women headed household to greater extent. Based on their finding they also recommended that

correct lawmaking, which will allow equity and equal access to food, utilization, and availability in the study area.

UNDP (2012) highlighted that women have an indispensable duty in all the three components of food security (production, distribution, and utilization) further they also observed that participation of women in community-level activities which supports development in the agricultural sector.

Kassie *et al.* (2012) shed light from their findings that women headed household has more possibility to be food insecure than the men headed household. Furthermore, they also highlighted that good quality of extension services; quality extension personnel, increase quality of land resources, size of land holding shoot up food security in women headed household. Based on the result of their findings they suggested that extra effort toward improving quality of extension services, personnel, effective transfer of technology, information, and concentration toward and land increasing practices by policy maker can help in improving food security status.

Kassie *et al.* (2014) in their study in Kenya tried to relate food security of the household and sex of household head to which they found that there was a gap between men headed and women headed household. And it was clarified through determined and undetermined characteristics of the household head. They also added that still if the head of the household has the same determined characteristics, then undetermined characteristics are accountable for food security to lesser extent in women headed household.

FAO (2016a) reported that men and women have a different duty in ensuring food security for their own household and communities in low-income countries. Generally, men were involved in growing field crops and while women were mostly engaged in growing food crops for household consumption, food preparation and raising small livestock. Rural women ensure adverse diet which was mostly carried out by home food processing. It was also evident that the chance of child survival was higher by 20 per cent when the women control the household budget. While they also spotted that access to education by women was a parameter which determined the nutrition level and status of child health. Research result from Africa also revealed that children are likely to live beyond the

specified age of five by 40 per cent, whose mother has access to education at least up to primary level.

FAO (2017) found that rural women execute most of the processing activities which generally ensures dietary diversity, minimizes food loses and renders marketable products. Moreover, there is also more possibility that women spend most of their income on the need of their children and food. In addition, it was also observed that 20 per cent child's chances of survival increases if the mother controls the household budget. It also highlighted that sufficiency supply does not mean that sufficiency levels of nutrition. Women and girls in most of society take their food after the male member of the family has already taken. Women and girls were spotted to be the main victim of "food discrimination".

According to Oxfam (2013) resilience is the capacity of the person (women, men, and children) to actualize their rights and upgrade their livelihood without being exposed to any inflection, shocks, and uncertainty**.**

Oxfam (2014) in the interview of leader's of women organization argued that simply investing on women empowerment does not make resilient to greater extent if other barriers is given rise by gender disparity (which includes time poverty, prejudiced stereotypes related to work of women, discriminatory inheritance and rights of property, gendered division of labour and uneven distribution of care duties) are not addressed. The organizations also highlighted gender disparity as a constructive obstacle toward resilience instead of simply a compounding parameter of vulnerability.

Smyth and Sweetman (2015) commented on their study that the leadership of women is a way to build resilience in household and communities and also directing toward gender dynamics is key to upgrading resilience. Addressing it is not only important to upgrade resilience but also to protect the immediate and future welfare child (girl) and women. They also further commented that to strengthen the resilience of women it is important to comprehend the association between individuals, their family members and households, the community, and larger society, including both the state and market.

Boukary *et al.* (2016) from their study in Niger found that men headed households were more resilient in household food insecurity than women headed

household as in the women headed household women has less asset possession, low adaptive capacity and were more vulnerable.

Goshu (2016) in his study in Ethiopia revealed that men headed households were more resilient than women headed household. In contrast he also spotted that in the household having more number of dependent and women, and women headed households, the resilience components SSN (social safety net) and SCN (social capital and network) plays an important role and help to perform better cope with shock or disturbances. While in case of men headed households IFA (income and food access), assets (household), ABS (Access to basic services), technological level (household) and economic connectivity were the important components.

The study conducted by Ado *et al.* (2019) in Niger also highlighted from findings that men headed households were more resilient to food insecurity than women headed households.

In the present study gender analysis was carried out in all the dimensions of food security and resilience to food insecurity to explore the gender roles in household and the result can help in formulating gender sensitive projects, policy, and programme to improve food security and resilience to food insecurity both in household and individual level.

2.7. Constraints in achieving food security

FAO (2008) pointed out poverty, climate change, the role of government and politics and social aspects, conflicts were some of the constraints encountered in achieving food security.

Al Qahtani (2009) highlighted from the study that population growth, bulldozing agricultural lands and replacing them with new factories and industrial development, land ownership, lack of fresh water for irrigation, reduction in food production due to natural calamity, lack of pesticides and regular agricultural guidelines were the constraints which hinder food security.

Ibnouf (2011) from his study observed that inadequate accessibility toward advanced production methods and inputs *viz.* fertilizers, seeds of higher standard, credit accessibility, pesticides, and services to market as consequences of gender prejudice practice were the major constraints faced by women farmers.

O'sullivan (2012) concluded that corruption in politics, natural disaster, an imbalance in rural/urban; fast population growth and climate change were the issues which have ever existed to jeopardize the availableness of food to the definite population.

According to Saravia-Matus *et al*. (2012) technological constraints, elimination or substitution of agricultural practices, lack of access to micro-nutrients for crop, rural infrastructure, lack of harvest equipment, storage facility, transport and communication, increase fuel price, climate change, and contract enforcement are the constraints mostly faced my farmers in low-income countries in achieving food security.

Brown (2013) pointed out that rapid population growth, dynamic diet, decreasing water tables, starvation, slowing irrigation, raising soil erosion, climate change, melt in water reserves, decrease in yields and less time to prepare food were some of the major challenges.

Agada and Igbokwe (2014) from their study in North Central Nigeria found that climatic change and variability, shortage of farm labour, limited access to farmland, poor market access, weak support services, poor nutrition education, poor sanitation, rapid population growth, low crop yield, lack of access to clean water, inadequacy and lack of access to improved agricultural inputs and lack of labour saving devices are the factors that hinder in achieving food security.

Jaswal (2014) from his study figured out that increase in cultivation cost/expenditure, increase in real wages in agriculture much faster than real growth in gross value added in agriculture, increase in price in energy, increase in price of input, with increase in income and dietary pattern, are the prime challenges in meeting food security.

Oxfam (2014) found that most of women respondent claim that climate-related shocks (drought, floods, and erratic weather patterns), women's access to land, sexist stereotypes, agricultural challenges, riot against women, women's care burden and time poorness, lifecycle issues, poverty, health, women's literacy and men migration are the main constraints in achieving food security in the household. Whereas the men farmers claimed that racism and riot against women were

comprehended as externalities, but not as core menace to food security and wellness.

Gustafson (2017) has mentioned that the trend and challenges in food security were population growth, crisis, climate change, the triple burden of malnutrition, a pattern of structural change and agricultural transformation.

Matemilola and Elegbede (2017) from their study in Nigeria came out with the finding that inadequate production, gender disparity, inadequate policies and dishonesty, fights and civil anxiety, climate change and natural calamity, reduced technology for processing and storage, etc were the major cause of food insecurity. Further, they also came with a recommendation to overcome challenges through employment both in agriculture and non-agricultural section and also by providing credit facilities to weaker section.

Khadka (2018) commented that loss in human capital, and agricultural labour as consequences of migration to urban areas may have negative impacts on crop production and food availability.

Biotechnology and biological (sciences research council 2018) also reported that population growth and climate changes are a major obstacle in achieving food security.

From the literature reviewed numerous constraints were recorded which prevents in achieving food security. But among the recorded constraints climate change, access to land/land ownership, population growth, role of government or politics, weak support services, poverty and low production etc were mostly reported constraints by eminent researchers and organizations that hinder in attaining food security in farm households. Exploring constraints for present study is as important as other objectives in the study as it can be first step toward reducing insecurity and help concern department to set certain agendas in reducing constraints

CHAPTER III
MATERIALS AND METHODS

This chapter deals with research design, sampling procedure, variables and their measurement techniques, methods of data collection, statistical tests used and analytical procedures followed to interpret the data of the study. The details of the methodology adopted in the present investigation are explained under the following major heads.

3.1 Locale of the Study

3.2 Sampling Plan

3.3 Variables for the study

3.4 Operational definitions and measurement of variables

3.5 Development of interview schedule

3.5.1 Validity of interview schedule

3.5.2 Reliability of interview schedule

3.6 Procedure followed for data collection

3.7 Statistical tools employed for data analysis

3.1 Locale of the study

The study was carried out in the North East Region (NER) of India. The region is comprised of eight states viz. Arunachal Pradesh, Sikkim, Manipur, Mizoram, Meghalaya, Assam, Nagaland, and Tripura. The study was carried out in two purposively selected states *viz*., Tripura and Meghalaya.

3.2 Sampling Plan

3.2.1 Selection of States

Two states, Tripura and Meghalaya were selected purposively among the eight north-eastern states of India. Tripura is located in 22^{o} 56'; 24^{o} 32' North and 91^{o} 09' and 92^{o} 20' East. The state has a total geographical area of 10.486 Sq. Km.

and share an international border with Bangladesh and a national border with Mizoram and Assam. It is home to 19 different tribal groups (31.76 per cent) and non-tribal groups (68.2 per cent). And the state has a population of 4.42 million in 2017 (India Population, 2019).

Meghalaya is located in between Bangladesh in the south and north in northeast portion of India The state is located at 25^{o} 30' North and 91^{o} 00 East' (Map of India, 2011). It has a total geographical area of 22,430 Sq. Km. Meghalaya is home to many tribal ethnic groups of which majority are *Khasi* (34.0 per cent), *Garo* (30.5 per cent) and *Jantia* (18.5 per cent) (Census, 2011). Meghalaya is famous for its matrilineal society and has a population of 3.53 million in 2018 (India Population, 2019).

3.2.2 Selection of districts:

Two districts from each state were selected randomly based on the ethnic group. From Tripura one tribal and one non tribal district were selected randomly. The selected districts were Dhalai and Sepahijala district respectively. From Meghalaya, one districts habitat with Khasi tribe and one with Garo tribe was selected randomly. The selected districts were East Khasi hills and South-West Garo hills respectively.

Fig. 3.1: Map of selected study area

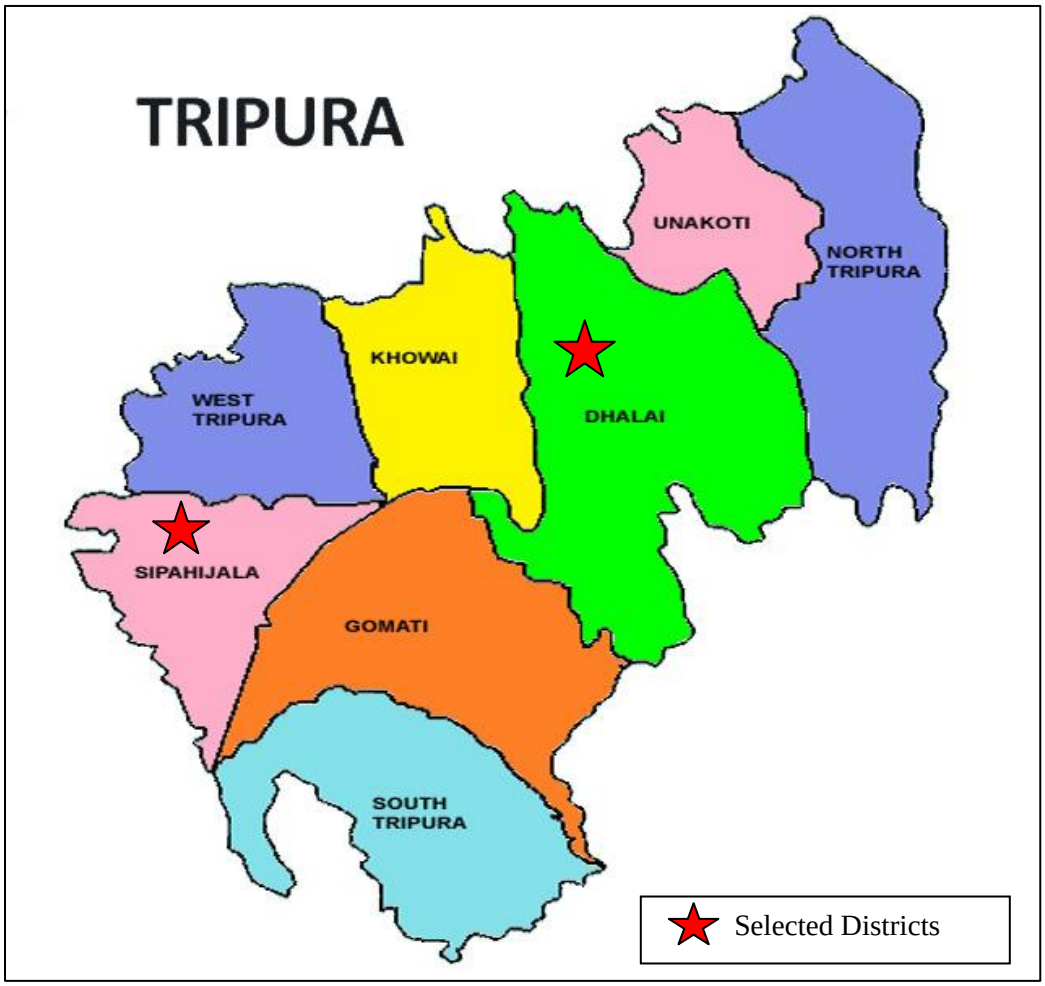


Fig. 3.2: Map of Tripura showing the selected district for the study

Fig. 3.3: Map of Meghalaya showing selected districts for study

3.2.3 Selection of block and villages

Two rural development blocks from each district and 2 villages from each rural development block were randomly selected which comprises of 8 blocks and 16 villages in total. The selected rural development blocks and villages from Tripura and Meghalaya were given below.

Sl. No.	States	District (4)	Blocks (8)	Villages (16)
1.	Tripura	Dhalai	Manu	Baishnabpara
				Jamichherra
			Ambasa	Kashimchherra
				Ghantachherra
		Sepahijala	Bishalgarh	Golagati
				Pathalia
			Nalchar	Jhumerdepa
				Taijiling
2.	Meghalaya	East Khasi Hills	Myliem	Maweitnai
				Nongumlong
			Pynursla	Urksew-wahpathaw
				Nongmadanshadsngi
		South West Garo Hills	Zigzag	Patizora
				Kalaipara
			Betasing	Rongramgre
				Nirghini

3.2.4 Selection of respondent

From each village, 10 farm households (total 160 households) were selected randomly. From each household two respondents, one woman and man was interviewed making sample size of 320 respondents.

Country	India																Sampling Technique
State	Tripura								Meghalaya								Purposive
Districts	Dhalai				Sepahijala				East Khasi Hills				South-West Garo hills				Random
Blocks	Ambassa		Manu		Bishalghar		Nalchar		Myliem		Pynursla		Zigzag		Betasing		Random
Villages	Kachimchhara	Ghantachhara	Baishnabpara	Jamichhara	Golaghati	Pathalia	Jhumerdhepa	Taijiling	Maweitnai	Nongumlong	Urksew-wahpathaw	Nongmadanshadsngi	Patizora	Kalaipara	Rongramgre	Nirghini	Random
Households	10 households from each villages																Random
Primary women	1 from each households																
Primary men	1 from each household																

- 160 Households
- 160 Household heads
- 320 Respondents (160 women and 160 men)

Fig. 3.4: Sampling plan for the present study

3.3 Variables for the study

Independent variables

- Age
- Education
- Education level of the household head
- Social Participation
- Cosmopoliteness
- Family type
- Family size
- Number of children
- Household head
- Annual household income
- Material possession
- Livestock possession
- Expenditure pattern
- Income diversity of the household members
- Food sources
- Land ownership

Dependent Variables

- Extend of Food security
- Resilience to food insecurity

3.4 Operational definitions and measurement of variables

3.4.1 Age

It is operationally defined as the chronological years of the respondent at the time of interview. The respondents were classified into three categories, based on the census report Government of India (1991) for the analysis (GOI, 1991). A respondent can obtain minimum score of 1 and maximum score of 3.

Categories	Score
• Young (below 35 years)	1
• Middle-age (35 to 50 years)	2
• Old (above 50 years)	3

3.4.2 Education

Education was operationalized as respondents' qualifications acquired through formal education. It is ascertained by direct questioning. Given below was the scoring procedure as developed by socio-economic and caste census 2011-rural (GoI)**.** Scoring was done to measure this variable in manner given below.

Category	Score
• Low (below 5^{th} standard)	1
• Medium (5^{th} to 10^{th} standard)	2
• High (Higher Secondary and above)	3

3.4.3 Education level of the household head

It is operationalized as the formal education received by the household head. It is ascertained by direct questioning. Scoring was done to measure this variable in manner given below:

Category	Score
• Low (below 5^{th} standard)	1
• Medium (5^{th} to 10^{th} standard)	2
• High (Higher Secondary and above)	3

3.4.4 Social Participation

The social participation of the respondent of farm households in this study refers to the degree of involvement of the respondent in formal/informal organization as member or executive/office bearer or both in his/her community. The scale used by Trivedi (1963) was followed here in this study with slight modification.

A social participation score was computed for each respondent on the basis of their membership (s) and position informal/informal organizations. The scoring was done in following manner:

Category	Score
Formal activity	
• No membership	1
• Member of one organization	2
• Member of more than one organization	3
Non-formal	
• Active participation in any village activity	4

3.4.5 Cosmopoliteness

It was operationally defined as the degree to which the respondent is oriented outside her/his social system. It consist of five items *viz.,* 'general purpose' (work related to village or community), 'entertainment', 'personal' (medical, education, service, visiting relatives), 'related to agriculture', Grocery/ration and response were obtained on eight point continuum of 'never', 'seldom', '2-3 times year', 'once a year', 'once a month', 'once a week', '2-3 times a week', 'almost daily' and scored 0, 1, 2, 3, 4, 5, 6, and 7 respectively. The minimum and maximum scores that can be obtained by respondent were 0 and 35 respectively.

Individual cosmopoliteness: Scoring was done to measure this variable. Based on the scores obtained by the respondents, they were categorized into three categories.

Category	Score
• Low<(Mean± SD)	1
• Medium(Mean± SD)	2
• High>(Mean± SD)	3

3.4.6 Family Type

Family type for this study is operationally defined as type of family structure practiced by the farm households at the time of investigation. It has been

categorized into nuclear family (parents and unmarried children) and joint family (members related through blood and spread over several generations living together). The score that could be obtained by household against two item 'Nuclear family' and 'Joint family' are 1 and 2 respectively.

3.4.7 Family Size

The number of members living in the respondent's family was considered as size of family of the respondents. They were categorized as follows:

Category	Score
• Small<(Mean± SD)	1
• Medium(Mean± SD)	2
• Large>(Mean± SD)	3

3.4.8 Number of Children

The total number children (both boys and girls) below the age of 14 years living in the respondent's family are considered as number of children in farm household.

3.4.9 Household Head

Household head for the present study was operationally defined as the individual who has the power to run the family and entitled to take economic and social decisions on behalf of the family. Based on the gender of the household head, the households were categorized as "Men headed Household" and Women headed Household" and nominally scored as 1 and 2 respectively.

3.4.10 Annual household income

Annual income is referred to the total earnings of the household in terms of rupees from all available sources including farm and non-farm activities in a year. To measure the total income of the household, they were asked about the farm income and income from other sources separately; the addition of the two gave the total income. It was calculated in terms of rupees taking in to account all possible sources of income. The respondent's family was categorized into five classes like first quintile, second, third, fourth and fifth quintile based on the classification by

National Council of Applied Economic Research (NCAER, 2014) as given in the table.

Categories	Range (₹.)
• First quintile	1000-33000
• Second quintile	33001-55000
• Third quintile	55001-88000
• Fourth quintile	88001-150000
• Fifth quintile	>1,50,000

3.4.11 Material Possession

It was operationalized as the assets (productive and non-productive other than livestock) owned by the household at the time of investigation. They were scored as follows:

Category	Score
• Cell phone	1
• Small consumer durables (cook ware, radio, etc)	2
• Large consumer durables (fridge, TV, sofa, cooking gas etc)	3
• Farm equipment (non-mechanized) and fishing equipment	4
• Non-farm business equipment	5
• Farm equipment (mechanized)	6
• Means of transport (bicycle, motorcycle/scooty, car)	7
• House and other structure	8
• Fish Pond	9
• Other land not used for agricultural purposes (pieces, residential or commercial land)	10
• Agricultural land (pieces/plot)	11

Individual material possession: Assets owned/bought by an individual and have control and access over the assets in household for purchase/sell or transfer.

3.4.12 Livestock Possession

It is operationally defined as the livestock (large or small) owned by the household at the time of investigation. It has been scored as given

Items	Score
• Other livestock (Chickens, ducks, turkeys, pigeons)	1
• Small livestock (goats, pigs, sheep)	2
• Large livestock (Oxen, Cattle)	3

Individual livestock possession: Livestock owned/bought by an individual and have control and access over the assets in household and also have right to purchase, sale and transfer of asset.

3.4.13 Expenditure Pattern

It is operationally defined as the amount of money spent (routine or unusual expenditure) to run a particular household smoothly by household head irrespective of his/her personal expenditure.

Individual expenditure pattern: Amount of money spent on various area and expenditure borne by an individual for his/her personal need irrespective of expenditure for household needs.

3.4.14 Income diversity of the household members

Income diversity for this investigation referred to the different sources of household member's income be it from public, private or other sector, which contributes to annual household income.

3.4.15 Food Source

Food source in this study was operationally defined as distinct sources from which the household obtain food for consumption. The food sources were classified into categories like grow it and consume from their own stocks; receive it as a transfer from relatives, members of the community, the government fair price shop or foreign donors; purchase it in the marketplace; gather from forest/ponds/rivers; and other etc.

3.4.16 Land Ownership

Household land ownership: Land ownership was operationalized as the total number of standard hectares of land possessed by household at the time of investigation (NSSO, 2003). The households were categorized into five categories based on land possessed and the scores also assigned accordingly as given below

Category	Score
• Marginal (<1ha)	1
• Small (1-2ha)	2
• Semi-medium (2.1-4ha)	3
• Medium (4.1-10ha)	4
• Large (>10ha)	5

Individual land ownership: Land owned by the respondent in hectares at the time of investigation in his/her name other than owned by his/ancestor and family members. The respondents were classified based on five categories based on land possessed and the scores also assigned accordingly as given above.

3.4.17 Dietary Diversity

Individual dietary diversity: It can operationally be defined as the qualitative measure of food consumption which mirrors the individual access to different types of food and also representative for nutrient sufficiency of the diet of an individual. It is simple count of food groups consumed by an individual in previous 24 hours.

3.4.18 Micronutrient intake (individual)

It was operationally defined as the qualitative measure of micronutrient intake by an individual through variety of food groups in proceeding of 24 hours. Two micronutrients have been considered for the present investigation (vitamin A plant based, vitamin A animal based, and iron).

3.4.19 Access to resources/Assets (individual)

It referred to the ability of an individual to have access to resources/assets such as land, agricultural equipments/machinery, non business equipments, fisheries/fisheries equipments and livestock etc in household.

3.4.20 Control over Resources/assets (individual)

It was operationally defined as decision making power of an individual over the resources/assets such as land, agricultural equipments/machinery, non business equipments, fisheries/fisheries equipments and livestock etc for purchase/sale and transfer of rights etc.

3.4.21 Decision on food purchase/sell

It was operationalized as decision making power of an individual over purchase of food such as cereals, vegetables, fruits, legumes, baked goods, beverages, fats, chicken, and fish in household or sell of marketable surplus (such as grains, vegetables, fruits and livestock etc) .

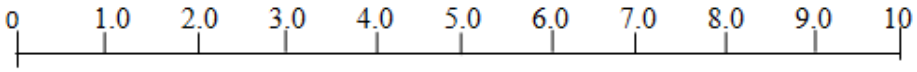
3.4.22 Extend of Food Security

To measure extend of food security, module by Bickel *et al.* (2000) for measuring food security was used. The module consists of 18 numbers of questions. The food security scale is based on the responses to questions Q2 to Q16.

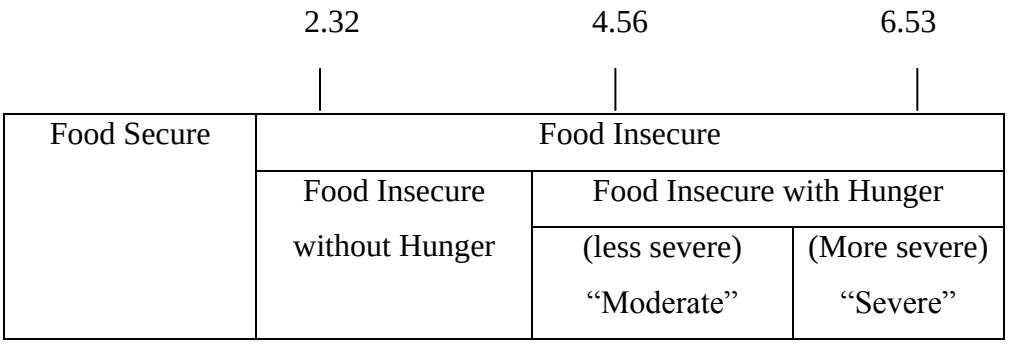
Q2.	Worried food would run out
Q3.	Food bought just didn't last
Q4.	Could not afford to eat balanced meals
Q5.	Few kind of low-cost food for children
Q6.	Could not feed children a balanced meal
Q7.	Children were not eating enough
Q8.	Adult(s) cut or skipped meals
Q8a.	Adult(s) cut or skipped meals, 3+ months
Q9.	You ate less than felt you should
Q10.	You were hungry but didn't eat
Q11.	You lost weight because not enough food
Q12.	Adult(s) not eat for whole day
Q12a.	Adult(s) not eat for whole day, 3+ months

Q13.	Cut size of children's meal
Q14.	Children ever skip meals
Q14a.	Children ever skip meals, 3+ months
Q15.	Children ever hungry
Q16.	Children not eat for whole day

Household food security Scale: It is continuous measure and ranges from 0 to 10



However, household food security status is a categorical measure



The values are located at midpoint between the two adjacent household scale values.

FOOD SECURITY SCALE VALUES AND STATUS LEVELS CORRESPONDING TO NUMBER OF AFFIRMATIVE RESPONSES

Number of Affirmative Responses		1998 Food Security Scale Values	Food Security Status Level	
(Out of 18) Households With Children	(Out of 10) Households Without Children		Code	Category
0	0	0.0		Food Secure
1		1.0	4	
	1	1.2		
2		1.8		
	2	2.2		
3		2.4	3	Food Insecure without Hunger
4		3.0		
	3	3.0		
5		3.4		
	4	3.7		
6		3.9		
7		4.3		
	5	4.4		
8		4.7	2	Food Insecure with Moderate hunger
	6	5.0		
9		5.1		
10		5.5		
	7	5.7		
11		5.9		
12		6.3		
	8	6.4		
13		6.6	1	Food Insecure with Severe Hunger
14		7.0		
	9	7.2		
15		7.4		
	10	7.9		
16		8.0		
17		8.7		
18		9.3		

3.4.23 Resilience to food insecurity

For measuring resilience updated version of the resilience frame work developed by Alinovi *et al.,* in 2008 was followed with slight modification. In the original framework, Alinovi *et al.* proposed to assess the resilience to food insecurity for the *i-th* household as a latent variable defined according to the following components: income and food access (IFA), assets (A), access to public services (APS), social safety-nets (SSN), stability (S), and adaptive capacity (AC):

$$R_i = f\ (IFA_i\ ,\ A_i\ ,\ APS_i,\ SSN_i\ ,S_i\ ,\ AC_i)$$

In the present study to measure resilience to food insecurity in farm household, the following five components has been considered: Access to basic services (ABS), Assets (A), Social Safety Net (SSN), Adaptive Capacity (AC) and Sensitivity (S)

$$R_i = f\ (ABS_i,\ A_i,\ SSN_i,\ AC_{i,}\ S_i)$$

In this framework, resilience is not observable per se and is considered a latent variable depending on the terms on the right-hand side of equation. To estimate R, it is necessary to estimate the components ABS, A, SSN, AC and S separately, which are themselves latent variables because they cannot be directly observed in a given survey, although it is possible to estimate them through multivariate techniques. Thus, the resilience index is estimated using a two-stage factor analysis strategy. In the first stage, an index for each component is estimated separately using an iterated principal factor method over a set of observed variables. In the second stage, the resilience index is derived using a factor analysis on the interacting components estimated in the first stage:

$$R = \sum w_j F_j$$

In which the resilience index is a weighted sum of the factors generated using Bartlett's method and the weights are the proportions of variance explained by each factor.

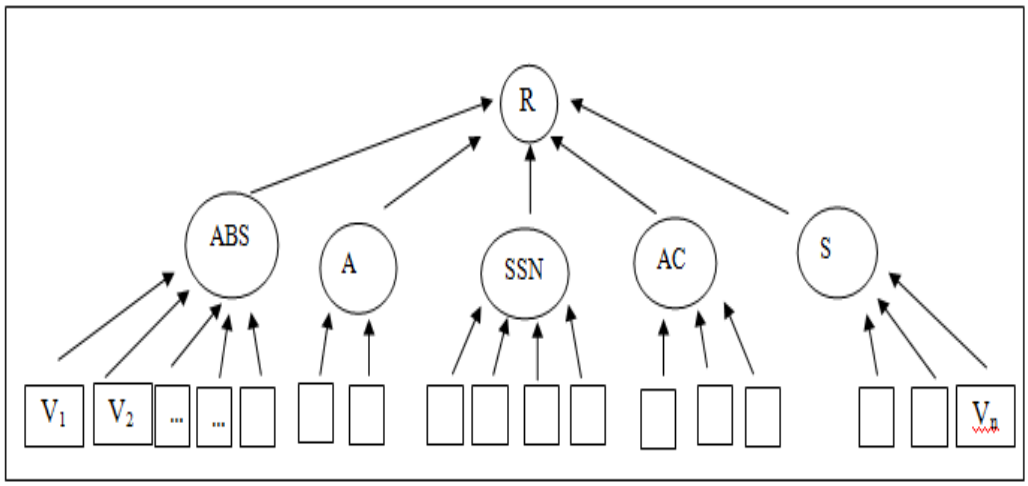


Fig 3.5: Path diagram of household resilience model

3.4.23.1 Measuring of components

3.4.23.1.1 Access to Basic Services (ABS)

The most important variables for Access to basic services were health services, access to electricity, education, drinking water, toilet facilities etc. For this study variables such as Health, Education, Market, mobility and transport limitation and Access to services were considered.

i. Health: Measurement of the health involves two indicators: physical access to health (no access to services, access to services after time limit, and access to services within time limit); and the health care quality (good, neutral and bad) based on the services provided in different health areas.

a. Physical Access to health care: The basic health care facilities obtained from any health centre in the locality. They were scored as “No access to services=1”, “access to services after time limit=2”, “access to services within time limit=3”

b. Health care quality: It refers to the quality of health facilities provided by public health centre. It was scored as “Bad=1”, “Neutral=2”, “Good=3” according to the quality perceived by the respondents.

ii. Quality of education system: The quality of education system is the measure of quality of education facilities (teaching, basic facilities, infrastructure, transportation facility, behaviour of teacher toward students and discipline) prevailing in the study area at the time of investigation. And the qualities were

scored as “very poor=1”, “Poor=2”, “Fair=3”, “Good=4”, “Very good=5”, and “Excellent=6” according to the quality perceived by the respondents.

iii. Market: It is the distance of the nearest market from the residence of the respondent measured in kilometers. Households were classified three categories according to the mean and standard deviation of the distance

Category	Score
• Near < (Mean±SD)	1
• Moderate distance (Mean±SD)	2
• Far > (Mean±SD)	3

iv. Mobility and transport limitation: Measurement of mobility and transport limitation involves two indicators: mode of transport and quality of transportation services. The two indicators are scored as follows:

a. Mode of transport: Different means of transport were scored as “Bus=1”, “Auto/taxi=2”, “Two wheeler=3”, “Private vehicle=4”.

b. Quality of transportation services: The quality of transportation was scored as “Bad=1”, “Neutral=2” and “Good=3”.

v. Access to services/ facilities: It refers to the various services/ facilities which was available in the household of the respondent. Important services and facilities were identified and provided the following scores. The total score of a respondent/ household was the sum of the score of the services/ facilities they access.

Services	Scores
• Mobile connection	1
• Fixed land line	2
• Solar Connection	3
• Cooking gas connection	4
• Electricity connection	5
• Toilet	6
• Drinking water	7

In this case, use of the traditional multivariate method (factor or principal component analysis) is impossible because the observed variables are not continuous. So for estimation of Access to basic services (ABS) optimal scaling technique has been used.

3.4.23.1.2 Assets (A)

Assets are part of a farm household capital and their availability is an important coping mechanism during the period of hardship. Therefore asset has been considered as key factor in estimating resilience. Two indicators are considered for measuring asset. In this case as the variables are in continuous traditional multivariate method is used. .

i. Productive asset: It includes farm equipment (non-mechanized), other livestock (chickens, ducks, turkeys, pigeons), small livestock (goats, pigs, sheep), large livestock (oxen, cattle), farm equipment (mechanized), fish pond or fishing equipment, Agricultural land (pieces/plot) etc.

ii. Non-Productive assets: It includes other land not used for agricultural purposes (pieces, residential or commercial land), house (and other structure), means of transportation (bicycle, motorcycle, car), large consumer durables (fridge, TV, sofa), small consumer durables (radio, cookware), cell phone etc.

3.4.23.1.3 Social Safety Nets (SNN)

Social safety net is considered as crucial aspect of mitigating crisis. Social safety net is considered in estimating resilience as it can represent the household's capacity to mitigate shock. For measuring social safety net, four indicators have been considered: formal assistance, informal assistance, assistance in cash and assistance in kind. In this case for estimation of social safety nets, optimal scaling technique has been used.

i. Formal Assistance: Formal assistance includes assistance obtained by the household from International agency/charities/NGO, Job Assistance, Government Schemes (Public distribution system, MNREGA etc) in the last one year prior to data collection and the scoring was done as "International agency/charities/NGO=1", "Job Assistance=2", and "Government Schemes=3".

ii. Informal Assistance: Assistance obtained by the household during need or crisis from friends, relatives, neighbours and others informal groups or individuals. They were scored as “Friends=1”, “Relatives=2”, “Neighbours=3” and “other informal groups or individuals=4”.

iii. Assistance in cash: It is frequency of assistance received by household in cash at the time of need and crises in the last one year from formal or informal organization/group. Scoring were as follows “rare=1”, “Sometime=2”, and “Most of the time=3”.

iv. Assistance in kind: It is frequency of assistance received by household in kind at the time of need and crises in the last one year from formal or informal organization/group. Scoring were as follows “rare=1”, “Sometime=2”, and “Most of the time=3”.

3.4.23.1.4 Adaptive Capacity (AC)

The adaptive capacity indicates a household’s capacity to cope with and adapt to a certain shock, enable that household to keep performing its key function. Thus, adaptive capacity is considered for estimation of household resilience. For measuring it three indicators has been considered: Diversity of income sources, coping strategy index and capacity to keep up in future. Each indicator has different scoring.

i. Diversity of income sources (count from 0 to 6): This indicates the number of income sources from different sectors (public, private, etc); during crisis, the more sources of income, the less the risk of losing essential basis of the household’s livelihood (i.e. income).

ii. Coping strategy index (count from 0 to 18): This represents the number of available coping strategies mostly adopted by the household at the time of crisis.

iii. Capacity to keep up in future: This is based on a household’s perception of its own capacity to keep up in the future considering socio-economic shock due to natural calamity. It is a forward-looking variable, which allows household’s expectations to be taken into account. Scoring is done as follows “Very small

extent=1", "Small extent=2", "some extent=3", "Somewhat great extent=4" and "Great extent=5".

As the variables are not continuous even in this case optimal scaling technique has been used.

3.4.23.1.5 Sensitivity (S)

Sensitivity in farm household is related to exposure to risk and resistant to risk. It measures the shock struck to the household in last one year. To measure sensitivity three indicators has been considered: Animal shock (Number of livestock loss and its monetary value), Crop shock (Crop loss in tons due to pest, diseases, price etc and its monetary value), Shock (disturbed by any natural calamity and other viz. Flood, hailstorm, landslides, etc and its number of occurrence in a year).

3.5 Development of schedule

The module developed by Bickel *et al.* (2000) for USDA to measure the household food security and to measure the resilience to food insecurity index was developed with the procedure followed by Alnovi *et. al* (2008) slightly modified to fit the local situation in consultation with experts of concerned area. The interview schedule was also designed on the basis of objectives, independent, dependent variables and focusing gender dimensions. Each question was thoroughly examined and discussed with the experts before presenting the interview schedule. Adequate precautions and care were taken into consideration to formulate the questions in a manner that they were well understood by the respondents and would find it easier to respond.

3.5.1 Validity of Interview Schedule

Validity refers to "the degree to which the scale or instrument measure what it supposed to measure". The interview schedule for the present study was validated through following steps

1. The interview schedule was framed based on relevancy with the objectives of the study.

2. Through discussion of interview schedule was carried out with the experts and their suggestion was incorporated.

3. Further correction was done based on the result of pre-testing for improvement of interview schedule.

3.5.2 Reliability of interview schedule

Reliability of an interview schedule refers to "the precision or accuracy of information obtained from respondents".

To check the reliability of the of the interview schedule test-retest method of estimating reliability of an interview schedule was followed in this study. Fifteen non-sample farm households from Mwkrydep village, Ri-bhoi district of Meghalaya were selected randomly and total of thirty respondents were interviewed and they were re-interviewed after fortnight administering the same interview schedule. The primary man and woman from each household were interviewed. Since same responses were observed, the reliability of the schedule was ensured. After pre-testing on the basis of experience gained, the necessary modifications and suggestions were incorporated before finalizing the interview schedule.

3.6 Procedure followed for data collection

3.6.1 Data collection

Both primary and secondary data were collected to answer the research problem. Required secondary data were collected from Department of Agriculture, Directorate of Economics and Statistics Planning (Statistics) Department Government of Tripura and the official web portal of Government of Meghalaya. Primary data were collected from 80 households from Tripura and 80 households from Meghalaya. For the purpose of increasing accuracy and ensuring adequate item response, the survey was conducted by adopting face-to-face interviews of heads of households as well as their counterpart using a pre-tested structured interview schedule. The respondents were contacted and interviewed individually either at their residence or farm alone, with adult woman present, with adult man present, with adult mix sex present, with children present or with adult mixed sex and children present. The filled in interview schedule were scrutinized and tested immediately after the interview for completeness in all respect.

3.7 Statistical tools employed for data analysis

Both qualitative and quantitative types of data were collected. The qualitative data are converted in quantitative form by giving scores. The statistical techniques used in the present study include:

3.7.1 Frequency: It is defined as the number of observation. It was calculated to find the number of respondents in a particular cell.

3.7.2 Arithmetic mean: The mean is the sum of all the items in the series divided by number of items. It is represented by $\bar{X}$

$$\bar{X} = \frac{\sum x_i}{n}$$

Where,

$\bar{X}$= Arithmetic mean

x_i= i^{th} number of items

n= number of items

3.7.3 Percentage (%): Percentage is the number, amount, rate etc. expressed as part of total which is 100.

3.7.4 Standard deviation: It is the deviation from the mean. It is the measure which quantifies the amount of variation in a data set. It is denoted by σ (sigma)

$$\sigma = \sqrt{\frac{\sum(X - \bar{X})}{n}}$$

Where,

σ= Standard Deviation

$\sum$= Sum of

X= Each value in data set

$\bar{X}$= Mean of values in the data set

n= Number of values in data set

3.7.5 Pearson correlation: It is the measure of strength and systematic linear association of two variables. If the change in one variable affects the change in other variables, the two variables are said to be associated or correlated. It is represented by "r". The Pearson correlation coefficient ranges from value -1 to +1. The value "0" indicates there is no association between the two variables, whereas -1 indicates perfect negative correlation

and +1 indicates positive perfect correlation. The coefficient is computed with the formula given below:

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

Where,

N= number of pairs of scores

$\sum xy$= sum of the products of paired score

$\sum x$ = Sum of x scores

$\sum y$ = Sum of y score

$\sum x^2$ = sum of squared x score

$\sum y^2$ = sum of squared y score.

3.7.6 z-test: z test is a statistical procedure to deduce whether two samples means are different when variances are known, sample size is more than 30, each population independent of one another and samples taken from the population is normally distributed. The test is performed with the formula given under:

$$Z = \frac{\bar{x} - \mathrm{U}}{\sigma/\sqrt{n}}$$

Where,

$\bar{x}$= mean of sample

U= mean of population

σ= standard deviation of population

n= number of observations

3.7.7 Multiple regressions: Regression analysis is mathematical measure of the average relationship between two or more variables in terms of the original units of the data (Gupta and Kapoor, 2017). Multiple regression is used when the values of a variables need to predict based on the value of two or more other variables. It has two kinds of variables dependent and independent variable. The variables whose values is predicted is called regressed or explained variables (dependent variable) and the variables which is used for prediction is known as regressor or predictor (independent variables).

$$Y_1 = a + b_1x_1 + b_2x_2 + \ldots\ldots\ldots + b_nx_n$$

Where,

Y_1 = Dependent variable

$x_1 \ldots x_n$ = Independent variables

a = Constant value or intercept

$b_1 \ldots b_n$ = the regression coefficient for respective independent variables

3.7.8 Stepwise regression: In statistics stepwise regression is a method of selection of best model by either adding or removing predictor variable (independent variable). It is mainly carried out based on test statistics of the estimated coefficient.

3.7.9 Path analysis: Path analysis is a form of multiple regressions, which test the theories of casual relationship among a set of variables. That is it checks direct and indirect effect of explaining variables (independent variable/exogenous variable) on outcome variable (dependent/endogenous variable). Standardized regression coefficient (beta weight) is path coefficient.

3.7.10 Optimum scaling technique: It is used by categorical procedure for data analysis in which it is difficult or impossible for standard statistical procedures. Abstract behind optimal scaling is to assign numerical quantification to categories of each variable which as a result allows standard procedure to use in obtaining solution on the quantified variables. In the analysis, it has metric properties unlike original lebels of the ordinal and nominal variables. Iterative method called alternative least method is used to obtain optimal quantification for each scaled variable in most categories procedure.

3.7.11 Principal component analysis: It is a form of factor analysis, uses form of orthogonal transformation and eigenvector based multivariate analyses. It transforms the set of correlated variable into new uncorrelated variable and method to reduce the number parameter.

3.7.12 Factor Analysis: It is statistical technique in which large number of variable is reduced in to fewer numbers (factors). It considers multiple

observed variables having similar type of responses as they all are connected with latent variables. It is generally carried out on the correlation matrix of observed variables.

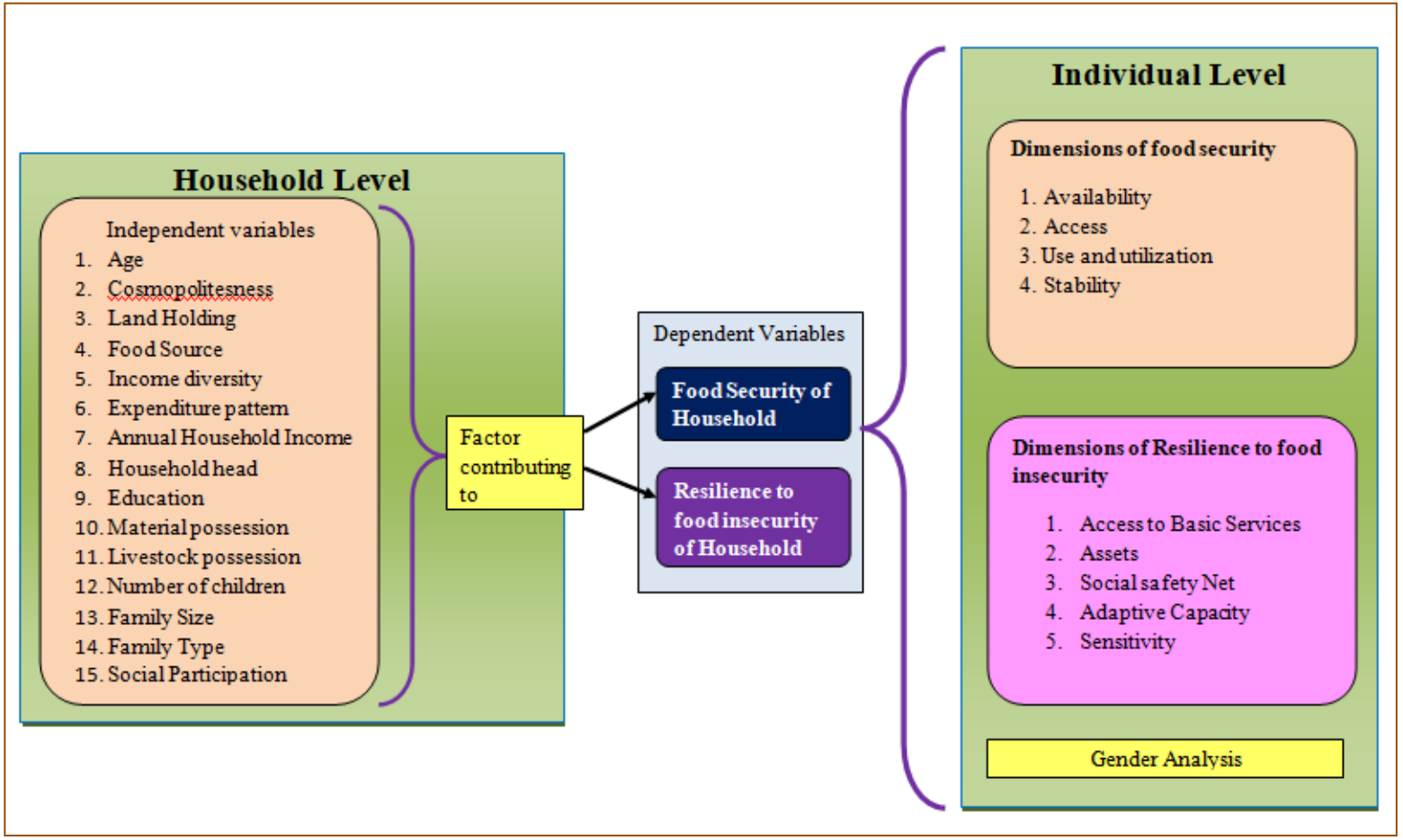


Fig. 3.6: Conceptual Framework of the study

Fig. 3.7a: Photographs of data collection in Tripura

Fig. 3.7b: Photographs of data collection in Meghalaya

Fig. 3.8: Roadside vegetable shops on the way to Tura (Garo Hills) Meghalaya.

Fig. 3.9: Cauliflower cultivation in East Khasi hills district, Meghalaya.

Fig.3.10: Traditionally prepared yeast in Dhalai district, Tripura.

Fig. 3.11: A *Koch* lady weaving their traditional attire in South west Garo hills of Meghalaya

Fig. 3.12: Garo ladies of Rongramgre village, Meghalaya

Fig. 3.13: Malnourished kids spotted during data collection in Tripura

CHAPTER- IV

RESULTS AND DISCUSSION

This chapter deals with the results based on the empirical data collected and are presented along with discussion under the following heads:

4.1 Profile of households and respondents under study area

4.2 Level of food security of the farm households

4.3 Resilience to food insecurity of the households

4.4 Gender analysis of various dimensions of food security and resilience in the households

4.5 Factors contributing to the level of food security

4.6 Constraints in achieving food security and suggestions from the households to overcome the constraints

4.1 Profile of households and individual respondents under study area

In social science studies, profile of household and characteristics/profile of the respondent plays significant role in highlighting the conditions prevailing in the study area at the time of investigation.

4.1.1. Profile of the households under study area

The household data are presented disaggregated state-wise and also according to the gender of the household head.

4.1.1.1Household Head

Household heads were the major decision makers in the household. Generally in patriarchy, men were the household head. In the present study, even though in some part of study area follows a matrilineal society, as much as 78.75 per cent of the household has men as household head and only 21.25 per cent household has women as household head indicating that matrilineality does not translate to a matriarchal society. Furthermore, when both the states were compared, percentage of men headed household was more in Tripura than Meghalaya. Whereas, the percentage of women

headed household, was spotted to be more in Meghalaya than Tripura. Moreover state Meghalaya follows matrilineal society while in Tripura patriarchy is followed. The details of the result are presented in table 4.1 and figure 4.1.

Table 4.1: Distribution of households according to household head

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)	
	F	%	F	%	F	%
• Men Headed	126	78.75	72	90.00	54	67.50
• Women headed	34	21.25	8	10.00	26	32.50

Note: F=Frequency, %=Percentage.

4.1.1.2 Age

Generally age of household head is appraised to be prime element which involved in making up individuals personality as the ways and need in which individual thinks is nearly related to the number of year lived by a person (Zahid and Ahmed, 2013). Furthermore, Hofferth (2004) added that older person are more mature and have better experiences in securing various types of resources they required. However, in the present study, more than fifty per cent of the household head belonged to medium age (55.62 per cent) group followed by old age (36.25 per cent) and young age (8.13 per cent) group. The findings also depict similar result with Abdullah *et al.* (2017). Almost same result was found as overall result, in both the states Tripura and Meghalaya; Men headed and women headed household where the medium age group (Tripura 57.50 per cent; Meghalaya 53.75 per cent; Men headed household 57.14 per cent and women headed household 50.00 per cent) outnumbered the other two age group, old age (Tripura 35.00 per cent; Meghalaya 37.50 per cent; men headed household 34.92 per cent and women headed household 41.18 per cent) and young age group (Tripura 7.50 per cent; Meghalaya 8.75 per cent; Men headed 7.94 per cent and women headed household 8.82 per cent). There was slightly difference in the results of age group when the comparison was made between the households of two states Tripura and Meghalaya; Men headed and women headed household. It was also interestingly found that age of head in women

headed household was found to more in old age group compared to men headed household. Like the present finding, Modirwa and Oladele (2012) also found in their study that majority of the household head belonged to medium age group.

Table 4.2: Distribution of households according to age of household head

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Age of household head (in year)										
• Young	13	8.13	6	7.50	7	8.75	10	7.94	3	8.82
• Medium	89	55.62	46	57.50	43	53.75	72	57.14	17	50.00
• Old	58	36.25	28	35.00	30	37.50	44	34.92	14	41.18

Note: F=Frequency, %=Percentage, Young = below 35 Years, Medium = 35 to 50 years, Old=above 50 years, HH=Headed household.

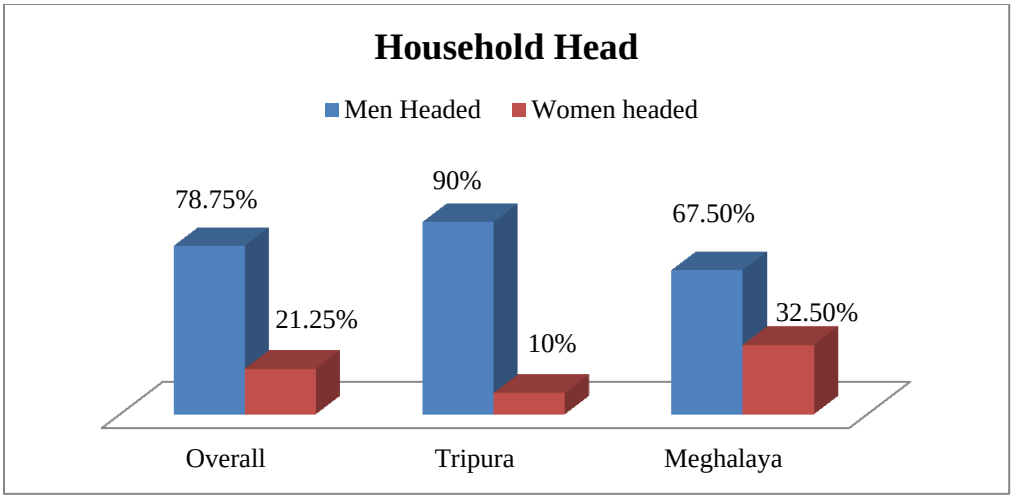


Fig. 4.1: Distribution of households according to household head

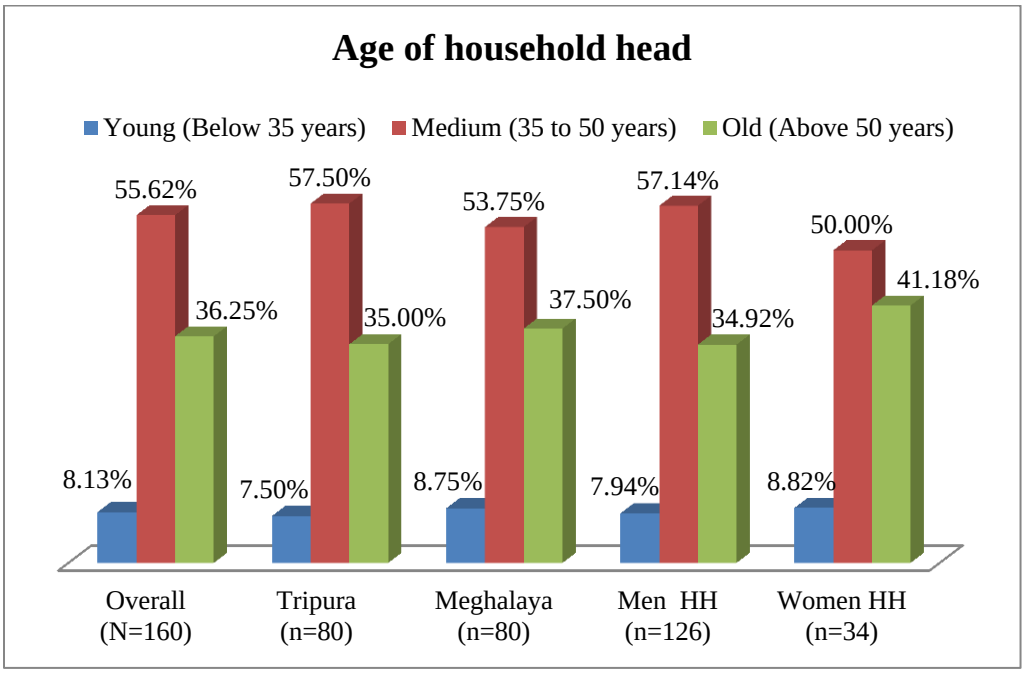


Fig. 4.2: Distribution of households according to the age of household head

4.1.1.3 Education (of household head)

Education is one of the important attribute for recognizing the status of household. In the present study less than ten per cent of the household head were having high education level (8.13 per cent), while enormous proportion of the household head had medium level (46.88 per cent) of education followed by low level (45.00 per cent). Compared to the state Meghalaya (5.00 per cent), percentage of household head having high education was more in Tripura (11.25), even if the per cent was small. This may be due to the fact that literacy rate in Tripura is high, and education facilities provided by state government and the people emphasize more in education. In Tripura medium education level (50.00 per cent) outnumbered the low education level (38.75 per cent) but in Meghalaya percentage of low education level (51.25 per cent) was more than medium education level (43.75 per cent) of household head. Whereas, when men and women headed household were compared, more than fifty per cent of household head falls under low education level (55.88 per cent) followed by medium level (41.18 per cent) and high education level, which also highlights that high education level percentage of household head in women headed households were found to be very small (2.94 per cent) than men headed households (9.52 per cent). However, 47.62 per cent of household head in men headed household comes under medium education level. The findings also reflects less per cent of household head of men headed households belonged to low education level which results in almost 8.00 per cent less compared to women headed households. It can be due to the fact that women had to leave their education early in their life when they reach marriageable age compared to men. The detail of the findings in presented in Table 4.3 and Fig. 4.3.

4.1.1.4 Social Participation

Social participation in this case represents the involvement of household head or members of household in any formal or non formal activities. In the study area, overall result showed that as much as 78.75 per cent of the household head did not have any participation/membership in any formal group/organization (Table 4.4).

Only around 21.25 per cent of head had membership in formal group/organization, out of which 10.00 per cent of them were office bearer in formal group/organization, whereas, more than fifty per cent of the head had active participation in non-formal village activities (groups/committee in villages for managing any marriage functions and ceremonies as helping hand). In case of states, Tripura (20.00 per cent) and Meghalaya (22.50 per cent), small per cent of household head was observed to have membership, but the percentage of membership was found slightly high by 2.50 per cent in Meghalaya. Participation in non formal activities in village was found to be more by 10.00 per cent in Tripura (76.25 percent) compared to Meghalaya (66.25 percent). On the other hand an interesting result had been observed between men headed and women headed household. In women headed household (38.24 per cent) membership in an organization was found to be more compared to men headed household (16.67 per cent) and even the percentage of office bearer were found to be slightly more in women headed household (11.76 per cent). But the percentage of participation in non-formal village activity in women headed household (64.71 per cent) were less compared to men headed household (73.02 per cent). Less participation of women head in non formal village activity can be due to the reason that women were always captured with different household chores and they hardly get time to participate in such activity rather they substitute by any responsible older member of the family in non formal village activity. Women of the study area were mostly a member of SHGs in both the states and *Bandhan* group in Tripura. The details and pictorial representation of the study are presented in Table 4.4 and Fig. 4.4 respectively.

Table 4.3: Distribution of households according to education of household head

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Education of household head										
• Low	72	45.00	31	38.75	41	51.25	54	42.86	19	55.88
• Medium	75	46.88	40	50.00	35	43.75	60	47.62	14	41.18
• High	13	8.13	9	11.25	4	5.00	12	9.52	1	2.94

Note: F=Frequency, %=Percentage, HH=Headed household, Low = below 5^{th} standard, Medium= 5^{th} to 10^{th} standard, High= Higher Secondary and above.

Table 4.4: Distribution of households according to social participation of household head

	Overall (N=160)		Tripura (n=80)		Meghalaya(n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Social Participation										
• No participation	126	78.75	64	80.00	62	77.50	105	83.33	21	61.67
• Membership in an organization	34	21.25	16	20.00	18	22.50	21	16.67	13	38.24
• Office bearer in any organization	16	10.00	9	11.25	8	10.00	13	10.32	4	11.76
• Non-formal village activity	114	71.25	61	76.25	53	66.25	92	73.02	22	64.71

Note: F=Frequency, %=Percentage, HH=Headed household

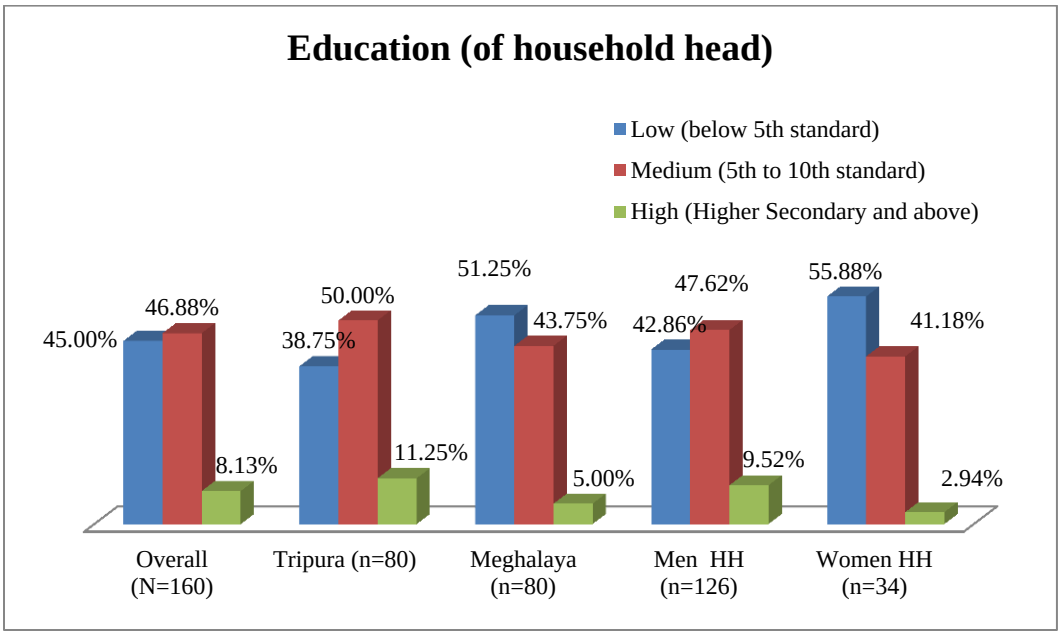
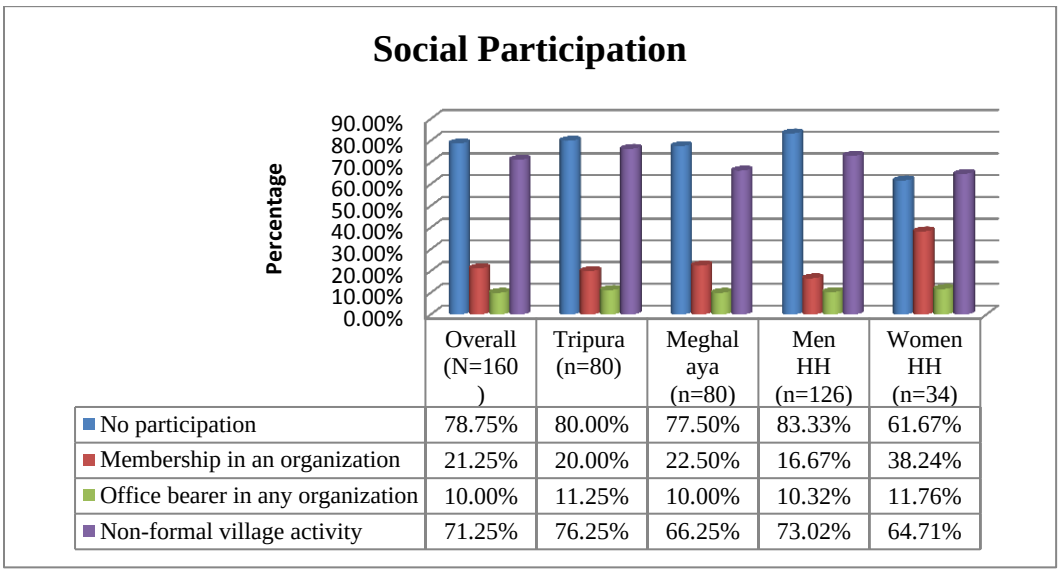


Fig. 4.3: Distribution of households according to the education of household head



	Overall (N=160)	Tripura (n=80)	Meghalaya (n=80)	Men HH (n=126)	Women HH (n=34)
No participation	78.75%	80.00%	77.50%	83.33%	61.67%
Membership in an organization	21.25%	20.00%	22.50%	16.67%	38.24%
Office bearer in any organization	10.00%	11.25%	10.00%	10.32%	11.76%
Non-formal village activity	71.25%	76.25%	66.25%	73.02%	64.71%

Fig. 4.4: Distributions of households according to social participation of household head

4.1.1.5 Number of Children

It gave the status of the number of children residing in the household. Table 4.5 showed that in the overall result, as much 66.88 percent of the household had children between 1 to 3 numbers. However, less than thirty per cent of the households (27.50 per cent) did not have any child below 18 years of age, and only a small per cent (5.63 per cent) of the household were having children more than three numbers. In both the states maximum percentage of households were having number of children between one and three (Tripura 77.50 per cent; Meghalaya 56.25 per cent) followed by household with no children (Tripura 21.25 per cent; Meghalaya 33.75 per cent). But percentage of household having children more than three was found more in Meghalaya (10.00 per cent) compared to Tripura (1.25 per cent). A kind of similar result was found in men headed and women headed household where the percentage of household having children between one and three (men headed 67.46 per cent; women headed 64.71 per cent) was more followed by no children (Men headed 28.57 per cent; Women headed 23.53 per cent) in the household, whereas percentage of the household having children more than three were spotted more in women headed household (11.76 per cent) compared to men headed household (3.97 per cent).The bar graph of the finding is given in Fig. 4.5.

Table 4.5: Distribution of households according to the number of children in the household

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Number of Children										
• No child	44	27.50	17	21.25	27	33.75	36	28.57	8	23.53
• 1 to 3 children	107	66.88	62	77.50	45	56.25	85	67.46	22	64.71
• More than 3 children	9	5.63	1	1.25	8	10.00	5	3.97	4	11.76

Note: F=Frequency, %=Percentage, HH= Headed household

4.1.1.6 Family Size

Family size is important to know the characteristics of the household in the study area. In general family size also affects households' access to food as both family size and household requirements are positively correlated (Hoddinot, 1999). The result (Table 4.6 and Fig 4.6) from the finding showed that as much as 63.75 per cent of household led medium family size with 4 to 6 members. While, 21.25 per cent of household had family member more than 6 numbers and only 15.00 per cent of the household had member up to 3 numbers. Percentage of medium family size was found to be more in Tripura compared to Meghalaya. On the other hand large family size was observed more in Meghalaya compared to Tripura and percentage of small family size was also observed to have difference between the two states (Tripura; Meghalaya). Similarly, when the comparison was made between men and women headed households, in men headed households percentage of medium family size was more which was 70.63 per cent compared 38.24 per cent of women headed households. But in case of women headed households percentage of large family size was more followed by medium and small family size. Men headed household had more percentage under small family size which was almost half of percentage more than women headed households.

Table 4.6: Distribution of the households according to family size

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Family Size										
• Small (up to 3 members)	24	15.00	15	18.75	9	11.25	21	16.67	3	8.82
• Medium (4 to 6 members)	102	63.75	58	72.50	44	55.00	89	70.63	13	38.24
• Large (above 6 members)	34	21.25	7	8.75	27	33.75	18	14.29	16	47.06

Note: F=Frequency, %=Percentage, HH= Headed household.

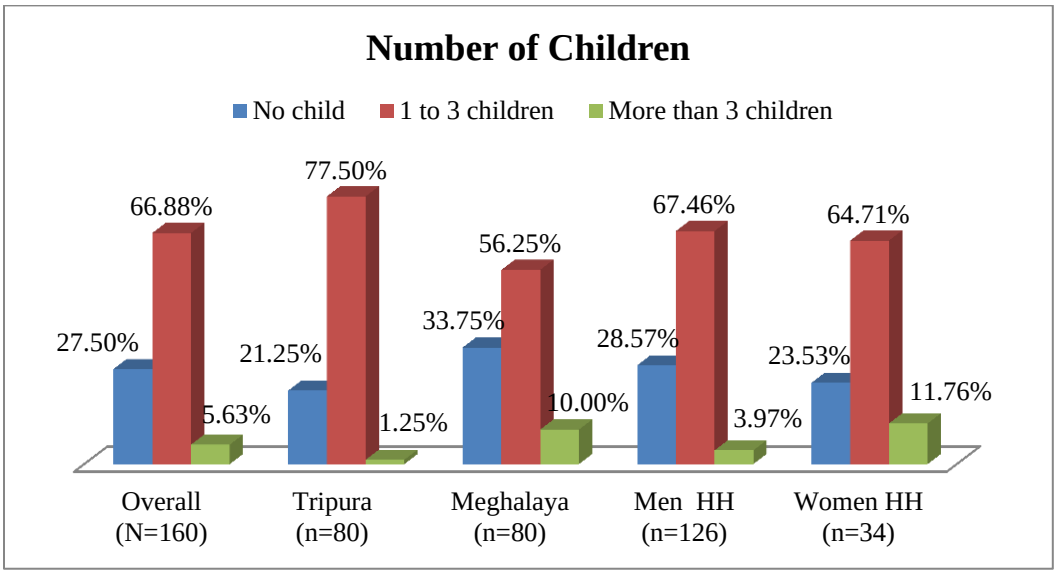


Fig. 4.5: Distribution of households according to the number of children in the household

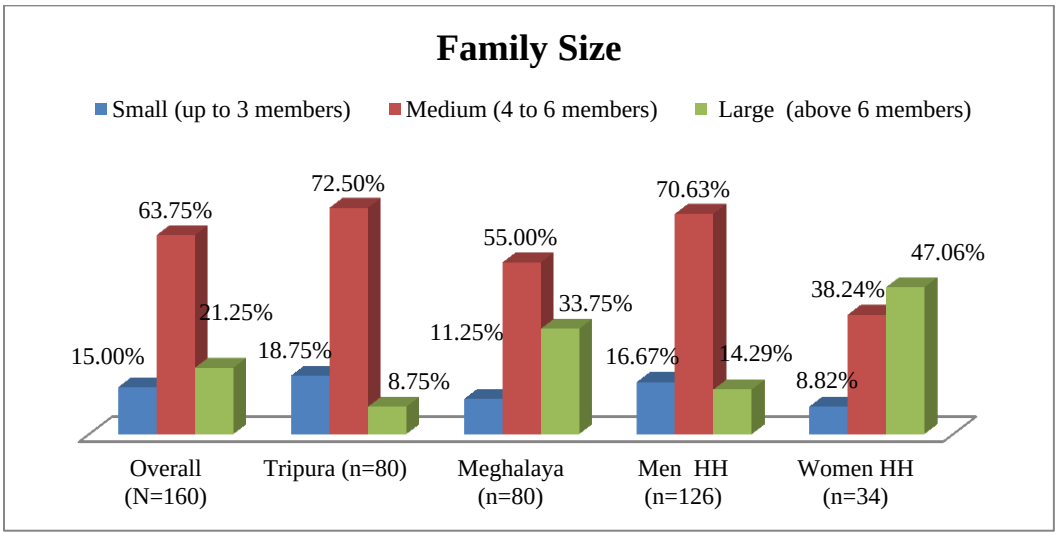


Fig. 4.6: Distribution of the households according to family size

4.1.1.7 Family Type

Family has always been one of the important components in India. Family type either nuclear or joint family have been considered for this present study. Indian societies have been following the joint family type from the time immemorial. But with modernization, Indian society has shifted from joint to nuclear family (Bansal, *et al.*, 2014). Similar finding was also observed in the study area. More than fifty per cent of household followed nuclear family type (60.00 per cent). While in case of two states Tripura (52.50 per cent) and Meghalaya (67.50 per cent) slight differences by around ten per cent was found in nuclear family type. Similarly, percentage of nuclear family was more in men headed household compared to women headed household. Joint family was observed comparatively less in men headed households (38.10 per cent) than women headed households (47.07 per cent). Details of the findings were presented in Table 4.7 and Fig.4.7.

Table 4.7: Distribution of the households according to family type

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Family Type										
• Nuclear family	96	60.00	42	52.50	54	67.50	78	61.90	18	52.94
• Joint family	64	40.00	38	47.50	26	32.50	48	38.10	16	47.06

Note: F=Frequency, %=Percentage, HH= Headed household.

4.1.1.8 Annual Household Income

Annual household income gives the financial status of any household over the year. In the overall result around 30.63 per cent of the household falls under 3rd Quintile followed by 5th Quintile (28.75 per cent), 2nd Quintile (21.25 per cent) 4th Quintile (13.13 per cent) and 1st Quintile (6.25 per cent). Like overall result, similar result was found in Tripura where the maximum percentage of annual household income falls under 3rd Quintile (32.50 per cent) followed by 5th Quintile (30.00 per

cent), 2nd Quintile (26.00 per cent), 4th Quintile (16.25 per cent), and 1st Quintile (10.00 per cent). However, compared to Tripura, in Meghalaya different result has been found, even through small percentage maximum per cent was found to be under 2nd Quintile (31.25 per cent) unlike Tripura followed by 3rd Quintile (28.75 per cent), 5th Quintile (27.50 per cent), 4th Quintile (10.00 per cent) and 1st Quintile (2.50 per cent). While, in case of Men headed household percentage of 5th Quintile (30.95 per cent) was observed to be more followed by 3rd Quintile (27.78 per cent), 2nd Quintile (20.63 per cent), 4th Quintile (13.49 per cent), 1st Quintile (7.14 per cent). On the other hand in Women headed household 3rd Quintile was having good percentage (41.18 per cent), followed by 2nd Quintile (23.53 per cent), 5th Quintile (20.59 per cent), 4th Quintile (11.76 per cent), and 1st Quintile (2.94 per cent). The reason behind may be due to differences in wages existing between men and women and also due to different geographical area. The details of the findings are given in Table 4.8.

Table 4.8: Distribution of the households according to annual household income

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	**%**	F	%
Annual Household income (₹)										
1st Quintile (1000-33000)	10	6.25	8	10.00	2	2.50	9	7.14	1	2.94
2nd Quintile (33001-55000)	34	21.25	9	26.00	25	31.25	26	20.63	8	23.53
3rd Quintile (55001-88000)	49	30.63	26	32.50	23	28.75	35	27.78	14	41.18
4th Quintile (88001-150000)	21	13.13	13	16.25	8	10.00	17	13.49	4	11.76
5th Quintile (>1,50,000)	46	28.75	24	30.00	22	27.50	39	30.95	7	20.59
Mean	₹. 145556.3 /-		₹.148987.5 /-		₹.142425 /-		₹.154070.87/-		₹.112787 /-	

Note: F=Frequency, %=Percentage, HH= Headed household

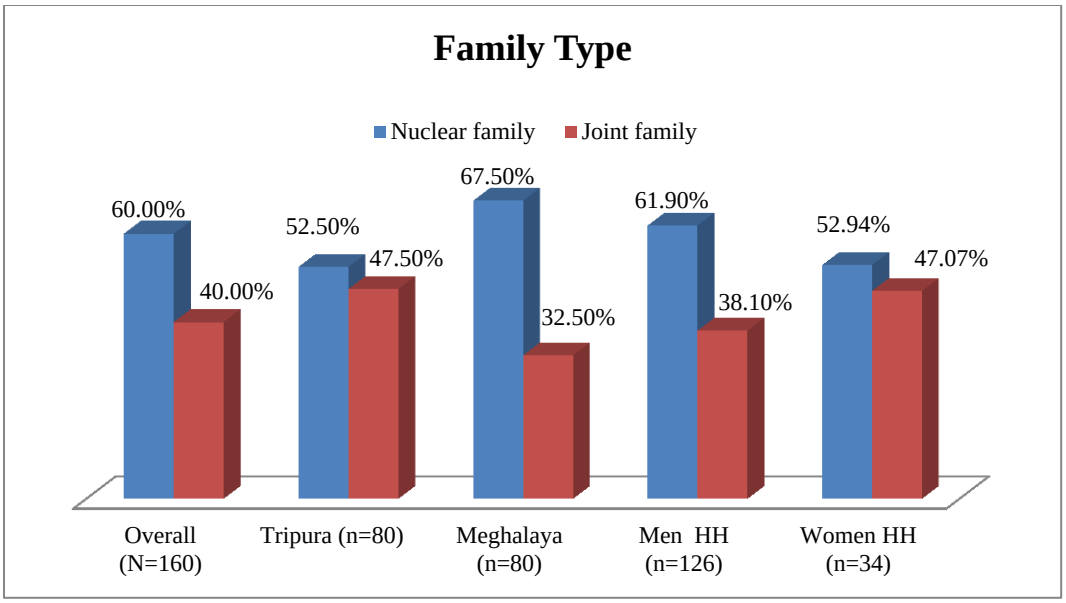


Fig. 4.7: Distribution of the households according to family type

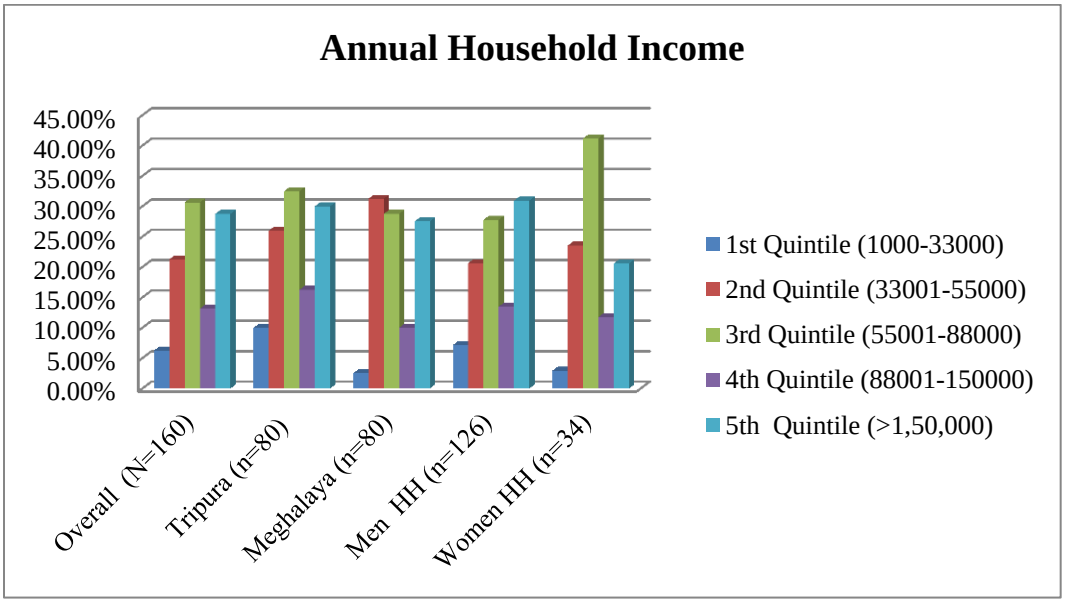


Fig.4.8: Distribution of the households according to annual household income

4.1.1.9 Expenditure Pattern

This gave an idea to learn the amount of the money spent in meeting the need of the household members. Table 4.9 shows that in the study area the household spent on an average of ₹.129766 /-. While the average expenditure was found more in Tripura (₹.159623.20 /-) compared to Meghalaya (₹. 99908.70 /-). Being different states, climate, geographical region, different food habit and culture may also have some role in varying household expenditure. Whereas, when the men and women households were compared men headed households were found to spend more compared to women headed households. The average expenditure in women headed households (₹. 80895.53 /-) which was low compared to men headed household (₹. 142953.2 /-) may be due to the reason that women were better off in managing household income and spends judiciously. Furthermore, findings from Nigeria by Akdiri *et al.* (2018) is in lined with the present findings where the household expenditure was more in men headed household compared to women headed household. However, another finding by them from Ethiopia found the household expenditure in women headed household was more.

Furthermore, from the Table 4.9 it is also evident that in the study area per cent spent on food (26.96 per cent) was more in overall households followed by farm expenditure (13.39 per cent), education (13.24 per cent), transportation (7.98 per cent), loan repayment (7.57 per cent), medical expenditure (6.86 per cent) etc, and 1.98 per cent was least which was spend on electricity. Least expenditure on electricity can be due to the reason that most of the household in the study area lacks electricity connections.

The percentage spent on food (25.46 per cent) was more in Tripura followed by farm expenditure (14.71 per cent), education (11.32 per cent), loan repayment (9.29 per cent), medical expenditure (8.34 per cent), transportation (6.6 per cent), fuel (5.59 per cent), productive investment (4.37 per cent), consumer goods (4.21 per cent), rituals/ceremonies (3.48 per cent), habits/addictions (2.75 per cent), housing (2.16 per cent) and least in electricity (1.70 per cent). Moreover even in Meghalaya

expenditure per cent on food (29.35 per cent) was observed more followed by education (16.29 per cent), farm expenditure (11.28 per cent), transportations (10.16 per cent), consumer goods (6.21 per cent), productive investment (4.92 per cent), loan repayment (4.82 per cent), medical expenditure (4.50 per cent), habits/addictions (3.47 per cent), electricity (2.43 per cent), fuel (2.37 per cent), rituals/ceremonies (2.28 per cent) in descending order and least in housing (1.90 per cent). In addition, the expenditure pattern was different when two states Tripura and Meghalaya were compared. Compared to Tripura percentage spent on food, habit/addiction, education, consumer goods, electricity, transportation productive, investments was highest in Meghalaya. While Tripura was found to spend more on fuel, rituals/ceremonies housing, loan repayment, farm expenditure, medical expenditure compared to Meghalaya.

Similarly, percentage spent on education, fuel, transportations, rituals/ceremonies, housing, loan repayment, farm expenditure and medical expenditure was spotted to be more in men headed household compared to women headed household. On the other hand percentage spent on food, habits/addictions, consumer goods, electricity, and productive was more in women headed household compared to men headed households. The details of the findings are also shown in Fig. 4.9 and Fig. 4.10.

Table 4.9: Distribution of the households according to expenditure pattern

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH(n=34)	
	AE (₹.)	%	AE (₹.)	%	AE (₹.)	%	AE (₹.)	%	AE (₹.)	%
Food	5598060	26.96	3251828	25.46	2346240	29.35	4637280	25.75	960780	34.93
Habbits/Addictions	628584	3.03	350904	2.75	277680	3.47	505224	2.80	123360	4.49
Education	2747988	13.24	1445808	11.32	1302180	16.29	2416188	13.41	331800	12.06
Consumer goods	1034040	4.98	537996	4.21	496044	6.21	890328	4.94	143712	5.23
Fuel	903960	4.35	714240	5.59	189720	2.37	810480	4.50	93480	3.40
Electricity	411504	1.98	217104	1.70	194400	2.43	295944	1.64	115560	4.20
Transportation	1656600	7.98	844200	6.61	812400	10.16	1512000	8.39	144600	5.26
Rituals/ceremonies	627192	3.02	444804	3.48	182388	2.28	568644	3.16	58548	2.13
Housing	427928	2.06	276344	2.16	151584	1.90	388832	2.16	39096	1.42
Productive investments	951228	4.58	557796	4.37	393432	4.92	691188	3.84	260040	9.45
Loan Repayment	1570836	7.57	1185840	9.29	384996	4.82	1483236	8.23	87600	3.18
Farm expenditure	2780236	13.39	1878384	14.71	901852	11.28	2508556	13.93	271680	9.88
Medical expenditure	1424396	6.86	1064616	8.34	359780	4.50	1304204	7.24	120192	4.37
Total	20762552	100	12769864	100	7992696	100	18012104	100	2750448	100
Mean	129766		159623.3		99908.7		142953.2		80895.53	

Note: AE=Annual expenditure, %= Percentage, HH= Headed household.

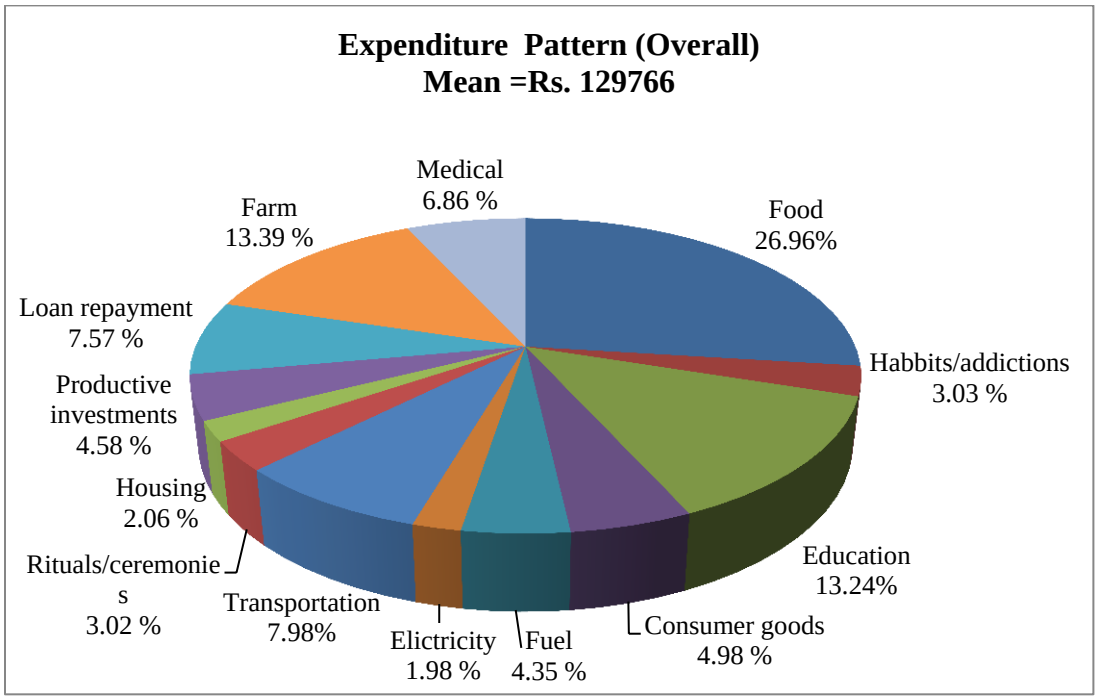


Fig. 4.9: Distribution of expenditure pattern of overall households according to expenditure categories

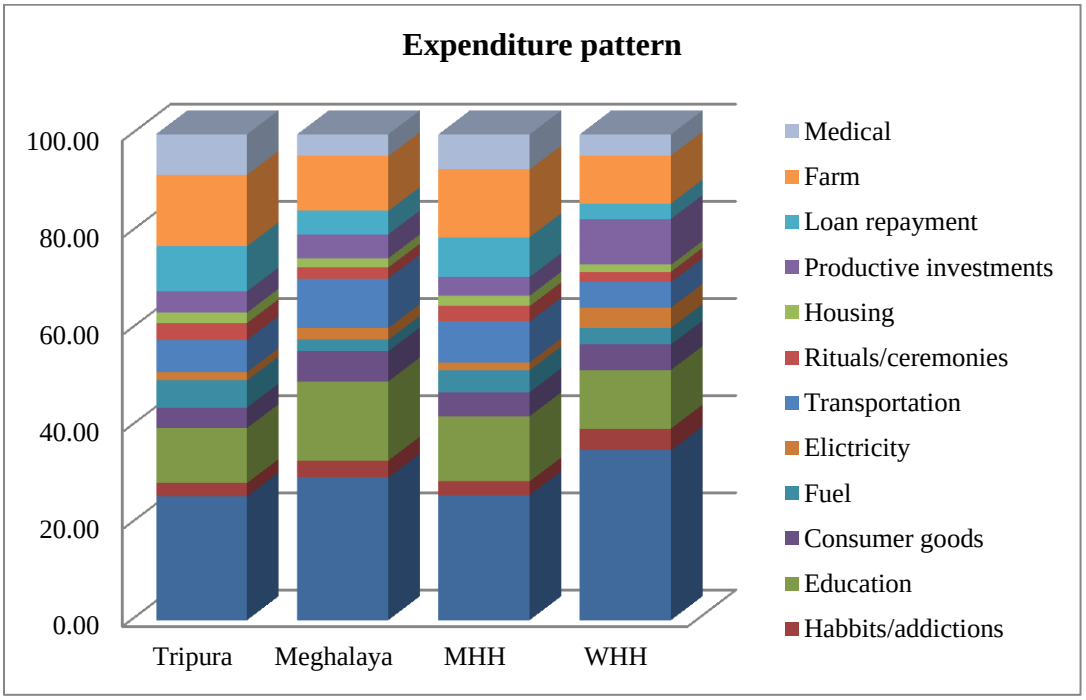


Fig. 4.10: Distribution of expenditure pattern of the households according to expenditure categories

4.1.1.10 Material Possession

It highlights the wealth information of farm household. According to Table 4.10 material possessions in the overall finding was observed to be slightly more than fifty per cent which was medium level (57.50 per cent) followed by low (25.00 per cent) and high level (17.50 per cent) material possession. Both in Tripura (53.75 per cent) and Meghalaya (61.25 per cent) medium level of material possession percentage was found to be more followed by high (35.00 per cent) and low (11.25 per cent) in Tripura whereas in Meghalaya low material possession was found to be 38.75 per cent and interestingly high material possession was not observed in this state. The result varied to some extent in medium, low and high level of material possession between the households of Tripura and Meghalaya. Similarly, it was also noticed to have varying difference to large extent in medium material possession (Men headed 56.35 per cent; women headed household 61.76 per cent), high material possession (men headed 19.84 per cent); slight extent in low material possession (men headed 23.81 per cent; women headed 8.82 per cent) between men and women headed household. Fig. 4.11 shows pictorial representation of the findings.

Table 4.10: Distribution of the households according to material possession

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Material Possession (number)										
Low (up to 36 score)	40	25.00	9	11.25	31	38.75	30	23.81	10	29.41
Medium (37 to 49 score)	92	57.50	43	53.75	49	61.25	71	56.35	21	61.76
High (above 49 score)	28	17.50	28	35.00	0	0	25	19.84	3	8.82

Note: F=Frequency, %=Percentage, HH=Headed household.

4.1.1.11 Livestock Possession

Like the material possession, livestock possession also gives the wealth status of household, which captures the number of livestock possessed by the farm household at the time of investigations. As much as 63.75 per cent of the household were having livestock between 3 and 5 number (medium) followed by more than 5 numbers (High, 19.38 per cent) and up to 2 numbers (low, 16.88 per) of livestock. Similarly, like overall result, households from Tripura (71.25 per cent) and Meghalaya (56.25 per cent); men headed (66.67 per cent) and women headed (52.94 per cent) household also had maximum percentage of livestock between 3 to 5 numbers (medium). It also showed a difference in percentage in livestock possession between Tripura and Meghalaya; Men headed and women headed household (shown in Table 4.11 and Fig. 4.12).

Table 4.11: Distribution of the households according to livestock possession

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Livestock Possession										
Up to 2 numbers	27	16.88	9	11.25	18	22.50	18	14.29	9	26.47
Between 3 to 5 numbers	102	63.75	57	71.25	45	56.25	84	66.67	18	52.94
Above 5 numbers	31	19.38	14	17.50	17	21.25	24	19.05	7	20.59

Note: F=Frequency, %=Percentage, HH=Headed household.

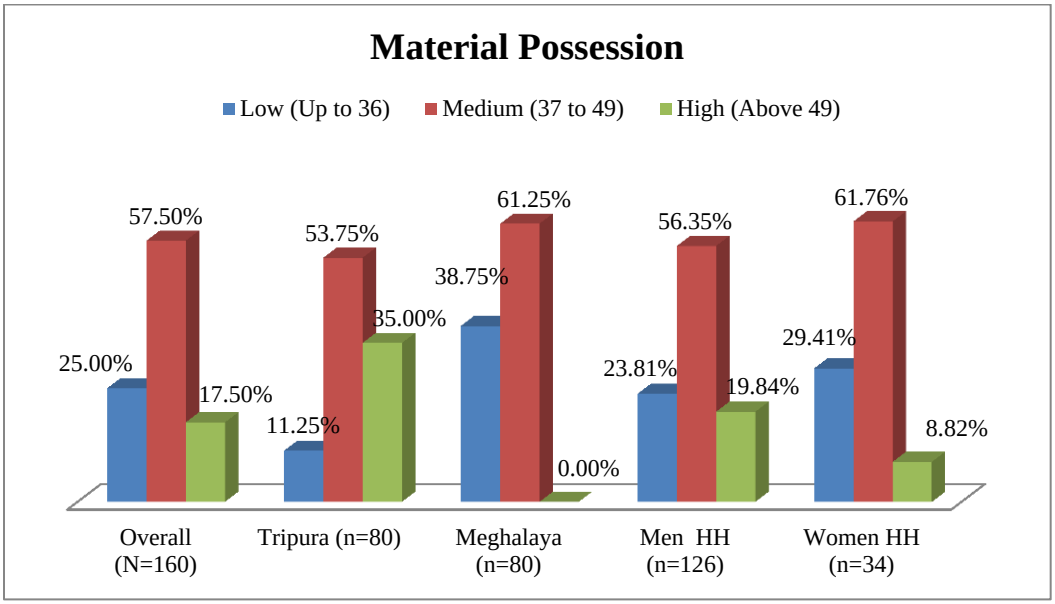


Fig. 4.11: Distribution of the households according to material possession

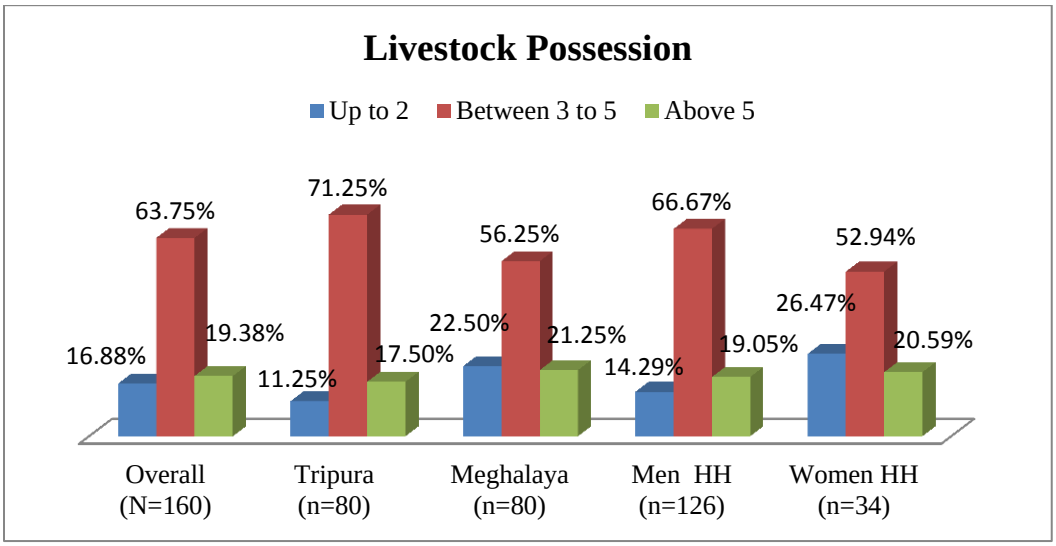


Fig 4.12: Distribution of the households according to livestock possession

4.1.1.12 Income diversity

Involvement of household member in different occupation helped in improving the wealth status of household. More than fifty per cent in overall result showed that the household has medium income diversity (62.50 per cent) followed by low income diversity (28.75 per cent) and high income diversity (8.75 per cent). Consequently, similar result was spotted in case of Tripura and Meghalaya; men headed household and women headed household. Even though maximum percentage was observed in medium income diversity there was differences in percentage between Tripura (low 33.75 per cent; medium 61.25 per cent; high 5.00 per cent) and Meghalaya (low 23.75 per cent; Medium 63.75 per cent; high 12.50 per cent); Men headed (low 31.75 per cent; medium 63.49 per cent; high 4.76 per cent) and women headed household (low 17.65 per cent; medium 58.82 per cent; high 23.53 per cent) in all the levels (Details given in Table 4.12 and Fig. 4.13). Percentage of income diversity was more in women headed household and Meghalaya might be due to fact that women head are more liberal, thrive hard and encourage members for variant activity, whereas, Meghalaya follows matrilineal society and households headed by women was more than Tripura.

Table 4.12: Distribution of the households according to income diversity

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Income diversity										
Up to 2	46	28.75	27	33.75	19	23.75	40	31.75	6	17.65
Between 3 to 4	100	62.50	49	61.25	51	63.75	80	63.49	20	58.82
Above 4	14	8.75	4	5.00	10	12.50	6	4.76	8	23.53

Note: F=Frequency, %=Percentage, HH=Headed household

4.1.1.13 Food Source

As much as 69.38 per cent, 65.00 per cent, 73.75 per cent, 66.67 per cent and 79.41 per cent in overall result, Tripura, Meghalaya, men headed and women headed household had medium food source. In overall result low food source percentage (21.88 per cent) was found to be more followed by high food source (8.75 per cent). Similar result was also spotted in the two states and households headed by men and women (given in Table 4.13a and Fig. 4.14). The result from Table 4.13b also highlighted that the main source of cereal for overall households, households of Tripura and men headed households was from their own stock, market and governments fair price shop, while for households of Meghalaya and women headed households was from market and government fair price/ration shop. This can be explained with the fact that most of the households in some study area of Meghalaya (East Khasi hills) cultivate vegetables instead of rice, on the other hand households of Tripura are headed by men and generally practice rice cultivation along with vegetable cultivation. Vegetable source for most of the households were from own production, market and from wild source (overall 64.38 per cent; Tripura 50.00 per cent; Meghalaya 78.75 per cent; men headed 62.70 per cent and women headed 70.59 per cent) for all the households. While for non vegetable items were from own stock and market for all the households (overall 41.25 per cent; Tripura 60.00 per cent; men headed 45.24 per cent and women headed 26.47 per cent), except households of Meghalaya, the source was mostly from the combination of own stocks + market place + wild source (46.25 per cent). The food habit of northeastern are diverse and their cuisines ingredients and condiments (bamboo shoot, wild mushrooms, wild banana flower, *Spilanthus paniculata,* edible snails, fern and Asiatic pennywort etc) are generally available in wild.

Table 4.13a: Distribution of the households according to food source

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Food Source										
Up to 5	35	21.88	23	28.75	12	15.00	28	22.22	7	20.59
Between 6 to 8	111	69.38	52	65.00	59	73.75	84	66.67	27	79.41
Above 8	14	8.75	5	6.25	9	11.25	14	11.11	0	0

Note: F=Frequency, %=Percentage, HH=Headed household.

Table 4.13b: Distribution of the households according to food source

Sl. No.	Combination of sources	Overall (N=160)	Tripura (n=80)	Meghalaya (n=80)	Men HH (n=126)	WHH (n=34)
		F and %	F and %	F and %	F and %	F and %
A	Cereals					
1.	Grow it and consume from their own stocks + Purchase from market place + Government ration shop	43 (26.88)	29 (36.25)	14 (17.50)	42 (33.33)	1 (2.94)
2.	Purchase from market place + Government ration shop	38 (23.75)	5 (6.25)	33 (41.25)	17 (13.49)	21 (61.76)
3.	Grow it and consume from their own stocks + Government ration shop	34 (21.25)	20 (25.00)	14 (17.50)	29 (23.02)	5 (14.71)
4.	Grow it and consume from their own stocks	26 (16.25)	17 (21.25)	9 (11.25)	24 (19.05)	2 (5.88)
5.	Grow it and consume from their own stocks + Purchase from market place	9 (5.63)	6 (7.50)	3 (3.75)	9 (7.14)	0 (0.00)
6.	Purchase from market place	8 (5.00)	1 (1.25)	7 (8.75)	3 (2.38)	5 (14.71)
7.	Grow it and consume from their own stocks + Receive it as a transfer from relatives, members of the community, or foreign donors + Government ration shop	1 (0.63)	1 (1.25)	0 (0.00)	1 (0.79)	0 (0.00)

8.	Grow it and consume from their own stocks + Receive it as a transfer from relatives, members of the community, or foreign donors + Purchase from market place + Government ration shop	1 (0.63)	1 (1.25	0 (0.00)	1 (0.79)	0 (0.00)
B.	Vegetable					
1.	Grow it and consume from their own stocks + Purchase from market place + Gather from wild	103 (64.38)	40 (50.00)	63 (78.75)	79 (62.70)	24 (70.59)
2.	Grow it and consume from their own stocks + Purchase from market place	38 (23.75)	26 (32.50)	12 (15.00)	32 (25.40)	6 (17.65)
3.	Purchase from market place + Gather from wild	7 (4.38)	7 (8.75)	0 (0.00)	6 (4.76)	1 (2.94)
4.	Purchase from market place	5 (3.13)	3 (3.75)	2 (2.50)	4 (3.17)	1 (2.94)
5.	Grow it and consume from their own stocks	5 (3.13)	2 (2.50)	3 (3.75)	3 (2.38)	2 (5.88)
6.	Grow it and consume from their own stocks + Receive it as a transfer from relatives, members of the community, or foreign donors + Purchase from market place + Gather from wild	2 (1.25)	2 (2.50)	0 (0.00)	2 (1.59)	0 (0.00)
C.	Non-Vegetable (Meat, fish, egg, etc)					
1.	Grow it and consume from their own stocks + Purchase from market place	66 (41.25)	48 (60.00)	18 (22.50)	57 (45.24)	9 (26.47)

2.	Grow it and consume from their own stocks + Purchase from market place + Gather from wild	43 (26.88)	6 (7.50)	37 (46.25)	34 (26.98)	9 (26.47)
3.	Purchase from market place	35 (21.88)	20 (25.00)	15 (18.75)	28 (22.22)	7 (20.59)
4.	Purchase from market place + Gather from wild	13 (8.13)	3 (3.75)	10 (12.50)	5 (3.97)	8 (23.53)
5.	Grow it and consume from their own stocks	3 (1.88)	3 (3.75)	0(0.00)	2 (1.59)	1 (2.94)

Note: F=Frequency, %=Percentage, HH=Headed household, the number in the parenthesis indicates percentage.

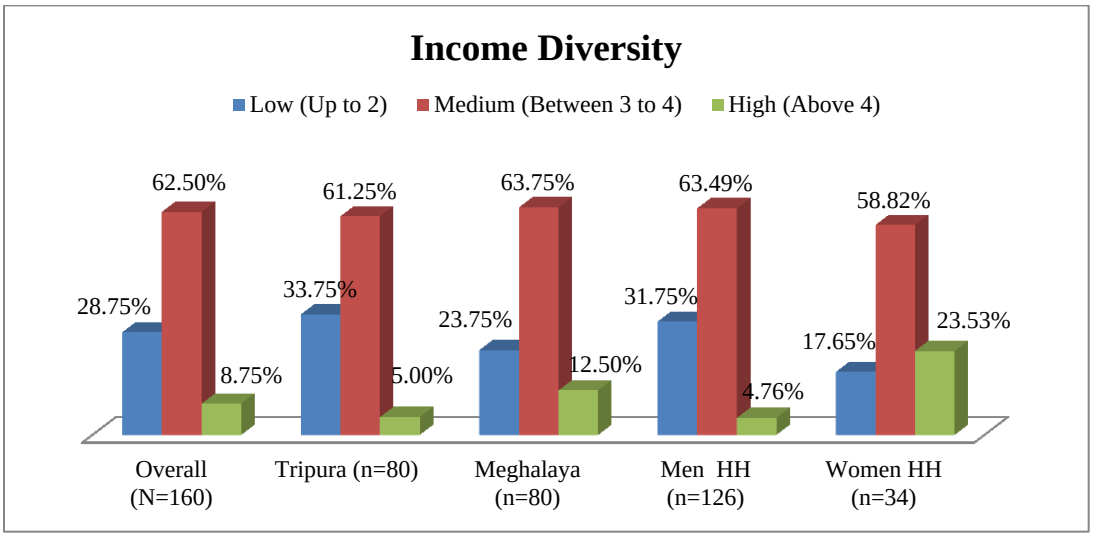


Fig. 4.13: Distribution of the households according to income diversity

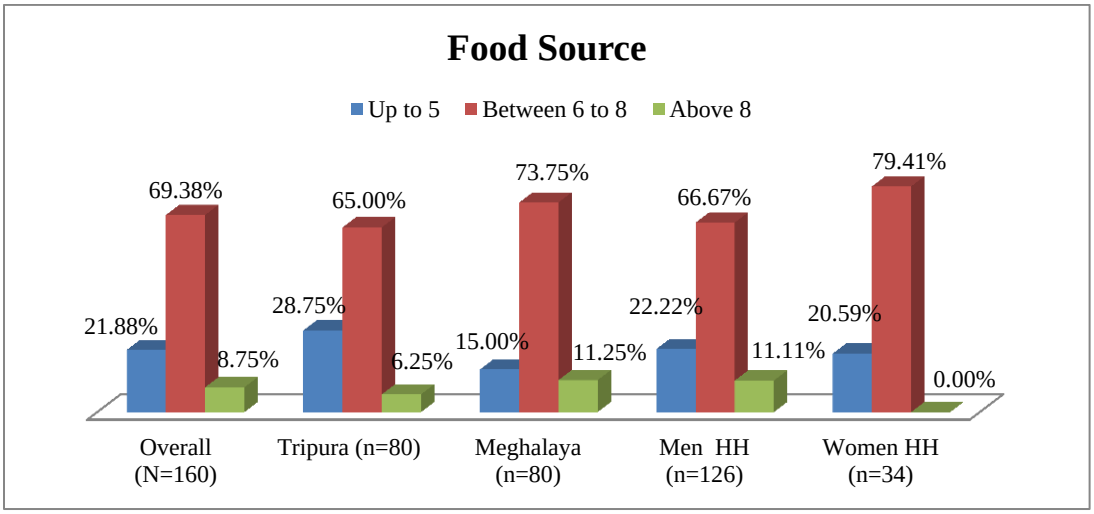


Fig. 4.14: Distribution of the households according to food source

4.1.1.14 Land ownership

Unlike the other mainland farmers, farmers of Northeast are having marginal land holdings or even don't have any land holdings or land ownership. It was also in case of present study. The result of present study was also in lined with Raihan *et al*. (2009). They cultivate their crop either taking land as rent or taking land as share from the village. Almost half of the households in study area has marginal land holdings (overall 56.25 per cent; Tripura 66.25 per cent; Meghalaya 46.25 per cent; Men headed household 57.94 per cent and women headed household 50.00 per cent), followed by small (overall 30.63 per cent; Tripura 22.50 per cent; Meghalaya 38.75 per cent; Men headed household 29.37 per cent and women headed household 35.29 per cent), semi-medium (overall 11.25 per cent; Tripura 8.75 per cent; Meghalaya 13.75 per cent; Men headed household 11.11 per cent and women headed household 11.76 per cent) and medium (overall 1.88 per cent; Tripura 2.50 per cent; Meghalaya 1.25 per cent; Men headed household 1.59 per cent and women headed household 2.94 per cent) . However, there was not a single household having large land holding. It can be better explained with the fact that with the modernization, households prefer nuclear family which results in land fragmentation. The details of the findings are given in Table 4.14 and Fig 4.15.

Table 4.14: Distribution of the households according to land ownership

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Land Ownership (Ha)										
Marginal (<1 ha)	90	56.25	53	66.25	37	46.25	73	57.94	17	50.00
Small (1-2 ha)	49	30.63	18	22.50	31	38.75	37	29.37	12	35.29
Semi-Medium (2.1-4 ha)	18	11.25	7	8.75	11	13.75	14	11.11	4	11.76

Medium (4.1-10 ha)	3	1.88	2	2.50	1	1.25	2	1.59	1	2.94
Large (>10 ha)	0	0	0	0	0	0	0	0	0	0

Note: F=Frequency, %=Percentage, HH= Headed household.

4.1.1.15 Cosmopoliteness

Cosmopoliteness gave idea of degree to which the household head is oriented outside his/her social system. In overall result cosmopoliteness score was engraved between 17 to 38 score which was considered to be having medium level of cosmopoliteness followed by low (19.38 per cent) and high cosmopoliteness (12.50 per cent). Almost similar result was observed in all the cases Tripura and Meghalaya; Men headed and women headed household even though there was differences to great extent between households of Tripura and Meghalaya; women and men headed household in all the considered three categories (Table 4.15 and Fig. 4.16).

Table 4.15: Distribution of the households according to cosmopoliteness of household head

	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Cosmopoliteness										
Low (Up to 16)	31	19.38	6	7.50	25	31.25	16	12.70	15	44.12
Medium (Between 17-38)	109	68.13	59	73.75	50	62.50	94	74.60	15	44.12
High (Above 38)	20	12.50	15	18.75	5	6.25	16	12.70	4	11.76

Note: F=Frequency, %=Percentage, HH=Headed household.

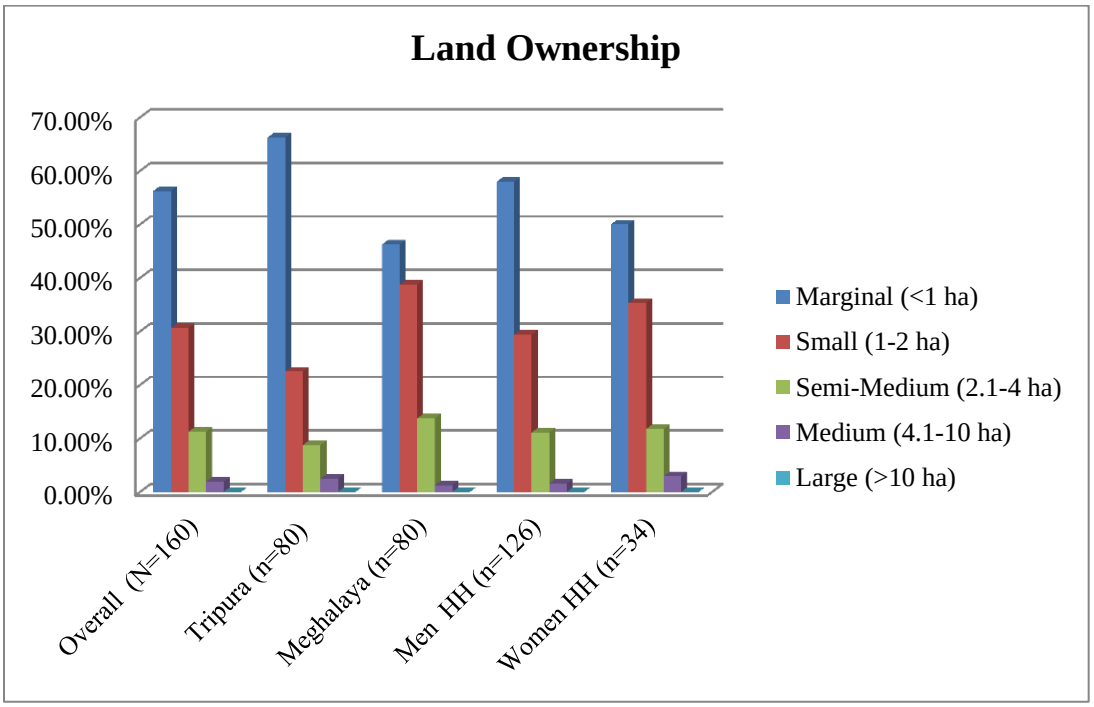


Fig. 4.15: Distribution of the households according to land ownership

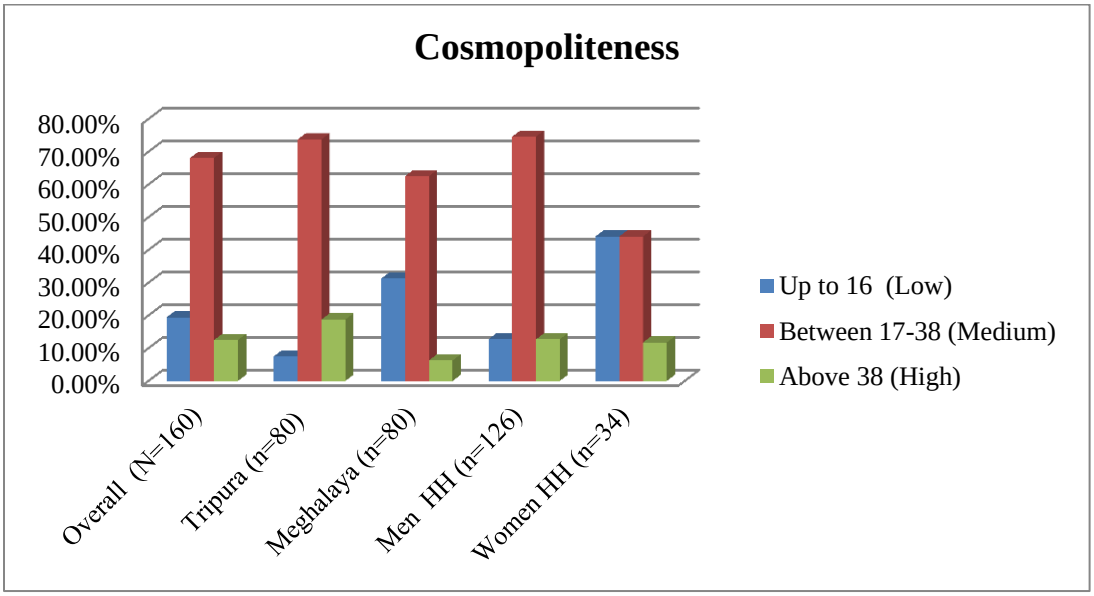


Fig. 4.16: Distribution of the households according to cosmopoliteness of household head

4.1.2. Profile of individual respondent under study area

From the overall 160 households selected for the study, the primary men and primary women (or household heads) were the respondents of the study. Altogether, 160 numbers of men and 160 numbers of women constituted the respondents. The profile of the respondents are presented and described here under.

A. Socio-personal attributes of an individual respondent

The details of the findings are shown in Table 4.16 and 4.17.

4.1.2.1 Age

The result in overall, Tripura, Meghalaya, men headed and women headed household showed that maximum percentage of respondents both men and women falls under medium age group (overall women 59.37 per cent, men 53.75 per cent; Tripura women 56.25 per cent, men 53.75 per cent; Meghalaya women 62.50 per cent, men 53.75 per cent; Men headed household women 62.70 per cent, men 56.35 per cent; women headed household women 50.00 per cent, men 44.12 per cent) followed by old age (Overall women 20.00 per cent, men 32.50 per cent; Tripura women 21.25 per cent, men 35.00 per cent; Meghalaya women 18.75 per cent, Men 30.00 per cent; Men headed household women 14.29 per cent, men 35.71 per cent; women headed household women 41.18 per cent, men 20.59 per cent) and young age group (Overall women 20.62 per cent, men 13.75 per cent; Tripura women 22.50 per cent, men 11.25 per cent; Meghalaya women 18.75 per cent, Men 16.25 per cent; Men headed household women 23.02 per cent, men 7.94 per cent; women headed household women 8.82 per cent, men 35.29 per cent) . It may be due to the reason that basically medium age groups were more enthusiastic and involved in farm activities. The result differs to some extend between men and women counterparts. Percentage of women in medium age category were found to be more in compared to their men counterparts in overall result, two states, men and women headed households. But the percentage of men under old age and young age category were found to be more compared to women in overall, Tripura, Meghalaya and men headed, except women headed household where the percentage of women were found

to be less compared to men in young age category. The details of the findings are given in the Table 4.16.

4.1.2.2 Education

Education is one of the most important factors in a person life and enlightens ones personal characteristics. It broadens person way and angle of looking at life. And also education of women is as important as men counterparts in household for food security, because women were the one who were most of the time concerned in food purchasing, preparation and serving (Zahid and Ahmed, 2013). However, findings in the overall result unveiled that, as much as 53.75 per cent of women respondent were having education below 5^{th} standard superseded by medium (44.38 per cent) and high (1.88 per cent). Percentage of women having education below 5^{th} standard was spotted more compared to their men counterpart (43.13 per cent); on the other hand the percentage of women (1.88 per cent) under high education level was less to great extend compared to men (9.38 per cent) respondent, but there was only some per cent differences in medium education level between women (44.38 per cent) and men (47.50 per cent) respondent. In Tripura and Meghalaya the percentage of women in low and medium education was comparatively more compared to men counterpart, but not a single women respondent in Tripura was having high education, and in case of men only less 11.25 per cent. While in Meghalaya, even though the percentage of high education was less in both the gender, still the differences between men and women was observed. Likewise, in men headed household (women 53.17 per cent; men 42.86 per cent) and women headed household (women 55.88 per cent; men 44.12 per cent) it was also noticed that percentage of women below 5^{th} standard was more compared to men respondents. But in case of medium education level (in men headed households, women were 45.24 per cent and men were 47.62 per cent; while in women headed households, women were 41.18 per cent and men were 47.06 per cent) and high education level (men headed households, women were 1.59 per cent and men were 9.52 per cent; whereas in women headed households, women were 2.94 per cent and men were 8.82 per cent) percentage of men were spotted to be more in men headed compared to women in a household and very small percentage of women in both the

states (in Tripura women were 1.59 per cent high education; while in Meghalaya 2.94 per cent of women having high education) were spotted to fall under high education category. Less percentage of women in high education compared to men may be due to the fact that women were married off earlier than men in the study area. The detail findings are presented in Table 4.16.

4.1.2.3 Social Participation

It helps to spot out the active participation of respondent in any social activity (formal and non formal). In the overall result it was observed that participation of women, percentage in member in one organization and office bearer in any formal organization was found to be somewhat more compared to their men counterparts but slightly participation of men in non formal village activity were more (women 66.88 per cent, men 68.75 per cent). Less participation in non formal village activity can be due to the fact that women were busy with household chores and don't have much time, as they substitute any other family member, to attend. In Tripura and Meghalaya, quite a similar result was observed like overall result with slight difference. Participation of women and men were not much detected in Tripura compared to Meghalaya and also participation of women in formal activity was more in Meghalaya. There was only slight difference in percentage between women and men in "member in one organization; while in Meghalaya differences between women and men was of great extent. In other category much difference were not observed. But in case of "non-formal village activity" percentage of participation of men was more compared to women in Tripura and while, in Meghalaya as much as 73.75 per cent of women and 58.75 per cent men has active participation (Table 4.16). More participation of women in non-formal activity in Meghalaya can be due to the fact that women in Meghalaya were more active and practice matrilineal society in the state. However, to some extent similar result was observed in case of men and women headed household, but in women headed household, less participation or no membership from men member was observed.

4.1.2.4 Cosmopoliteness

It reveals the orientation of respondent outside his or her social system. Medium cosmopoliteless was found to be more in both women and men in case of all the section overall, Tripura, Meghalaya, men headed and women headed household, followed by low and high cosmopoliteness. Even though there was similar result but there was difference to great extend between women and men in all the levels of cosmopoliteness and all the sections (overall, Tripura, Meghalaya, men headed and women headed household). In Tripura no percentage of men were having low cosmopoliteness and percentage of men was revealed more than women in high cosmopoliteness. The findings are presented in Table 4.16.

4.1.2.5 Dietary Diversity

Food consumption differs from person to person and day to day even between the household members. As much 85.63 per cent women and 80.63 per cent men had medium (3 to 5 group) dietary diversity and the percentage of women in this category was observed slightly more than men counterparts. But the percentages of men (16.25 per cent) were having high diversity than women (8.75 per cent), while percentage of women (5.63 per cent) were more than men (3.13 per cent) in low dietary diversity. Similarly, in Tripura, percentage of women (86.25 per cent) slightly outnumbered men (80.00 per cent) in medium diversity. Superseded by high and low diversity where in high dietary diversity, percentage of men (18.75 per cent) differed to great extent from women (6.25 per cent) and in case of low dietary diversity percentage of women (7.50 per cent; Men 1.25 per cent) was found to be more. Even in Meghalaya like Tripura percentage of women (85.00 per cent) were observed more than men (81.00 per cent) in medium dietary diversity but in high and low dietary diversity, percentage of men compared to their women counterpart were more. Almost the same result was also observed in case of men headed household but in case of women headed household, low dietary diversity was not noticed in women and even the percentage of men category was also less (5.88 per cent). While in medium category the percentage of women (85.29 per cent) and men (85.29 per cent) detected to be same and in high category percentage of men found to be low compared to men Table 4.16). These

results may be due to the fact that in women headed households, women being household head pay more attention regarding food items of the household.

4.1.2.6 Micronutrient intake

Micronutrients are the important element required for normal body function in human. Vitamin A (plant based and animal based) and iron under each category several food groups were also been pondered for the present study. In all the cases (overall result plant based vitamin A intake by women was 78.75 per cent, Men 83.13 per cent; Animal based vitamin A intake by was women 31.25 per cent, Men 38.13 per cent; Iron intake by women was 47.50 per cent, Men 50.00 per cent; while in Tripura plant based vitamin A intake by was women 73.75 per cent, Men 77.50 per cent; Animal based vitamin A intake by women 32.50 per cent, Men 37.50 per cent; Iron intake by women was 57.50 per cent, Men 58.75 per cent; Furthermore, in Meghalaya plant based vitamin A intake by women was 83.75 per cent, Men 88.75 per cent; Animal based vitamin A intake by women was 30.00 per cent, Men 38.75 per cent; Iron intake by women was 37.50 per cent, Men 58.75 per cent; whereas in men headed plant based vitamin A intake by women was 77.78 per cent, Men 82.54 per cent; Animal based vitamin A intake by women was 33.33 per cent, Men 38.89 per cent; Iron intake by women was 48.41 per cent, Men 51.59 per cent and in women headed household plant based vitamin A intake by women was 82.35 per cent, Men 85.29 per cent, Animal based vitamin A intake by women was 23.53 per cent, Men 35.29 per cent) percentage of micronutrient intake by men outnumbered their women counterparts in the present investigation (Table 4.16). Women were literally characterized by their caring nature, and mostly have habit of sharing food to their kids or their dear ones; these can also be the reason behind less percentage of women compared to men in micronutrient intake. Another reason can be, not all people like all food groups or avoid certain food groups due to their medical condition.

4.1.2.7 Access to resources/assets

Not all the material or assets available are easily accessible to every person in the household. Even in same household access of asset differ according to gender, age etc. The present investigation highlights that in all the result (overall women 73.75 per

cent, men 76.25 per cent; Tripura women 62.50 per cent, men 71.25 per cent; Meghalaya women 85.00, men 81.00, Men headed women 70.63 per cent, men 77.78 per cent and women headed women 85.29 per cent, men 70.59 per cent) percentage of medium access to resources/assets was more and the differences between women and men were also spotted. In addition percentage of women having access to resources/assets was more in Meghalaya and women headed household. Percentage of women in low access to resources/asset category was also more in all the households, but except in Meghalaya and women headed household. In addition percentage of men respondents were found more in high access to resources/assets but interestingly in women headed household slightly more per cent of women (8.82 per cent) than men (5.88 per cent) was observed to have high access to resources/assets (Table 4.17). However, these results might be due to, men/women being more responsible and breadwinner of the house in men/women headed household had more resources and had more access than their women/men counterpart and also Meghalaya follows matrilineal society. In the study area women have ownership of mostly small consumer durables (cook wares, utensils etc), small livestock (chicken, duck etc) and also some large consumer durables like TV, Fridge, sewing machines and furniture (which they receive from their parents as gift during marriage) and even some piece of land. However, men have ownership of large livestock, mechanized and non mechanized farm equipments, bicycle, fishing equipments, agricultural lands and two wheelers etc). Women/men not having access to particular assets may be due to the reason that they are not used to it, cannot operate it or didn't try to access as not important to them.

4.1.2.8 Control over resources/assets

Members of household or person in household may have access to certain resources/assets irrespective of the ownership of assets belonging to household or any other household member. However, in the present study the percentage of both women and men were noticed to be more in medium category in all the cases (overall women 85.62 per cent, men 82.50 per cent; Tripura women 77.50 per cent, men 73.75 per cent; Meghalaya women 93.75 per cent, men 91.25 per cent; men headed

women 82.54 per cent, men 81.75 per cent; women headed women 97.06 per cent, men 85.29 per cent) and also women slightly outnumbered men counterpart. But in case of category high control on resources/asset, men (overall 15.00 per cent; Tripura 26.25 per cent; Meghalaya 3.75 per cent; men headed 17.46 per cent; women headed 5.88 per cent) counterpart outnumbered women (overall 1.88 per cent; Tripura 1.25 per cent; Meghalaya 2.50 per cent; men headed household 1.59 per cent; women headed household 2.94 per cent) to an extent and in low control on resources/asset category percentage of women were more than men, except in women headed household where low control on resources/assets was not noticed. In the study area, women were believed to have more control over the resources/assets which they buy or receive as gift from their parents during their wedding and on which they had ownership. While men were having more control over resources on which they had ownership and also resources which are mainly run or utilized by them (mechanized farm equipments mechanized, bicycle etc). The details of the finding are given in Table 4.17.

4.1.2.9 Decision on food purchase/sell

For any kind of important household or farm activity a decision has to be made or action need to be carried out by an individual alone or jointly with their counterparts for any favorable outcome. Based on the overall result decision on food purchase/sell was taken almost equally by both the genders as responded by both women (43.75 per cent) and men (43.12 per cent). While 36.25 per cent of women and 40.62 per cent of men agreed that the decision was taken only by men. On the other hand 19.37 per cent of women and 16.25 per cent of men responded that decision was taken solely by women. Tripura, Meghalaya and Men headed household also showed relatively similar result like overall result (Table 4.17). While in women headed household slight different result was observed, where both men and women with slight different per cent from each other agreed that decision on food purchase/sell was taken solely by women. Less than fifty per cent women and men agreed that decision was taken by both women and men. Marginal per cent of women respondent agreed that decision was taken solely by men.

B. **Socio-economic attributes of an individual respondent**

The details of the findings are presented in Table 4.18 and 4.19.

4.1.2.10 Income diversity

In every result (Overall, Tripura, Meghalaya, men headed and women headed) both women and men were having maximum percentage in medium income diversity which was between 2 to 3 number. And the difference between women and men were also observed. Percentage of men (overall 67.50 per cent; Tripura 75.00 per cent and men headed household 70.63 per cent) were found to be more in all the result than women (overall 48.75 per cent; Tripura 33.75 per cent and men headed household 43.75 per cent), except in Meghalaya and women headed household, where the percentage of women (Meghalaya 63.75 per cent and women headed household 67.65 per cent) were found to be more than men (Meghalaya 60.00 per cent and women headed household 55.88 per cent). In addition it was also spotted that in all the cases (overall, Tripura, Meghalaya, Men headed) percentage of women having income source only one was more than men except in women headed household where the percentage of men were found to be more. At the same time percentage of men having income diversity above 3 was more in all the cases (overall women 8.13 per cent, men 20.00 per cent; Tripura women 3.75 per cent, Men 11.25 per cent; Meghalaya women 12.50 per cent, men 28.75 per cent; men headed women 4.76 per cent, men 20.63 per cent) was spotted except in women headed household (women 20.59 per cent, men 17.65 per cent) (Table 4.18). Less percentage of women having less income source in the study area may be due to the reason that women were always occupied with multiple household chores and does not have enough time for other income source or exposed to any income sources. Other than farming the source of income for women were mainly from livestock production, agriculture wage labour, government services, vegetable business or other craft business, weaving and tailoring, where from fisheries, plantation of rubber/beetle nut, wage labour, teaching and MNREGA etc.

4.1.2.11 Annual individual income

It gives the income status of an individual in the household. In the present study maximum percentage of the respondent was found to fall under 1st quintile

followed by 2nd, 3rd, 4th, and 5th quintile for both women and men in all the cases (overall, Tripura, Meghalaya, men headed and women headed). But compared to men percentage of women was found to be more in 1st quintile and very small per cent which was less than 5 per cent in 5th quintile. However, in all the cases (overall, Tripura, Meghalaya, men headed) in 2nd quintile, 3rd and 4th quintile, percentage of women respondent was very less. At the same time such similar result was not observed in women headed household. Even though the percentage of women in all the quintile was low and equal to men in 1st quintile (women 55.88 per cent, men 55.88 per cent) and 5th quintile (women 2.94 per cent, men 2.94 per cent), their percentage has outnumbered men counterparts in other quintile (2nd quintile, 3rd and 4th quintile). The result of the present scenario may be due to the fact that most of the women in men headed household did not have proper source of earning. Their earning was as less as one thousand per annum and they mostly depend on their husband. Another reason may be that only few farmers are progressive and has government job. The details of the finding are presented in Table 4.18.

4.1.2.12 Material Possession

It reflects the assets (productive and non-productive assets) own by the primary women and men in the household. Medium level of material possession was found to be more in all the cases. In overall result percentage of women (74.38 per cent) outnumbered men (48.13 per cent) in medium category followed by low material possession (women 18.75 per cent, 15.63 per cent). However, in high category of material possession percentage of men (24.38 per cent) outnumbered their women (5.00 per cent) counterparts to certain extent. While in Tripura and men headed household, to some extend similar result like overall result was observed. Furthermore, in Meghalaya and women headed household unlike previous finding, different result was detected, where percentage of men were more in low material possession (Meghalaya women 13.75 per cent, men 30.00 per cent; women headed households, women 2.94 per cent, men 52.94 per cent) and less in high material possession (Meghalaya women 8.75 per cent, men 5.00 per cent; women headed household women 20.59 per cent, men 5.88 per cent) compared to women (Table

4.19). Meghalaya and its tribe *Khasi* and *Garo* in the state follow matrilineal society, of which it can be certain reason behind the present result.

4.1.2.13 Livestock Possession

It highlights about wealth status of an individual in the household. Almost more than fifty per cent of the men respondent reported that they do not own any livestock whereas only 24.38 per cent of women reported for the same in overall result. Apart from it 53.75 per cent of women (34.38 per cent) reported that they possess livestock "more than one" followed by 21.88 per cent of women (men 4.38 per cent) having livestock at "least one number". However, in case of Tripura, Meghalaya, in men headed and women headed households similar result was observed with varying percentage between women and men. Both women and men in the study area have a habit of rearing large, small and other livestock and sell off during need of cash and crisis. Women mostly rear small (pig, goat etc) and other livestock (chicken, duck, turkey etc) while men were restricted to large livestock only. The details are given in Table 4.19.

4.1.2.14 Land Ownership

In developing country like India, land is considered as a source of income. It is also one of the important natural resources for prosperity, survival and maintenance of global society. Maximum percentage of women and men in all the cases/households have marginal land holding (overall women 76.06 per cent, men 64.42 per cent; Tripura women 57.14 per cent, men 67.53 per cent; Meghalaya women 80.70 per cent, men 55.56 per cent; men headed women 24.60 per cent, men 47.62 per cent; women headed women 67.65 per cent, men 20.59 per cent) in all the results followed by small, semi-medium, and medium (Table 4.19). Conversely, the differences between women and men in the category were also noted. However, in Meghalaya and men headed household none of the women had medium land ownership. Most of the farmers in study area did not have land of their own; they had lease-in land for cultivation every year. Fewer per cent in having small landholding can be the result of distribution of inherited land and share among the heirs in the family.

Table 4.16: Distribution of individual respondents according to their socio-personal attributes

Sl. No.	Socio-personal attributes	Gender	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
			F	%	F	%	F	%	F	%	F	%
1.	Age (in year)											
	Young (Below 35 Years)	W	33	20.62	18	22.50	15	18.75	29	23.02	3	8.82
		M	22	13.75	9	11.25	13	16.25	10	7.94	12	35.29
	Medium (35 to 50 years)	W	95	59.37	45	56.25	50	62.50	79	62.70	17	50.00
		M	86	53.75	43	53.75	43	53.75	71	56.35	15	44.12
	Old (Above 50 years)	W	32	20.00	17	21.25	15	18.75	18	14.29	14	41.18
		M	52	32.50	28	35.00	24	30.00	45	35.71	7	20.59
2	Education											
	Low (Below 5^{th} standard)	W	86	53.75	40	50.00	46	57.50	67	53.17	19	55.88
		M	69	43.13	32	40.00	37	46.25	54	42.86	15	44.12
	Medium (5^{th} to 10^{th} standard)	W	71	44.38	40	50.00	31	38.75	57	45.24	14	41.18
		M	76	47.50	39	48.75	37	46.25	60	47.62	16	47.06
	High (Higher Secondary and	W	3	1.88	0	0	3	3.75	2	1.59	1	2.94
		M	15	9.38	9	11.25	6	7.50	12	9.52	3	8.82

above)

3.	Social Participation										
	No participation	W	108	67.50	66	82.50	42	52.50	87	69.05	21	61.76
		M	139	86.88	68	85.00	71	88.75	105	83.33	34	100.00
	Member of one	W	49	30.63	12	15.00	37	46.25	37	29.37	12	35.29
	organization	M	18	11.25	11	13.75	7	8.75	18	14.29	0	0
	Member of more	W	3	1.88	2	2.50	1	1.25	2	1.59	1	2.94
	than one	M	3	1.88	1	1.25	2	2.50	3	2.38	0	0
	organization											
	Non-formal	W	107	66.88	48	60.00	59	73.75	85	67.46	22	64.71
	village activity	M	110	68.75	63	78.75	47	58.75	92	73.02	18	52.94
4.	Cosmopoliteness											
	Below 11 (Low)	W	37	23.13	20	25.00	17	21.25	27	21.43	10	29.41
		M	19	11.88	0	0	19	23.75	7	5.56	12	35.29
	Between 11-33	W	111	69.38	57	71.25	54	67.50	96	76.19	15	44.12
	(Medium)	M	92	57.50	41	51.25	51	63.75	77	61.11	15	44.12
	Above 33 (High)	W	12	7.50	3	3.75	9	11.25	3	2.38	9	26.47
		M	49	30.63	39	48.75	10	12.50	42	33.33	7	20.59
5.	Dietary Diversity											

	Low (below 3 food group)	W	9	5.63	6	7.50	3	3.75	9	7.14	0	0
		M	5	3.13	1	1.25	4	5.00	3	2.38	2	5.88
	Medium (3 to 5 group)	W	137	85.63	69	86.25	68	85.00	107	84.92	29	85.29
		M	129	80.63	64	80.00	65	81.25	100	79.37	29	85.29
	High (above 5 group)	W	14	8.75	5	6.25	9	11.25	10	7.94	4	11.76
		M	26	16.25	15	18.75	11	13.75	23	18.25	3	8.82
6.	Micronutrient intake											
	Vitamin A	W	126	78.75	59	73.75	67	83.75	98	77.78	28	82.35
	a. Plant based	M	133	83.13	62	77.50	71	88.75	104	82.54	29	85.29
	b. Animal based	W	50	31.25	26	32.50	24	30.00	42	33.33	8	23.53
		M	61	38.13	30	37.50	31	38.75	49	38.89	12	35.29
	Iron	W	76	47.50	46	57.50	30	37.50	61	48.41	15	44.12
		M	80	50.00	47	58.75	33	41.25	65	51.59	15	44.12

Note: F= frequency, %= Percentage, HH= Headed household, W=Women, M=Men

Table 4.17: Distribution of individual respondents according to their socio-personal attributes

		Gender	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
			F	%	F	%	F	%	F	%	F	%
7.	Access on resources/Assets											
	Low (below 8)	W	37	23.13	27	33.75	10	12.50	35	27.78	2	5.88
		M	13	8.13	2	2.5	11	13.75	5	3.97	8	23.53
	Medium (between 8 -15)	W	118	73.75	50	62.50	68	85.00	89	70.63	29	85.29
		M	122	76.25	57	71.25	65	81.25	98	77.78	24	70.59
	High (Above 15)	W	5	3.13	3	3.75	2	2.5	2	1.59	3	8.82
		M	25	15.63	21	26.25	4	5.00	23	18.25	2	5.88
8.	Control on Resources/assets											
	Low (below 3)	W	20	12.50	17	21.25	3	3.75	20	15.87	0	0
		M	4	2.50	0	0	4	5.00	1	0.79	3	8.82
	Medium (3 to 8)	W	137	85.62	62	77.50	75	93.75	104	82.54	33	97.06
		M	132	82.50	59	73.75	73	91.25	103	81.75	29	85.29
	High (above 8)	W	3	1.875	1	1.25	2	2.50	2	1.59	1	2.94
		M	24	15.00	21	26.25	3	3.75	22	17.46	2	5.88
9.	Decision on food purchase/sell											

Only men	W	58	36.25	32	40.00	26	32.50	56	44.44	2	5.88
	M	65	40.62	40	50.00	25	31.25	61	48.41	4	11.76
Only women	W	31	19.37	9	11.25	22	27.50	15	11.90	17	50.00
	M	26	16.25	6	7.50	20	25.00	8	6.35	18	52.94
Both women and men	W	70	43.75	38	48.75	31	38.75	55	43.65	15	44.12
	M	69	43.12	34	42.50	35	43.75	57	45.24	12	35.29

Note: F= frequency, %= Percentage, HH= Headed household, W=Women, M=Men

Table 4.18: Distribution of individual respondents according to their Socio-economic attributes

	Socio-economic attributes	Gender	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
			F	%	F	%	F	%	F	%	F	%
1.	Income diversity											
	Up to 1 (low)	W	48	30.00	31	38.75	17	21.25	44	34.92	4	11.76
		M	18	11.25	10	12.50	8	10.00	10	7.94	8	23.53
	Between 2 to 3 (medium)	W	78	48.75	27	33.75	51	63.75	55	43.65	23	67.65
		M	108	67.50	60	75.00	48	60.00	89	70.63	19	55.88
	Above 3 (high)	W	13	8.13	3	3.75	10	12.50	6	4.76	7	20.59
		M	32	20.00	9	11.25	23	28.75	26	20.63	6	17.65
2.	Annual individual income (₹.)											
	1st Quintile (1000-33000)	W	115	71.88	60	75.00	55	68.75	96	76.19	19	55.88

		M	67	41.88	29	36.25	38	47.50	48	38.10	19	55.88
	2nd Quintile (33001-55000)	W	16	10.00	3	3.75	13	16.25	9	7.14	7	20.59
		M	35	21.88	20	25.00	15	18.75	29	23.02	6	17.65
	3rd Quintile (55001-88000)	W	8	5.00	4	5.00	4	5.00	4	3.17	4	11.76
		M	18	11.25	12	15.00	6	7.50	16	12.07	2	5.88
	4th Quintile (88001-150000)	W	5	3.13	1	1.25	4	5.00	2	1.59	3	8.82
		M	17	10.63	9	11.25	8	10.00	13	10.32	4	11.76
	5th Quintile (>1,50,000)	W	5	3.13	1	1.25	4	5.00	4	3.17	1	2.94
		M	20	12.50	10	12.50	10	12.50	19	15.08	1	2.94

Note: F=Frequency, %=Percentage, HH= Headed household, W=Women, M=Men

Table 4.19: Distribution of individual respondents according to their Socio-economic attributes

		Gender	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HHH (n=126)		Women HH (n=34)	
			F	%	F	%	F	%	F	%	F	%
3.	Material Possession (number)											
	Low (at least 1)	W	30	18.75	19	23.75	11	13.75	29	23.02	1	2.94
		M	25	15.63	1	1.25	24	30.00	7	5.56	18	52.94
	Medium (2 to 6)	W	119	74.38	58	72.50	61	76.25	94	74.60	25	73.53
		M	77	48.13	44	55.00	33	41.25	69	54.76	8	23.53
	High (Above 6)	W	8	5.00	1	1.25	7	8.75	1	0.79	7	20.59

		M	39	24.38	35	43.75	4	5.00	37	29.37	2	5.88
4.	Livestock Possession											
	No livestock	W	39	24.38	11	13.75	28	35.00	27	21.43	12	35.29
		M	98	61.25	29	36.25	69	86.25	69	54.76	29	85.29
	At least one	W	35	21.88	24	30.00	11	13.75	34	26.98	1	2.94
		M	7	4.38	6	7.50	1	1.25	7	5.56	0	0
	More than one	W	86	53.75	45	56.25	41	51.25	65	51.59	21	61.76
		M	55	34.38	45	56.25	10	12.50	50	39.68	5	14.71
5.	Land Ownership (Ha)											
	Marginal (<1 ha)	W	54	76.06	8	57.14	46	80.70	31	24.60	23	67.65
		M	67	64.42	52	67.53	15	55.56	60	47.62	7	20.59
	Small (1-2 ha)	W	8	11.27	2	14.29	6	10.53	5	3.97	3	8.82
		M	25	24.04	15	19.48	10	37.04	22	17.46	3	8.82
	Semi-Medium (2.1-4 ha)	W	8	11.27	2	15.38	5	8.77	6	4.76	1	2.94
		M	9	8.65	8	10.39	1	3.70	8	6.35	1	2.94
	Medium (4.1-10 ha)	W	1	1.41	1	7.69	0	0	0	0	1	1.94
		M	3	2.88	2	2.60	1	3.70	3	2.38	0	0
	Large (>10 ha)	W	0	0	0	0	0	0	0	0	0	0
		M	0	0	0	0	0	0	0	0	0	0

Note: F=Frequency, %=Percentage, HH= Headed household, W=Women, M=Men

4.1.3. Differences in attributes among the households in study area

To find out if there is any significant differences in the attributes among the selected households, z-test was employed. The results are presented in Table 4.20.

i. Differences according to state

It can be inferred from z value in Table 4.20 that education of household head, and food source was found significantly different between the households of Tripura and Meghalaya at 0.05 level of probability, while family size, household expenditure, material possession, income diversity, and cosmopoliteness were significantly different at 0.01 level of probability. There was no variation in the attributes, age of household head, social participation, and number of children, family type, annual household Income, livestock possession and land ownership, among the households of two states.

ii) Differences according to the gender of the household head

Furthermore, significant difference at 0.01 level of probability in attributes family size, expenditure pattern, material possession, and income diversity, were observed between men headed and women headed household whereas attribute cosmopoliteness was spotted to be significantly different at 0.05 level of probability. However, no variation was observed among men and women headed households in the attributes age of household head, education of household head, social participation, number of children, family type, annual household income, livestock possession, food source and land ownership.

Table 4.20: Differences in attributes among the households in study area

Variables	Mean Score			Mean Score		
	Tripura (n=80)	Meghalaya (n=80)	z value	Men HH (n=126)	Women HH (n=34)	z value
Age (HHH)	48.87	47.66	0.67	47.92	49.56	0.68
Education (HHH)	3.73	3.47	1.99*	3.55	3.08	1.36
Social Participation	0.96	0.89	0.68	0.96	0.76	1.52
Number of Children	1.29	1.66	1.82	1.75	1.88	1.15
Family Size	4.6	5.75	4.20**	4.87	6.29	3.60**
Family Type	0.25	0.22	1.95	0.23	0.25	0.92
Annual Household Income	148987.5	142125	0.26	153309.5	116823.5	1.53
Expenditure pattern	159623.20	99908.7	3.56**	142953.21	80895.53	4.07**
Material Possession	45.86	39.18	7.36**	43.34	39.47	3.05**
Livestock Possession	3.93	3.48	1.76	3.83	3.20	1.78
Income diversity	2.86	3.38	3.27**	2.97	3.71	3.33**
Food Source	6.44	6.97	2.39*	6.78	6.44	1.40
Land Ownership	0.99	1.28	1.78	1.10	1.24	0.62
Cosmopoliteness	30.56	23.13	4.59**	28.15	22.00	2.57*

*****Significant at 0.01 level of probability, ******Significant at 0.05 level of probability, Note: HH= Headed household.

4.1.4 Differences in Socio-personal attributes among gender

It is evident from the Table 4.21 that among the socio-personal attributes, age (3.10**), education (2.73**), cosmopoliteness (7.44**) and control on resources (6.91**) were found to be significantly different between men and women at 0.01 level of probability. Whereas the attributes social participation (2.17*), and dietary diversity (2.06*) were significantly different at 0.05 level of probability between men and women. Furthermore it was also spotted that men respondent mean score were found to be higher than women in age, education, social participation, cosmopoliteness, control over resources and decision on food purchase/sell. However, women respondents were found to be significantly higher than men in and access on resources/assets.

In household mostly between husband and wife, age of wife was less than men as men prefers wife younger than them, can be one of the reason the reason behind this difference. While in case of difference in education, women's discontinuation of their study when they reach marriageable age can be the fact behind. Men being free from household chores were more mobile and being considered as bread winner of the family, have active social participation (both formal and non formal) and access to different food groups compared to their women counterpart. Gender based heavy machinery and other resources mostly belong to men and for which they have more control over it. In addition to it women had control over the resources which belongs to them, purchased by themselves, and received as gift from their parents or relatives during marriage.

Table 4.21: Differences in Socio-personal attributes among gender

Particulars	Mean Score		z value
	Women (n=160)	Men (n=160)	
Age	42.31	46.34	3.10**
Education	1.48	1.66	2.73**
Social Participation	0.82	0.99	2.17*

Cosmopoliteness	17.52	26.11	7.44**
Dietary Diversity	4.11	4.37	2.06*
Micronutrient intake	1.31	1.36	0.75
Access to resources/Assets	12.46	9.88	6.69**
Control over Resources/assets	4.83	6.39	6.91**
Decision on food purchase/sell	0.82	0.99	2.17*

**Significant at 0.01 level of probability, *Significant at 0.05 level of probability,

4.1.5. Differences in Socio-economic attributes among gender

The z value presented in the Table 4.22 revealed that all the five socio-economic attributes considered were significant at 0.05 level of probability. Men were found to have significantly higher score than women in the attributes income diversity, annual individual income, and material possession. While on the other hand women were found to have significantly higher score than men in livestock possession and land ownership.

In the study area farmers rent land on year basis for cultivation from farmer/family that had government job and don't have much time for agriculture or cultivate land which had been not transferred in their name. In Meghalaya women mostly own land as the state follows matrilineal society. In men headed household, women were dependent on men and were mostly housewives; they rear livestock which serve for their additional income and have very less annual income than their men counterparts. The detail of the finding is presented in Table 4.22.

Table 4.22: Differences in Socio-economic attributes among gender

Particulars	Mean Score		z value
	Women (n=160)	Men (n=160)	
Income diversity	1.86	2.55	5.55**
Annual individual income (₹.)	28441.25	74252.5	5.54**

Material Possession	3.09	4.06	3.79**
Livestock Possession	1.82	1.13	4.09**
Land Ownership (ha)	0.56	0.37	2.96**

**Significant at 0.01 level of probability

* Significant at 0.05 level of probability

4.2. Level of food security of the farm households

Food security is one of the major concerned of every country in the world. Level/extend of food security differs from household to household and region to region. But household to be food secure is very hard even for resource rich household. Even the households of food producer (farmers) are not always food secure. The details of the findings from present study are presented in the Table 4.23. The result in the table showed that around 50.63 per cent of the household in the study were food insecure without hunger. Whereas only 33.75 per cent of the households were food secure; 12.50 per cent household were food insecure with moderate hunger and only 3.13 per cent of the household were food insecure with severe hunger.

When state wise data are seen, less than fifty per cent of the household were food secure in the Tripura (33.75 per cent) and Meghalaya (33.75 per cent). Food insecure without hunger was high in both the states. Food insecurity with moderate hunger was found to be more in Meghalaya compared to Tripura. But there were slightly higher percentage of food insecurity with severe hunger households in Tripura more compared to Meghalaya.

The result also exhibited, men headed household were slightly more food secure than women headed household. This result was similar with the findings in Pakistan by Abdullah *et al.* (2017) & Felker-Kantor and Wood (2012). But food insecure without hunger was observed more in women headed household and food insecure with moderate hunger was found to have almost equal per cent in both men and women headed households. Interestingly not a single household was found to be food insecure with severe hunger in women headed households whereas in case of men headed household 3.94 per cent of household was found food insecure with severe hunger. Contrary, Mallick and Rafi (2010) revealed that there was no significant differences in

food security between women and men headed household, particularly among the tribal ethnic group through estimating generalized threshold model, which also challenges the traditional idea that women headed household were vulnerable to food insecurity compared to men headed household. While, on the other hand result found by CIMMYT (2014), highlights that women headed household suffered chronic food insecurity double the percentage of men headed household. Furthermore, as much as 58.00 per cent of men headed households and 43.00 per cent of women headed households were food secure in Kenya, which is 23.35 per cent and 13.00 per cent more apiece than the result of the present investigation. On the other hand, from the findings of Akadari *et al*. (2018) it can be concluded that men headed (79.92 per cent) and women headed household (56.05 per cent) of Ethiopia were better off than men headed (9.98 per cent) and women headed household (29.93 per cent) of present study in food security. While, men headed (57.91 per cent) and women headed household (45.78 per cent) in Nigeria was also observed much better than the present findings, and also households involved in agriculture were more food secure than non-agriculture households. The details of the findings are tabulated in Table 4.23 and its pictorial representation in Fig. 4.17.

Table 4.23: Distribution of households according to their extend of food security

Category	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
• Food Secure	54	33.75	27	33.75	27	33.75	44	34.65	10	30.30
• Food insecure without hunger	81	50.63	40	50.00	41	51.25	62	48.82	19	57.58
• Food insecure with moderate hunger	20	12.50	9	11.25	11	13.75	16	12.60	4	12.12
• Food insecure with severe hunger	5	3.13	4	5.00	1	1.25	5	3.94	0	0

Note: F=Frequency, %=Percentage, HH= Headed household

4.3. Resilience to food insecurity of the households

Risk is rising day after day and pattern of weather is also unpredictable. Natural calamity and food price are rising. Households in developing countries are vulnerable to food insecurity. Resilience to food insecurity of the households is the ability to prevent disaster and crisis as well as to anticipate, absorb, accommodate or recover from them in a timely, efficient and sustainable manner. This includes protecting, restoring and improving livelihoods systems in the face of threats that impact agriculture, nutrition, food security and safety (FAO, 2018). In this section estimation of latent dimension for resilience to food insecurity index as well as the resilience of the selected households to food insecurity are presented and discussed.

4.3.1 Estimation of latent dimensions for resilience to food insecurity index

Estimation of latent dimension was carried out using observed variables availed for the study, before constructing resilience to food insecurity index. As mentioned in materials and methods the index was estimated using multivariate technique. In the first stage each latent dimension was estimated, using principal component analysis or factor analysis if the observed variables used for estimation was continuous and optimal scaling (categorical principal component analysis) was used for categorical or non continuous variables. The admissible variable was extracted based on the factor loading and other statistical criteria. In addition for present analysis to check the sample was adequate for factor analysis, Kaiser-Meyer-Oklin (KMO) test and Bartlett's test of sphericity was taken up using SPSS (Statistical Packages for Social Sciences) version 21. In the second stage the estimated latent dimension was used to estimate the final resilience index. For the present study five dimensions were considered access to basic services, assets, social safety nets, adaptive capacity and sensitivity.

4.3.1.1 Access to basic services (ABS)

For estimating access to basic services optical scaling (categorical principal component) was applied. The Table 4.24 shows that total Cronbach's Alpha was 0.90 closer to 1 which depicted the used sample has the high internal consistency. From the analysis three factors was extracted based on Eigen values more than one. It depicted

that that factor 1 explained 25.09 per cent, factor 2 explained 20.85 and factor 3 explained 16.72 per cent of variance respectively, which in other word means that the three factors together explained 62.7 per cent of total variance and was satisfactory. However, the first factor obtained can represent access to basic services alone. Furthermore, the factor loading explained that the factor loads of each variable, higher load means, the variable considered has greater importance and need to be concentrated for any policy implications. All the variables considered were not loaded in only one factor but loaded in differently in three factors. Variable access to health care and access to services/facilities were found to have positive and higher factor loading in factor 1, the variable mode of transport was observed loaded in factor 2, whereas the variable access to quality education and quality of transport was loaded highest in factor 3. On the other hand the variable distance to market did not load in any of the considered factor and was not considered important representative in estimation of access to basic services dimension unlike the other variables. The correlation of variables with ABS showed that access to health care was spotted to be correlated positive significantly at 0.01 level of probability followed by access to quality education, health care quality, quality of transport and access to services/facilities which means that an increase in variable value results in increase in ABS. However, the variable distance to market and mode of transport/travel did not have correlation with ABS, which also means that in increase and decrease in value of the variables results in non-significant change (neither increase nor decrease) in ABS. Therefore, based on the statistical criteria, the factor score was utilized to estimate dimension ABS with the given mathematical expression

$$ABS = (0.2509 \times \text{Factor } 1 + 0.2085 \times \text{Factor } 2 + 0.1676 \times \text{Factor } 3)/3$$

Whereas, the score obtained from this estimation was further utilized as one of the latent variable in estimating resilience to food insecurity index. The details of finds are given in Table 4.24.

Table 4.24: Factor loadings and correlation of transformed variables with ABS

Indicators of ABS	Factor loading			Correlation with ABS
	1	2	3	
Access to health care	0.556	-0.498	0.004	0.585**
Access to quality education	-0.123	-0.115	0.844	0.529**
Health care quality	0.264	-0.708	-0.395	0.521**
Quality of transport	0.499	-0.102	0.530	0.466**
Access to services/facilities	0.717	0.312	-0.023	0.356**
Distance to Market	-0.772	-0.409	0.038	0.069 NS
Mode of transport/travel	-0.060	0.650	-0.144	0.033 NS
Eigen Value	1.757	1.460	1.173	
Variance (%)	25.09	20.85	16.76	
Cumulative (%)	25.09	45.94	62.7	Total Cronbach's Alpha
Cronbach's Alpha	0.503	0.367	0.172	0.901
Extraction Method: Optimal Scaling (categorical PCA)				

** Correlation is significant at 0.01 level (2 tailed) of probability

*Correlation is significant at 0.05 level (2 tailed) of probability

NS= Non significant

4.3.1.2 Assets (A)

Assets endowment was considered one of the dimensions for estimating resilience, as asset is important element in household. It also means that more the number of assets in the household means that it has more capacity to withstand shocks and crisis which also on the other hand improve resilience. Amaza *et al.* (2006) also mentioned that household goods were regarded as one of the important measures for the resilience of household, further which also acts as a safety net during adverse situation (crop failure, rainfall and drought, etc.) on food security of household. For estimation of assets dimension principal component analysis was run as the variables considered was continuous. In the analysis Bartlett's scoring method and varimax rotation (was used as there was no correlation between the factors in the component correlation matrix) was applied. The result from the table highlights that sample used

for analysis was fit for factor analysis as the KMO value (0.7) was above 0.5 which was very good and Bartlett's test of sphericity was also found to be significant at 0.0001 level of probability (Chi square=584.173). Furthermore from the analysis four factors were extracted based on the eigen value more than 1. It was observed that factor 1 alone explained 30.01% of the variance and the variables loaded in the first factor can be representative in estimating asset dimension. While on the other hand factor 2, 3 and 4 explained 11.97 per cent, 10.35 per cent, and 8.65 per cent apiece, which in total with factor 1 explained 60.99 per cent of the total variance. In factor 1, as much as eight variables (small consumer durables, cellphone, non mechanized farm equipments, agricultural land, transportation means, large consumer durables, house and fish pond/equipment) was positively loaded as highest compared to its loads in other three factors and the variables were found to have high correlation with the dimension assets, in addition increase in value in the variable can increase in assets. On the other hand the variable large livestock was loaded in factor 2, mechanized farm equipment in factor 4, while the rest three variables homestead, small livestock and other livestock together was loaded in factor 3. More over the variables loaded in factor 2, 3 and 4 was found to be less correlated with asset dimension compared to other eight variables loaded in factor 1 and the variables small livestock and other stock was not found significantly correlated with asset. The present result can be explained with the fact that most of the household were having medium material possession, mostly marginal land holders, and depends on public transport. Furthermore, unlike the present findings in estimation, Dhraief *et al.* (2019) spotted that herd size was having highest correlation with the estimated asset possession. On the other hand Boukary *et al.* (2016) shed light from their hypothesis that household having more ownership of resources had high level of resilience to food insecurity. The formula given below was used to estimate asset dimension

A= (0.3011× Factor 1+ 0.1197× Factor 2+0.1035× Factor 3+0.0865×Factor 4)/4

The details of the findings are presented in Table 4.25.

Table 4.25: Communalities, factor loadings and correlation of transformed variables with Assets

Indicators of Assets	Communalities		Factor loadings				Correlation with assets
	Initials	Extraction	1	2	3	4	
Small Consumer durables	1.000	0.676	0.778	-0.054	0.045	-0.256	0.717**
Cellphone	1.000	0.657	0.724	-0.263	-0.115	-0.224	0.682**
Farm equipment (Non Mechanized)	1.000	0.565	0.719	-0.081	0.162	0.123	0.663**
Agricultural Land	1.000	0.787	0.648	0.580	-0.172	-0.002	0.635**
Transportation means	1.000	0.514	0.616	-0.268	-0.205	-0.144	0.599**
Large consumer durables	1.000	0.661	0.637	-0.485	-0.118	0.072	0.588**
House	1.000	0.635	0.583	0.483	0.047	0.244	0.585**
Fish pond/equipment	1.000	0.447	0.597	-0.294	-0.064	-0.002	0.528**
Large Livestock	1.000	0.715	0.355	0.687	0.053	-0.337	0.480**
Farm Equipment (Mechanized)	1.000	0.577	0.409	0.105	0.116	0.621	0.443**
Homestead	1.000	0.486	0.225	0.036	0.658	-0.011	0.343**
Small Livestock	1.000	0.751	-0.004	-0.102	0.734	-0.449	0.135
Other livestock	1.000	0.460	0.093	-0.140	0.474	0.455	0.131
Eigen Value			3.901	1.557	1.346	1.125	
Variance %			30.011	11.978	10.355	8.654	

Cumulative %	30.011	41.990	52.345	60.995

Extraction Method: Principal Component Analysis

Rotation Method :Varimax with Kaiser normalization

Kaiser-Meyer-Olkin measure of sampling adequacy=0.728

Bartlett's test of sphericity is Significant at 0.001 level of probability

Chi square =584.173

** Correlation is significant at 0.01 level (2 tailed)

*Correlation is significant at 0.05 level (2 tailed)

NS= Non significant

4.3.1.3 Social Safety Net (SSN)

Social safety net is positive indicator/dimension for estimating resilience and for estimation of this dimension optimal scaling was used. From the analysis two factors were extracted based on the eigen value more than one and Cronbach's alpha was found to be 0.803. Factor 1 explained 32.57 per cent of variation while factor 2 explained 30.22 per cent of the variation, and overall both the factor together explained 62.79 per cent of variation. The result also depicted that three variables (assistance in kind, formal assistance and informal assistance) were loaded in factor 1, while assistance in cash was loaded in factor 2. Furthermore, in the table correlation of transformed variable with social safety net column showed that formal assistance was correlated highest and positively related at 0.01 level of probability with dimension social safety net, which means increase formal assistance can improve social safety net. In addition assistance in cash was having second highest significant positively correlated with SSN followed by assistance in kind and informal assistance was found to be least correlated. The present result can be explained with the fact that most of time farmers seek help from their friends, relatives and neighbor both in cash and kind. Dhraief *et al.* (2019) from their estimation recorded that the observed variable "borrow food or get help from a relative or the community" was having highest correlation with latent variable social safety Net.

The formula given below ascertained for estimating social safety Nets.

SSN= (0.3257× Factor 1+ 0.3022× Factor 2)/2

The details of the findings are presented in Table 4.26.

Table 4.26: Factor loadings and correlation of transformed variables with Social safety net

Indicators of SSN	Factor loading		Correlation with SSN
	1	2	
Formal assistance	0.593	-0.370	0.748**
Assistance in cash	0.147	0.956	0.645**
Assistance in kind	0.818	0.274	0.620**

Informal assistance	0.511	-0.288	0.420**
Eigen Value	1.303	1.209	
Variance (%)	32.57	30.22	
Cumulative (%)	32.57	62.79	Total Cronbach's Alpha
Cronbach's Alpha	0.310	0.230	0.803
Extraction Method: Optimal Scaling (categorical PCA)			

** Correlation is significant at 0.01 level (2 tailed) of probability
*Correlation is significant at 0.05 level (2 tailed) of probability
NS= Non significant

4.3.1.4 Adaptive Capacity

Adaptive capacity is the ability of the household to acclimatize to certain shock or crisis and it is also taken in importance in overcoming food insecurity. So, it is pondered, adaptive capacity as one of the main feature of resilience. As the variables considered for estimating adaptive capacity was not continuous, optimal scaling have been used and total Cronbach's alpha was found to be 0.887. From the analysis two factors have been extracted even through the eigen value of factor 2 was less than one but closer to 1 and also for reason that income diversity was taken as one of important variable for estimating adaptive capacity which it didn't load positively in first factor but in 2nd factor. Furthermore the table also showed that the two variables coping strategy and capacity to keep up in future were loaded together in factor 1 and accounts 51.52 per cent of variance, in addition factor 1 and factor 2, together in total depicted 81.62 per cent of the variance. Moreover, the variable income diversity had highest positive significant correlation at 0.01 level of probability with the estimated adaptive capacity and the least variable was capacity to keep up in future. Increase in income diversity and coping strategy can bring improvement in adaptive capacity. The present finding can be explained with the fact that in some part of the study area the households have only two to three number of income source apart from farming in the study area moreover in some part of the study area women have less income source and mostly depend on their men counterparts. For the estimation of adaptive capacity the given formula below has been used

AC= (0.5152× Factor 1+ 0.3010× Factor2)/2

The details of the findings are presented in Table 4.27.

Table 4.27: Factor loading and correlation of transformed variables with Adaptive capacity

Indicators of Adaptive Capacity	Factor loading		Correlation with AC
	1	2	
Income Diversity	-0.513	0.848	0.746**
Coping Strategy	0.774	-0.403	0.476**
Capacity to keep up in future	0.827	0.148	0.196**
Eigen Value	1.546	0.903	
Variance (%)	51.52	30.104	
Cumulative (%)	51.52	81.62	Total Cronbach's Alpha
Cronbach's Alpha	0.530	-0.161	0.887
Extraction Method: Optimal Scaling (categorical PCA)			

** Correlation is significant at 0.01 level (2 tailed) of probability

*Correlation is significant at 0.05 level (2 tailed) of probability

NS= Non significant

4.3.1.5 Sensitivity

According to Adger (2006) sensitivity is the extent to which human or natural can absorb effects without experience any everlasting distress or any other notable change. So, based on the definition the dimension sensitivity had been pondered. For estimation of sensitivity, principal component analysis was ascertained. From the analysis two factors were obtained and two factor in total explained 52.00 per cent of the variance, in which factor 1 explained 29.68 per cent and factor 2 explained 22.32 per cent. The result shown in the table also highlighted that three variables [shocks, crop shock (pest and diseases), small animal shock] were observed to be loaded in the first factor, while the other two variables [large animal shock and crop shock (flood/drought/rain/hailstorm)] were loaded highest in factor 2. Apart from it the

correlation column revealed that the variable shock was having highest correlation with sensitivity followed by the other variables. For estimation of this dimension the given expression below has been used.

S= (0.2968× Factor 1+ 0.2232× Factor2)/2

The details of the result are presented in the Table 4.28.

Table 4.28: Communalities, factor loadings and correlation of transformed variables with Sensitivity

Indicators of Sensitivity	Communalities		Factor loading		Correlation with Sensitivity
	Initials	Extraction			
			1	2	
Shock	1.000	0.357	0.537	0.262	0.610**
Crop shock (Pest and disease)	1.000	0.535	0.722	-0.118	0.554**
Small animal shock	1.000	0.586	0.765	-0.029	0.509**
Large animal shock	1.000	0.470	0.206	0.654	0.425**
Crop shock (Flood/drought/rain/ hailstorm)	1.000	0.652	-0.217	0.778	0.409**
Eigen Value			1.484	1.116	
Variance %			29.681	22.323	
Cumulative %			29.681	52.004	

Extraction method: Principal component analysis

Rotation method: Varimax with Kaiser normalization

Kaiser-Meyer-Olkin Measure of Sampling Adequacy=0.535
Bartlett's Test of sphericity significant at 0.001 level of probability
Chi-square=32.933

** Correlation is significant at 0.01 level (2 tailed) of probability

*Correlation is significant at 0.05 level (2 tailed) of probability

NS= Non significant

4.3.1.6 Estimation of resilience to food insecurity index

Resilience to food insecurity index was estimated by applying principal component analysis and using the latent dimensions estimated (access to basic services, assets, social safety nets, adaptive capacity and sensitivity) earlier (using principal component analysis and optimum scaling). The considered five dimensions were analyzed by using Bartlett's method for scoring factor to estimate index. The result in the table showed that KMO value was above 0.5 and Bartlett's test of sphericity was significant at 0.01 level of probability. Beside, the result also showed that only asset and sensitivity loaded highest in factor 1, and it explained 27.49 per cent of the variability, whereas social safety nets and adaptive capacity were loaded highest in factor 2. On the other hand access to basic services was loaded highest in factor 3, even though the eigen value was less than one the factor 3 was considered as it explained 19.25 per cent of the variance. The total three factors together explained 70.84 per cent of the variability. Moreover the correlation with the resilience depicted that social safety nets has the highest correlation with the resilience followed by access to basic services, assets, adaptive capacity and sensitivity. Boukary *et al.* (2016) also mentioned in their study that the indicator social safety net had significant positive effect on the resilience of household. In contrast to the present findings D'Errico *et al.* (2016) from their study elucidated that adaptive capacity was the most relevant attribute for household resilience and also of which education was one of the most relevant components of adaptive capacity in Tanzania and Uganda. Similarly, FAO (2016b) also reported that adaptive capacity was contributing more to resilience capacity for mixed livelihood and farmer in the Matam region of Senegal, while education played a major role in explaining different levels of resilience. As the five dimensions of resilience were loaded in three different factors, but not in single factor, the result also depicted the resilience cannot be considered as one-

dimensional and where all the three factors were taken in account for index estimation. And the resilience to food insecurity index was expressed with the given expression below

Resilience= 0.2749× Factor 1+ 0.2243× Factor2+ 0.1925× Factor 3

And hence, resilience to food insecurity was developed by computing the weighted sum of three factors extracted (where weights are the proportional to the variance explained by each factor) based on the suggestion by DiStefano *et al.* (2009).

Table 4.29: Factor loading and correlation of the dimensions with Resilience

Indicators of Sensitivity	Factor loading			Correlation with resilience
	1	2	3	
Social safety nets	-0.115	0.688	0.179	0.625**
Access to basic services	0.049	0.049	0.949	0.495**
Assets	0.758	-0.113	0.240	0.459**
Adaptive Capacity	0.027	0.808	-0.122	0.418**
Sensitivity	0.837	0.011	-0.147	0.307**
Eigen Value	1.375	1.121	0.963	
Variance %	27.498	22.427	19.255	
Cumulative %	25.03	48.29	70.84	

Extraction method: Principal component analysis

Rotation method: Varimax with Kaiser normalization

Kaiser-Meyer-Olkin Measure of Sampling Adequacy=0.516

Bartlett's Test of Sphericity significant at 0.01 level of probability

Chi-square=21.941

** Correlation is significant at 0.01 level (2 tailed) of probability

*Correlation is significant at 0.05 level (2 tailed) of probability

NS= Non significant

4.3.1.7 Multiple regression analysis to measure significant relationship of dimensions with resilience to food insecurity:

A multiple regression was run to predict the resilience to food insecurity with the dimensions of the resilience (access to basic services, assets, social safety nets, adaptive capacity, and sensitivity) and also with believe that all the dimensions do not contribute equally to resilience. However, from the model all the dimensions statistically significantly predicted resilience to food insecurity, F (5, 155) =10093.88, $p<0.001$, $R^2=0.99$. In the model social safety nets was found to be contributed more followed by assets, access to basic services, adaptive capacity and least by sensitivity and all the dimensions are positively significant at 0.01 level of probability. Furthermore it can also be explained that 0.601 unit increase in social safety nets can increase household resilience to food insecurity by one standard deviation. The detail of the findings is given in the Table 4.30.

Table 4.30: Multiple Regression analysis to measure significant relationship of dimensions with resilience to food insecurity

Sl. No.	Dimensions	Overall (N=160)	
		b value	t value
1.	Access to basic services (ABS)	0.410**	91.527
2.	Assets (S)	0.411**	87.472
3.	Social safety nets (SSN)	0.601**	133.244
4.	Adaptive Capacity (AC)	0.369**	81.963
5.	Sensitivity	0.246**	52.755
	$R^2=0.99$, F(5,154)=10093.88, P<0.001		

**Significant at 0.01 level (2 tailed) of probability
*Significant at 0.05 level (2 tailed) of probability
NS= Non significant

4.3.2 Resilience of households to food insecurity

The result from the study area showed that only 38.8 per cent of the households in the study area was found to be resilient followed by moderately resilient (38.8 per cent), low resilient (13.38 per cent) and high resilient (8.8 per cent). When two study areas Tripura and Meghalaya were compared percentage of resilient and high resilient households were spotted to be more in Meghalaya compared to

households of Tripura, while percentage of moderately resilient and low resilient were observed more in the households of Tripura. This may be due to way of response and adaptive capacity of the households toward stress and shocks are different.

Percentage of men headed household was found to be more in moderately resilient category (39.68 per cent) followed by resilient (38.89 per cent), low resilient (11.11 per cent) and high resilient (10.32 per cent). However, in women headed household, 38.24 per cent of the household was found to be resilient followed by 35.29 per cent of moderately resilient, 23.53 per cent of low resilient and only 2.94 per cent of women households was under highly resilient category. This can be explained with the fact that in study area in women headed household most of the household members were grown up and have diverse income source. Furthermore when men headed and women headed households were compared men headed households were found to have outnumbered women headed households in all category of resilience to food insecurity (moderately resilient men headed 39.68 per cent, women headed 35.29 per cent; resilient men headed 38.89 per cent, women headed 38.24 per cent; high resilient men headed 10.32 per cent, women headed 2.94 per cent). But in case of the low resilient category women headed household were found have outnumbered men headed household, which in other word depicted that men headed households were more resilient than women headed household. The present findings was found to be in line with the find findings of Boukary *et al.* (2016) in Niger where men headed households were more resilient in household food insecurity than women headed household as women headed household women has less asset possession, low adaptive capacity and were more vulnerable. Furthermore, similar findings were also reported by Goshu (2016) in Ethiopia which revealed that men headed households were more resilient that women headed household. The study by Ado *et al.* (2019) also highlighted that men headed households were more resilient to food insecurity than women headed households in Niger. The details of the findings are shown in Table 4.31, Fig. 4.18.

Table 4.31: Distribution of households according to resilience to food insecurity

Categories	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men HH (n=126)		Women HH (n=34)	
	F	%	F	%	F	%	F	%	F	%
Low resilient (up to 0.37)	22	13.8	14	17.5	8	10.00	14	11.11	8	23.53
Moderately resilient (0.37 to 0.43)	62	38.8	34	42.5	28	35.00	50	39.68	11	35.29
Resilient (0.44 to 0.49)	62	38.8	28	35.00	34	42.50	49	38.89	13	38.24
Highly resilient (above 0.49)	14	8.8	4	5.00	10	12.50	13	10.32	1	2.94

Note: F=Frequency, %=Percentage, Mean =0.43, SD=0.058, HH= Headed household

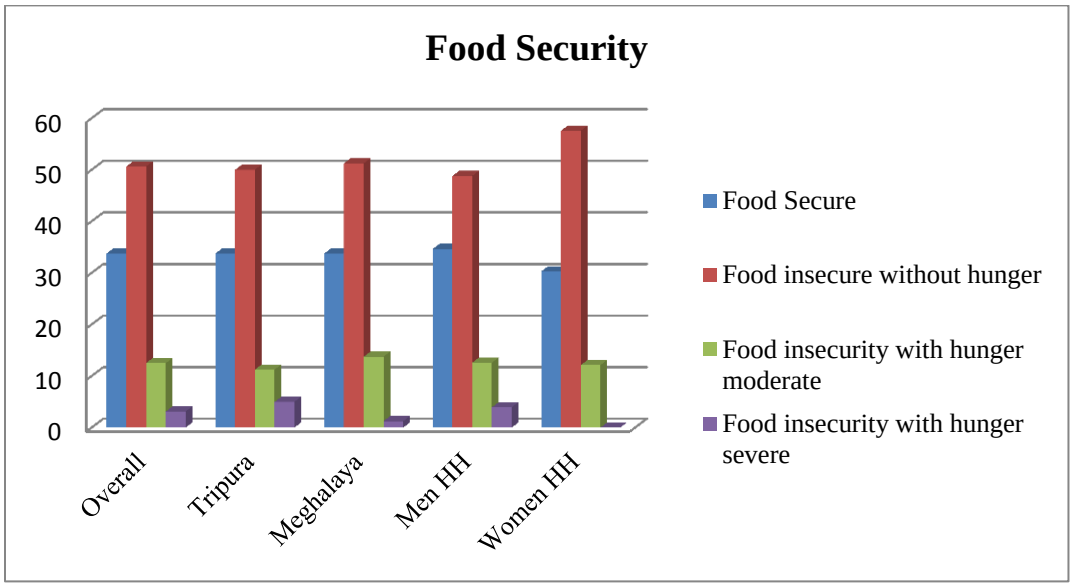


Fig. 4.17*:* Distribution of households according to their extend of food security

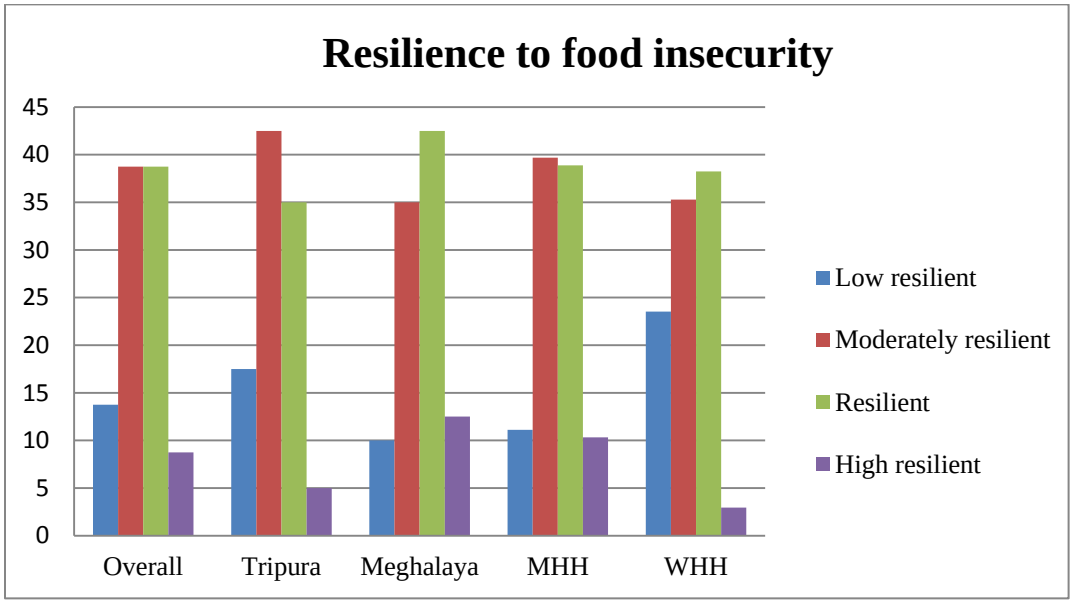


Fig. 4.18: Distribution of households according to resilience to food insecurity

4.4. Gender analysis of various dimensions of food security and resilience in the households

4.4.1 Gender analysis of dimensions of food security

Differences might not be apparent between the genders roles in developed countries. But in developing country like India gender differences is observed in almost all the field. In the present investigation, there was no significant difference between women and men in availability, use and utilization dimension of food security. In addition to it significant difference was observed in dimensions “Access and Stability”. However, under “access” dimension item 1 “Access to nutritious vegetable/fruit” (z value=2.40*), item 2 “access to balance meal” (z value=3.29**) and item 4 “economic access to food (decision on purchase/sell of food)” (z value=4.16**), showed to have significantly higher in men compared to their women counterparts. While, in the dimension “stability” only item 3 “Adequate access to food during financial and economic crisis” spotted to have significant differences, in which men was found to be higher than women. Whereas rest of the items does not showed to have significant differences, but was somewhat higher for men respondent than women respondent. Except in the items of dimension “use and utilization” where women respondents were slightly higher than men respondents and the details is shown in Table 4.32. As per the response from the women respondent, they mostly avoid food, which are unknown to them, as the responsibility of food safety on them and also give enormous share of their nutritious food to their children and counterparts even though they have access and during crisis. In study area, women being bounded with household chores and other activities, for which they don’t get much time, most of the purchase/sell of the food was carried out by men.

Table 4.32: Gender analysis of dimensions of food security

Dimensions	Items	Mean Score		z value
		Women (n=160)	Men (n=160)	
A. Availability	1. Enough food available for consumption	0.79	0.81	0.28
	2. Eat limited variety of food due to lack of resources	0.77	0.77	0.00
	3. Food that preferred not available in store/market	0.21	0.16	1.14
	4. Decision on production	1.98	1.86	1.29
B. Access	1. Access to nutritious vegetable/fruit	0.67	0.79	2.40*
	2. Access to balance meal	0.44	0.62	3.29**
	3. Could not eat particular food due to some cultural/traditional restrictions	0.31	0.29	0.36
	4. Economic access to food (decision on purchase/sell of food)	0.64	0.84	4.16**
C. Use and utilization	1. Avoid particular nutritious food (fruits/vegetables) due to lack of knowledge	0.54	0.51	0.67
	2. Lack of knowledge of nutritious food or balance diet	0.61	0.57	0.79
D. Stability	1. Adequate access to food during price shock	0.92	0.94	0.88
	2. Adequate access to food during conflict and natural disaster	0.76	0.81	1.09
	3. Adequate access to food during financial and economic crisis	0.73	0.83	2.15*

**Significant at 0.01 level of probability,*Significant at 0.05 level of probability

4.4.2. Gender analysis of dimension of resilience to food insecurity

For the present study five dimensions/components (Access to basic services, assets, social safety nets, adaptive capacity and sensitivity) were considered for gender analysis.

A. Access to basic services (ABS):

Access to basic services is very important for human race. In the study area both women and men respondents have access to public health services, to which women respondents were spotted to be more in health facilities and quality health care though it does not showed significant difference. Women, being more sensitive and weak get more access to health facilities and men being strong and responsible generally tries to avoid or rarely visit health centers and get access to health services. Both women and men have less access to quality health care as they cannot afford. However, men respondents were found to be significantly higher compared to women in education (2.58**) at 0.01 level of probability. Women have less access to education, as they were married off before completion of their education and were burdened with household chores. In case of access to market (4.26**) there was a significant difference between men and women, where men were significantly higher than women. Men were considered as breadwinner in men headed household and takes all the responsibility for household goods and get more access to market. Men in the investigation area mostly had their own transportation means (two wheelers or vehicle) as compared to women, and they prefer their private mode of transports [private (z value=3.22**), public (z value=4.33**)] whereas women respondents literally had to depend on public transport services. On the other hand, in case of other "access to services" almost in all the services more or less both women and men had equal services, no significant differences as they belong to same household. On contrary, men respondents were spotted to be higher in case of "mobile connection" (5.95**) than their women counterparts which was positive significant at 0.01 level of probability. The details of the present findings are given in Table 4.33.

Table 4.33: Gender differences in the dimension/component access to basic services (ABS)

	Indicators		Mean Score		z value
			Women (n=160)	Men (n=160)	
I.	Health				
a.	Do you have access to health facilities?		0.81	0.75	1.35
b.	Were you able to access quality health care services		0.58	0.57	0.11
II.	Education				
a.	Were you able to access quality education in your early life?		0.19	0.32	2.58**
III.	Market				
a.	Access to market		0.88	0.99	4.26**
IV.	Transportation				
a.	Mode of travel to nearby city/town, market, hospital and work	Public	0.94	0.83	3.22**
		Private	0.06	0.22	4.33**
V.	Access to services				
a.	Drinking Water		0.89	0.89	0.00
b.	Electricity connection		0.93	0.93	0.00
c.	Solar Connection		0.04	0.04	0.00
d.	Toilet		0.57	0.57	0.00
e.	Cooking gas		0.5	0.5	0.00
f.	Telecommunication network		0	0	0
g.	Fixed landline		0	0	0
h.	Mobile Connection		0.48	0.77	5.95**

**Significant at 0.01 level of probability, *Significant at 0.05 level of probability

B. Assets:

Belongingness of asset based on temporary ownership by an individual. Asset gives wealth status of an individual. Result from the Table 4.34 reflects that men respondent were significantly higher than women respondent in all the items. Difference was observed between women and men in almost all the items of indicator productive asset except in the item "Small livestock (goats, pigs, sheep)", "chickens, ducks, turkeys, pigeons", where women respondents were significantly higher than men at 0.01 level of probability. In the study area, rearing of small and other livestock were considered to be in women's domain. Similarly, in case of non productive assets, all the items except "house (and other structure), large consumer durables (fridge, TV, sofa) and small consumer durables (radio, cookware), men respondents were significantly higher than women at 0.01 level of probability. In the present study most of the house and other structure belonged to women in women headed household whereas in men headed household old structure happens to belong to their ancestor father or grandfather.

Table 4.34: Gender differences in the dimension/component assets (A)

Sl. No.	Indicator	Mean Score		z value
		Men (n=160)	Women (n=160)	
A	Productive assets			
1.	Agricultural land (pieces/plot)	0.51	0.31	3.58**
2.	Large livestock (oxen, cattle)	0.33	0.14	4.07**
3.	Small livestock (goats, pigs, sheep)	0.03	0.44	9.88**
4.	Chickens, ducks, pigeons etc	0.07	0.51	10.13**
5.	Fish pond or fishing equipment	0.26	0.06	4.89**
6.	Farm equipment (non-mechanized)	0.43	0.31	2.20**
7.	Farm equipment (mechanized)	0.1	0	0.00
II	Non-Productive assets			

1.	Non-farm business equipment	0.13	0.11	0.69
2.	House (and other structure)	0.7	0.19	10.74**
3.	Large consumer durables (fridge, TV, sofa)	0.14	0.28	3.07**
4.	Small consumer durables (radio, cookware)	0.013	0.96	51.13**
5.	Cell phone	0.77	0.49	5.42**
6.	Other land not used for agricultural purposes (pieces, residential or commercial land)	0.58	0.34	4.25**
7.	Means of transportation (bicycle, motorcycle, scooty, car)	0.41	0.018	9.72**

**Significant at 0.01 level of probability, *Significant at 0.01 level of probability

C. Social Safety Nets (SSN)

Social safety net is generally an assistance provided by different agencies, formal, informal at the time of crises whether in cash or kind to an individual. In present investigation men were observed significantly higher than women at 0.05 level of probability in the indicator "formal assistance" (9.78**) and "assistance in kind" (3.26**). Generally for formal assistance, men's names were registered more except in women headed household. On the other hand women respondent were spotted more than men in informal assistance (3.26**). Women has more network with neighbors and able to get assistances more in kind. The details are given in Table 4.35.

Table 4.35: Gender differences in the dimension/component social safety net (SNN)

Sl. No.	Indicator	Mean Score		z value
		Men (n=160)	Women (n=160)	
I.	Formal assistance	2.13	2.08	9.78**
II.	Informal assistance	1.99	2.36	3.26**
III.	Assistance in cash	2.43	2.41	0.34
IV.	Assistance in kind	2.25	2.00	3.26**

**Significant at 0.05 level of probability, *Significant at 0.01 level of probability

D. Adaptive Capacity (AC):

Under adaptive capacity two indicator income diversity (5.55**) and capacity to keep in future (3.88**) showed significant differences at 0.01 level of probability where men respondents were observed to be higher than women. It can be due to the reason that women were less involved in money earning activities or means as they remained busy in their household chores. The details are given in Table 4.36.

Table 4.36: Gender differences in the dimension/component adaptive capacity (AC)

Sl. No.	Indicators	Mean Score		z value
		Men (n=160)	Women (n=160)	
I.	Income diversity	2.55	1.86	5.55**
II.	Coping strategy	4.17	4.63	1.53
II.	Capacity to keep up in future	3.06	2.60	3.88**

**Significant at 0.01 level of probability, *Significant at 0.05 level of probability

E. Sensitivity (S)

Men were found to be significantly higher than women in all the three (animal shock, crop shock and shock) indicators, in which animal shock and crop shock was significant at 0.01 level of probability, whereas indicator shock was significant at 0.05 level of probability. It can be elucidated with the fact that men were considered more responsible and breadwinner in the men household for which they take more risk. The details are given in Table 4.37.

Table 4.37: Gender differences in the dimension/component sensitivity (S)

Sl. No.	Indicators	Mean Score		z value
		Men (n=160)	Women (n=160)	
I.	Animal Shock	0.41	0.02	9.7**
II.	Crop Shock	0.11	0.02	3.44**
III.	Shock	0.34	0.23	2.24*

**Significant at 0.01 level of probability, *Significant at 0.05 level of probability

4.5. Factors contributing to the level of food security and resilience to food insecurity in farm household.

4.5.1 Factors contributing to the level of food security

Correlation analysis was carried out to measure the contribution of factor (independent variables) to level of food security (dependent variable). From the Table 4.37 it can be inferred that the correlation coefficient "r" of independent variable *viz.* land ownership (0.285**), expenditure pattern (0.375**), annual household income (0.445**), family size (0.336**) and family type (0.205**) were found to have positive significant correlation with the level of food security at 0.01 level of probability. Whereas material possession (0.158*) showed positive significant relationship at 0.05 level of probability. On the other hand variable food source (-0.281*) was observed to have negative significant relationship at 0.05 level of probability and the rest considered independent variables were found to be non-significant in relation to level of food security. The negative correlation of food source with food security was true to the fact that when the household are food insecure they try to collect food from different source (market, from wild, relatives etc). The present finding of the study was also in lined with the findings by Zahid and Ahmed (2013) where annual income and household size were determined as the most important factor in determining food security.

It can be also be deduced from the result that independent variables, land ownership, expenditure pattern, annual household income**,** family size, family type material possession and gender of household head have positive significant relationship which means that an increase in variable value results in increase in level food security. This can be elucidated with a reason that most of households in the study area were marginal landholder and less landownership, cultivate land renting on yearly basis. Moreover annual income among the households was less which means improving household income can bring changes to household food security. Correlation of family size significantly with food security can be due to the fact that in some households most of its members were grown up and were earning.

While the variable, food source has negative significant association with dependent variable, which can be concluded that decrease in variable value can increase in level of food security. Whereas on the other hand variables, age, cosmopoliteness, income diversity, livestock possession, number of children, social participation, education of household head and household head have positive and non-significant correlation with the dependent variable which means that in increase and decrease in value of the variables results in non-significant change (neither increase nor decrease) in dependent variable. Ifeome and Agwu (2014) spotted out educational level of household head, gender of household head, family size were significant determinant of food security status.

In case of Tripura, variables age (0.225**), land ownership (0.366**), expenditure pattern (0.519**), annual household income (0.592**), material possession (0.310**), family type (0.285**), family size (0.300**), were observed to have positive significant correlation at 0.01 level of probability. While, on the other hand livestock possession (0.241*) has positive correlation at 0.05 level of probability. Furthermore, variables food source (-0.380**) and social participation (-0.289**) have negative correlation with extent of food security at 0.01 level of probability. Similarly, in Meghalaya three variables annual household income (0.319**), expenditure pattern (0.317**), family size (0.345**) and education of household head (0.289**) were spotted to have positive significant association at 0.01 level of probability, whereas variable material possession (0.253*) and food source (-0.239*) were found to have positive and negative significant correlation at 0.05 level, respectively. The result from Meghalaya showed that education had an association with food security and is in lined with the findings from Kenya by Mutisya *et al.* (2016).

In men headed household out of 14 considered independent variables seven variables were found have a significant association with dependent variable. Variables land ownership (0.292**), expenditure pattern (0.438**), annual household income (0.472**) and family size (0.240**) were positive significant at 0.01 level of probability whereas material possession (0.222*) and family type (0.912*) were positive significant at 0.05 level of probability. Like overall result food source has

negative significant association with dependent variable in men headed household. On the other hand in women headed household only three variables were found to have positive significant relation, of which two variables (annual household income and family size) were significant at 0.01 level of probability and one independent variable (expenditure pattern) was significant at 0.05 level of probability. The rest 11 independent variables were non-significant with the dependent variable, which means increase or decrease in value of these variables has no change in level of food security. Conversely, Akadari *et al.* (2018) found that increase in education level increases the probability of food security in men headed household than women headed household. In addition, another finding by them also highlighted that increase in household income was likely to increase food security in men headed compared to women headed household. However, in present investigation, improvement in household income has positive impact, both in men and women headed household.

Table 4.38: Correlation analysis of independent variables with extent of food security

Independent variables	Overall (N=160)	Tripura (n=80)	Meghalaya (n=80)	Men HH (n=126)	Women HH(n=34)
	Correlation coefficient "r" value				
• Age	0.149NS	0.225**	0.068	0.137NS	0.208NS
• Cosmopoliteness	-0.074NS	0.099NS	-0.147	0.030NS	-0.293NS
• Land ownership	0.285**	0.366**	0.091	0.292**	0.252NS
• Food source	-0.281*	-0.380**	-0.239*	-0.278**	-0.233NS
• Income diversity	0.042NS	-0.04NS	-0.147	-0.135NS	0.081NS
• Expenditure pattern	0.375**	0.519**	0.319**	0.438**	0.370*
• Annual HI	0.445**	0.592**	0.317**	0.472**	0.444**
• Livestock possession	0.098NS	0.241*	0.008	0.147NS	0.057NS
• Material possession	0.158*	0.310**	0.253*	0.222*	0.147NS

• Family size	0.336**	0.300**	0.345**	0.240**	0.564**
• Family type	0.205**	0.285**	0.172	0.192*	0.219 NS
• Number of children	0.095NS	0.046NS	0.106	0.075 NS	0.094 NS
• Social participation	-0.140NS	-0.289**	-0.073	-0.156 NS	-0.069 NS
• Education HH	0.080NS	-0.011NS	0.289**	0.117 NS	-0.018 NS
• Household head	0.154NS	0.057 NS	0.180NS		

** Significant at the 0.01 level of probability (2-tailed)

* Significant at the 0.05 level of probability (2-tailed), NS= Non Significant

Note: AHI= Annual household income, HH=Household head.

4.5.2 Factors contributing to resilience to food insecurity

Correlation analysis was carried out to determine the factor contributing to resilience to food insecurity using SPSS. It can be inferred from the Table 4.39 that in the overall household, cosmopoliteness (0.251**), land ownership (0.301**), income diversity (0.216**), expenditure pattern (0.294**), annual household income (0.302**), material possession (0.186*), family type (0.242**) were spotted to be positively significantly correlated with resilience to food insecurity at 0.01 level of probability. It can be further explained that increase in value of positively significant variable can result in increase in dependent variable. However, the other considered variable was observed to be non significant with dependent variable which means that increase or decrease in those variable will not have any increase or decrease in dependent variable.

In Tripura, variables income diversity (0.549**), expenditure pattern (0.375**), annual household income (0.405**), material possession (0.343**), family size (0.369**) and family type (0.414**) were noticed to have positively significant correlation with resilience to food insecurity at 0.01 level of probability. While the variable land ownership (0.243*) was found to have positive significant correlation at 0.05 level of probability. On the other hand in Meghalaya out of 15 independent variables, six variables (cosmopoliteness 0.420, landownership 0.347**, expenditure pattern 0.314**, annual household income 0.242**, livestock possession 0.336**,

material possession 0.237**) were spotted to have positive significant relation at 0.01 level of probability, while gender of household head was found to be negatively significant at 0.01 level of probability. This may be explained with the fact than men headed households were more resilient to food insecurity. While the other selected variables were found to be non significant with resilience to food insecurity.

Furthermore, in case of men headed household variables *viz.* land ownership (0.444**), income diversity (0.315**), expenditure pattern (0.260**), annual household income (0.300**), family size (0.272**) and family type (0.269**) was observed to have positive significant correlation at 0.01 level of probability. In contrast rest of the other selected variables were spotted to be non significant with resilience to food insecurity. In case of women headed household out of 14 variables only 5 variables were found to have positive significant correlation with resilience, of which cosmopoliteness (0.444**), expenditure pattern (0.395**) and material possession (0.438**) have positive significant correlation at 0.01 level of probability, while land ownership and livestock possession were significant at 0.05 level of probability. The rest 9 variables were found to be non significant which means an increase or decrease in value of these variables have no change in resilience to food insecurity. In men headed households increasing household income can improve resilience to food insecurity while in women headed households increase in land ownership, material possession and livestock possession can improve resilience to food insecurity. In addition Babatunde, *et al.* (2008) observed that in women headed households, vulnerability to food insecurity increases as there is increase in household size and age of head, while decreases when increase in off-farm income, food expenditure, education of head and number of labour hour which is found to be similar with the findings of present study.

Table 4.39: Correlation analysis of independent variables with resilience to food insecurity

Independent variables	Overall (N=160)	Tripura (n=80)	Meghalaya (n=80)	Men HH (n=126)	Women HH (n=34)
	Correlation coefficient "r" value				
• Age	0.019NS	0.105	-0.057	0.093NS	-0.166 NS
• Cosmopoliteness	0.251**	0.213	0.420**	0.131NS	0.444**
• Land ownership	0.301**	0.243*	0.347**	0.283**	0.368*
• Food source	0.033NS	-0.075	0.109	0.029NS	0.010NS
• Income diversity	0.216**	0.549**	-0.112	0.315**	0.157 NS
• Expenditure pattern	0.294**	0.375**	0.314**	0.260**	0.395**
• Annual HI	0.302**	0.405**	0.242**	0.300**	0.327NS
• Livestock possession	0.033NS	0.180	0.336**	0.163NS	0.356*
• Material possession	0.186*	0.343**	0.237**	0.047NS	0.438**
• Family size	0.087NS	0.369**	-0.167	0.272**	-0.136NS
• Family type	0.242**	0.414**	0.113	0.269**	0.151NS
• Number of children	-0.014 NS	-0.023NS	-0.046	0.016NS	-0.036NS
• Social participation	0.014NS	-0.072NS	0.034	0.030NS	-0.023NS
• Education HH	0.058NS	0.147NS	0.012	0.016NS	0.155NS
• Household head	-0.133NS	0.095NS	-0.379**		

** Significant at 0.01 level of probability (2-tailed)

* Significant at 0.05 level of probability (2-tailed),

NS = Non Significant. Note: AHI=Annual household income, HH= household head.

4.5.3. Relationship between independent and dependent variables (extent of food Security)

4.5.3.1 Stepwise regression analysis of independent variables for variation in extent of food security in the farm household

Step wise regression analysis is combination of forward and backward selection technique. It was used to test different model to check their prediction and ascertain best predictor responsible for cause in variation in extent of food security in the household where, in each step, independent variables were dropped to identify the most desirable model with least number of variables explaining the highest variation in dependent variable (extent of food security). The obtained model wise analysis result using SPSS has been presented in Table 4.40.

When the overall sample was considered, it was evident from the table that Model 1explained 19.00 per cent of variation in dependent variable (extent of food security) having significant 'F' value at 0.01 level of probability which also meant that variation in extent of food security can be explained by considered 5 independent variables (annual household income, family size, expenditure pattern, household head). Other models *viz.* Model II, III, and IV described variation of 26.00, 28.00 and 30.03 per cent apiece in dependent variable.

In Tripura, Model I described variation of 35.00 per cent in dependent variable followed by model II and III which showed of variation 40.30, and 43.90 per cent respectively. Furthermost, in Meghalaya, variation in dependent variable was described by considering 3 independent variables (annual household income, family size and education of household head). The finding from the table showed that Model I explained 13.8 per cent variation followed by model II and III with 21.4 and 25.9 per cent respectively.

Whereas in men headed and women headed household Model I explained a variation in extend of food security by 22.30 per cent and 31.80 per cent respectively. The independent variables considered in men headed household were annual household income and expenditure pattern. On the other hand, family size and social participation were the independent variables considered for women headed households.

Table 4.40: Stepwise regression analysis of independent variables for variation in extent of food security

Model No.	Variables included in the model	R^2	"F" value	Variables
Overall				
I	X_7	0.198	38.930** at 1, 158 df	X_7=Annual household income
II	X_7,X_{10}	0.257	27.099** at 2, 157 df	X_{10}= Family size
III	X_7,X_{10},X_6	0.280	20.259** at 3, 156 df	X_6=Expenditure pattern
IV	X_7,X_{10},X_6, X_{15}	0.303	16.876** at 4, 155 df	X_{15}=Household head
Tripura				
I	X_7	0.350	42.092** at 1, 78 df	X_7= Annual household income,
II	X_7,X_6	0.403	25.984** at 2, 77 df	X_6=Expenditure pattern
III	X_7,X_6,X_8	0.439	19.826** at 3, 76 df	X_8=Livestock Possession
Meghalaya				
I	X_7	0.138	12.460 ** at 1, 78 df	X_7= Annual household income
II	X_7,X_{10}	0.214	10.479** at 2, 77 df	X_{10}=Family size
III	X_7, X_{10}, X_{14}	0.259	8.860 ** at 3, 76 df	X_{14}=Education of Household head
Men headed household				
I	X_7	0.223	35.489** at 1, 124 df	X_7= Annual household income
II	X_7, X_6	0.259	21.462** at 2, 123 df	X_6= Expenditure pattern
Women headed household				
I	X_{10}	0.318	14.953** at 1, 32 df	X_{10}=Family Size,
II	X_{10}, X_{13}	0.400	10.329** at 2, 31 df	X_{13}=Social Participation

** Significant at 0.01 level of probability

* Significant at 0.05 level of probability

4.5.3.2 Multiple Regression analysis to measure significant relationship of independent variables with Extent of Food Security

A multiple regression was run to predict food security in the household from age, cosmopoliteness, land ownership, income diversity, expenditure pattern, annual

household income, livestock possession, material possession, family size, family type, number of children, education of household head and household head. This variables statistically significantly predicted food security, F (14, 145) =5.151, p<0.001, R^2=0.33. Among the fourteen variables, four variables (Annual household income, expenditure pattern, family size and household head) were found statistically significantly to the prediction at 0.001 level of probability.

Based on the result from multiple regression analysis improving annual household income and management expenditure pattern in the overall household, of the study area can improve extent of food security of the household to certain level.

Among two states in Tripura and Meghalaya, the household variables of Tripura statistically significantly predicted food security F (14, 65) =4.070, p<0.001, R^2=0.47. The selected fourteen variables in the model showed 47.00 per cent contribution in the extent of food security of the household. Household variable expenditure pattern annual household income and household head showed statistically positive significant to the prediction at 0.05 level of probability, whereas land ownership was positively significant at 0.1 level of probability. On the other hand in Meghalaya the variables contributed 36.00 per cent in the extent of food security F (14, 65) =2.605, R^2=0.36, in which two variables (material possession and household head) was found to significant at 0.1 level of probability.

The regression analysis result of men and women headed household showed that, out of 13 variables in men headed household, two variables expenditure pattern and annual household income was found to have significant contribution at 0.05 level of probability, and variable livestock possession was significant at 0.1 level of probability, whereas in case of women headed household, variable family size was having positive significant contribution at 0.05 level of probability, which can be elucidated with the fact that may be number of earning member was more in the household. However, all the selected 13 variables in the model showed 32 per cent and 51 per cent contribution to the extent of food security in men and women headed household respectively. The details of the findings are presented in Table 4.41.

Table 4.41: Multiple Regression analysis to measure significant relationship of independent variables with extent of food security

Variables	Coefficient of regression analysis of variables									
Extent of food security	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men headed HH (n=126)		Women headed HH (n=34)	
	b 'value'	t 'value'	b'value'	t'value'	b 'value'	t 'value'	b 'value'	t 'value'	b'value'	t 'value'
Age	0.054	0.637	0.083	0.717	0.010	0.073	0.053	0.573	0.141	0.506
Cosmopoliteness	-0.123	-1.496	-0.056	-0.478	-0.166	-1.309	-0.154	-1.653	0.100	0.391
Land Ownership	0.028	0.346	-0.009*	-0.076	-0.153	-1.143	0.031	0.333	-0.048	-0.212
Food Source	-0.105	-1.301	-0.105	-0.898	-0.099	-0.783	-0.111	-1.196	-0.260	-1.014
Income diversity	0.027	0.335	-0.011	-0.111	-0.096	-0.767	0.007	0.078	0.174	0.885
Expenditure pattern	0.224***	2.233	0.252**	2.118	0.271	1.431	0.249**	2.240	0.355	0.955
Annual household Income	0.204***	2.133	0.359**	2.864	-0.001	-0.004	0.221**	2.022	-0.059	-0.210
Livestock possession	0.099	1.344	0.151	1.541	0.153	1.272	0.143*	1.691	-0.006	-0.030
Material possession	0.057	0.665	0.065	0.586	0.219*	1.923	0.070	0.699	-0.004	-0.017
Family Size	0.188*	1.669	-0.052	0.756	0.202	1.158	0.026	0.203	0.767**	2.726
Family Type	-0.035	-0.400	0.101	0.459	-0.012	-0.094	0.042	0.411	-0.313	-1.274

Number of Children	0.018	0.191	0.080	0.534	0.077	0.514	0.093	0.815	-0.179	-0.831
Education	0.049	0.572	-0.032	0.790	0.180	1.401	0.033	0.328	0.005	0.020
Household head	0.152*	1.905	0.005**	0.964	0.219*	1.689				
	R^2=0.33, F (14,145) =5.151, p<0.001		R^2=0.47 F (14, 65) =4.070, p<0.001		R^2=0.36, F (14, 65) =2.605 p<0.005		R^2=0.32 F (13,112)=4.000 p<0.001		R^2=0.51 F (13, 20)=1.608 NS	

*** Significant at 0.0l level probability, **significant at 0.05 level of probability, *significant at 0.1 level of probability

4.5.4. Relationship between independent variables and resilience to food insecurity

4.5.4.1 Stepwise regression analysis of independent variables for variation in resilience to food insecurity

The result from the Table 4.41 revealed that Model 1 explained 9.10 per cent of variation in dependent variable (Resilience to food insecurity) which have significant 'F' value at 0.01 level of probability followed by Model II, III, IV, V and VI which described variation of 16.00, 24.00 and 29.70 per cent, 32.60 per cent and 34.70 per cent apiece in dependent variable. Variation in resilience to food insecurity has been explained by considered six independent variables (annual household income, income diversity, cosmopoliteness, land ownership, livestock, and household head).

In Tripura, Model I described variation of 30.10 per cent in dependent variable followed by model II, III and IV which showed variation of 46.60 per cent, 52.00 per cent and 55.57 per cent respectively. While, in Meghalaya, variation in dependent variable (resilience to food insecurity) was described by considering 3 independent variables which were cosmopoliteness, household head and annual household income. The finding from the Table 4.42 also showed that Model I explained 17.70 per cent variation followed by model II, III and IV with 29.10 per cent, and 32.6 per cent respectively.

Whereas in men headed households Model I explained a variation in resilience to food security by 10.00 per cent followed by model II (23.50 per cent), model III (28.60 per cent), and model IV (31.50 per cent). The independent variables considered in men headed household were income diversity, annual household income, land ownership, and family type. In women headed household model I explained 19.00 per cent of the variation, whereas model II and model III explained 36.00 per cent and 45.00 per cent of variation respectively. Variables cosmopoliteness, material possession, and annual income were considered for checking variation in dependent variable. The details of the study are presented in Table 4.42.

Table 4.42: Stepwise regression analysis of independent variables for variation in resilience to food insecurity

Model No.	Variables included in the model	R^2	"F" value	Variables
Overall				
I	X_7	0.091	15.892** at 1, 158 df	X_2= Cosmopoliteness
II	$X_7, X_5,$	0.168	15.819** at 2, 157 df	X_3= Land Ownership
III	X_7, X_5, X_2	0.244	16.815** at 3, 156 df	X_5= Income diversity
IV	X_7, X_5, X_2, X_3	0.297	16.367** at 4, 155 df	X_7=Annual household income
V	X_7, X_5, X_2, X_3, X_8	0.326	14.907** at 5, 154 df	$X_{8=}$ Livestock Possession
VI	$X_7, X_5, X_2, X_3, X_8, X_{15}$	0.347	13.554** at 6, 153 df	$X_{15=}$ Household head
Tripura				
I	X_5	0.301	33.572** at 1, 78 df	X_5=Income diversity,
II	X_5, X_7	0.466	33.605** at 2, 77 df	X_7=Annual household income
III	X_5 , X_7 , X_8	0.520	27.474** at 3, 76 df	X_6= Expenditure pattern
IV	X_5, X_7, X_8, X_6	0.557	23.555** at 4. 75 df	X_8= Livestock Possession
Meghalaya				
I	X_2	0.177	16.726** at 1, 78 df	X_2= Cosmopoliteness
II	X_2, X_{15}	0.291	15.726** at 2, 77 df	X_7=Annual household Income,
III	X_2, X_{15}, X_7	0.326	12.264** at 3, 76 df	X_{15}= Household head
Men headed household				
I	X_5	0.100	13.704** at 1, 124 df	

II	X_5, X_7	0.235	18.923** at 2, 123 df	X_3= Land ownership
III	X_5, X_7, X_3	0.286	16.277** at 3,122 df	X_5= Income diversity
IV	X_5, X_7, X_3, X_{11}	0.315	13.908**at 4,121 df	X_7= Annual household income
				X_{11}= Family type
Women headed household				
I	X_2	0.19	7.865** at 1,32 df	X_2= Cosmopoliteness
II	X_2, X_9	0.36	8.921** at 2, 31 df	X_5=Income Diversity
III	X_2, X_9, X_7	0.45	8.193** at 3, 30 df	X_7= Annual household income
				X_9=Material Possession

** Significant at 0.01 level of probability, * Significant at 0.05 level of probability

4.5.4.2 Multiple Regression analysis to measure significant relationship of independent variables with Resilience to food insecurity

A multiple regression was run to predict resilience to food insecurity in the household from variable age, cosmopoliteness, land ownership, income diversity, expenditure pattern, annual household income, livestock possession, material possession, family size, family type, number of children, education of household head and gender of household head. This variables statistically significantly predicted resilience to food insecurity, F (14, 145) =6.302, $p<0.001$, $R^2=0.38$. Among the fourteen variables, six variables (cosmopoliteness, land ownership, income diversity, annual household income, livestock possession, and family type) were found statistically positive significant to the prediction. The "b" value of the significant variable (cosmopoliteness, land ownership, income diversity, annual household income, livestock possession and family type) indicates that with a unit increase in the variable will increase resilience to food insecurity. Fourteen selected variables in the model showed that 0.38 per cent contribution in the resilience to food insecurity of the household, even though the variables did not contribute much to the model, addition of other variable (like farming experience, climate change, physical connectivity, economic connectivity dependency ratio, food access, etc) may predict resilience to food insecurity more significantly.

Furthermore, from the regression analysis result of Tripura, it was observed that four variables (income diversity, annual household income, livestock possession and education of the household head) showed positive significant prediction, at 0.01 level of probability F (14, 65) =7.651, $p<0.001$, $R^2=0.62$. However in Meghalaya the variables in the model contributed 41.00 per cent for the prediction of resilience to food insecurity and only two variables were found significant (cosmopoliteness and household head). On the other hand variables in men headed household predicted 37.00 per cent of the variation whereas in women headed household 62.00 per cent and only two variables (cosmopoliteness and annual household income) was spotted to be significant at 0.1 level of probability. The findings are tabulated in Table 4.43.

Table 4.43: Multiple Regression analysis to measure significant relationship of independent variables with resilience to food insecurity

Variables	Coefficient of regression analysis of variables									
Resilience to food insecurity	Overall (N=160)		Tripura (n=80)		Meghalaya (n=80)		Men headed HH (N=126)		Women headed HH (N=34)	
	b value	t value	b value	t value	b value	t value	b value	t value	b value	t value
Age	-0.030	-0.366	0.110	1.128	-0.120	0.296	0.010	0.098	0.169	0.692
Cosmopoliteness	0.187**	2.370	0.056	0.561	0.291**	1.133	0.128	1.429	0.429*	1.915
Land Ownership	0.260***	3.345	0.027	0.259	0.193	1.398	0.187**	2.087	0.305	1.519
Food Scource	0.089	1.136	0.047	0.477	-0.011	-0.512	0.044	0.493	0.324	1.443
Income diversity	0.399***	5.226	0.545***	6.241	0.192	1.119	0.434***	5.096	0.109	0.634
Expenditure pattern	0.071	0.730	0.132	1.314	-0.015	-0.209	0.091	0.859	-0.092	-0.283
Annual household Income	0.240***	2.602	0.219**	2.075	0.173	0.410	0.233	2.226	0.487	1.972
Livestock Possession	0.144**	2.014	0.211*	2.554	0.151	2.842	0.131	1.609	0.134	0.705
Material Possession	-0.069	-0.838	-0.038	-0.380	0.086	6.872	-0.139	-1.453	0.106	0.462
Family Size	-0.102	0.935	0.172	1.217	-0.182	-0.507	0.030	0.246	-0.303	-1.227
Family Type	0.163*	1.953	0.075	0.653	0.147	1.038	0.169	1.644	0.250	1.161
Number of Children	-0.018	-0.206	-0.075	-0.697	-0.022	0.419	-0.071	-0.652	-0.090	-0.476
Education	0.055	0.670	0.241**	2.399	-0.004	2.425	0.104	1.092	0190	0.806
Household head	-0.129	-1.679	0.026	0.294	-0.237	-0.029				

	R^2=0.38	R^2=0.62	R^2=0.41	R^2=0.37	R^2=0.62
	F (14, 145)=6.302, p<0.001	F (14, 65)=7.651, p<0.001	F (14, 65)=3.244, p<0.001	F (13, 112)=5.312, p<0.001	F(13, 20)=2.551 p<0.001

***Significant at 0.0l level probability, **significant at 0.05 level of probability, *significant at 0.1 level of probability

4.5.5. Path analysis of casual/explaining variables (independent variables) and dependent variable/consequent variable (Extent of Food Security) for overall result:

The path coefficient presented in the Table 4.43 is the outcome of the analysis using SPSS (statistical Packages for Social Sciences, version 21) for total impact, direct effect and indirect effect of independent variable on dependent variable (Food security) for overall result in study area. The table also highlighted that the coefficient of those variables, through which substantial indirect effect are channelled, based on its importance on dependent variable (extent of food security). The direct, indirect and total effect by fourteen independent variables on dependent variable reflected that expenditure pattern (X_6) had the highest positive direct effect (0.0502) on food security followed by other independent variables in descending order were annual household income (X_7) [direct effect (0.0416)], family size (X_{10}) [direct effect (0.0353)], Household head (X_{14}) [direct effect (0.0231)], cosmopoliteness (X_2) [direct effect (0.0151)], food source (X_4) [direct effect (0.0110)], livestock possession (X_8) [direct effect (0.0098)], material possession (X_9) [direct effect (0.0032)], age (X_1) [direct effect (0.0029)], education (X_{13}) [direct effect (0.0024)], family type (X_{11}) [direct effect (0.0012)], land ownership (X_3) [direct effect (0.0008)], income diversity (X_5) [0.0007], and number of children (X_{12}) [0.0003]. While on the other hand annual household income (X_7) [Indirect effect (0.0490)] have the highest positive indirect effect on food security which was followed in descending order by expenditure pattern (X_6) [Indirect effect (0.0337)], family size (X_{10}) [Indirect effect (0.0278)], land ownership (X_3) [Indirect effect (0.0072)], material possession (X_9) [Indirect effect (0.0058)], age (X_1) [Indirect effect (0.0051)], household head (X_{14}) [Indirect effect (0.003)], education (X_{13}) [Indirect effect (0.0015)], and number of children (X_{12}) [Indirect effect (0.0014)]. Interestingly, at the same time family type (X_{11}) [Indirect effect (-0.0084)] came out to have highest negative indirect effect on food security which was followed in descending order by cosmopoliteness (X_2) [Indirect effect -0.0059)], income diversity (X_5) [Indirect effect (-0.0019)] and livestock possession (X_8) [Indirect effect (-0.0003)]. From the findings it was also reflected that the

selected independent variables, singularly or in combination with many other mutually interdependent variables are behind the variation in the extent of food security in the result of present investigation.

The epsilon being 0.67 and R^2=0.33, can be concluded that the independent variables considered could explain only 33 per cent of the variation in dependent variable. The findings are presented in Table 4.44.

Table 4.44: Path coefficient showing direct and indirect effect of explaining variables (independent variables) on extent of food security for overall result

Independent variables	DE	IE	TE
• Age (X_1)	0.0029	0.0051	0.0080
• Cosmopoliteness(X_2)	0.0151	-0.0059	0.0092
• Land Ownership (X_3)	0.0008	0.0072	0.0080
• Food Source (X_4)	0.0110	0.0184	0.0294
• Income diversity (X_5)	0.0007	-0.0019	-0.0011
• Expenditure pattern (X_6)	0.0502	0.0337	0.0839
• Annual household Income (X_7)	0.0416	0.0490	0.0906
• Livestock Possession (X_8)	0.0098	-0.0003	0.0095
• Material Possession (X_9)	0.0032	0.0058	0.0090
• Family Size (X_{10})	0.0353	0.0278	0.0631
• Family Type (X_{11})	0.0012	-0.0084	-0.0072
• Number of Children (X_{12})	0.0003	0.0014	0.0017
• Education (X_{13})	0.0024	0.0015	0.0039
• Household head (X_{14})	0.0231	0.003	0.0234
R^2=0.33			
Epsilon=0.67			

Note: IE=Indirect Effect, DE=Direct Effect, TE=Total Effect

4.5.6. Path analysis of casual/explaining variables (independent variables) and dependent variable/consequent variable (Resilience to food insecurity) for overall result:

The result of path coefficient in the Table 4.44 reflects the direct, indirect effect and total effect of thirteen casual variables on dependent variable (resilience to food insecurity). It was also observed that the coefficient of those variables, through which substantial indirect effect are channelled, based on its importance on dependent variable (resilience to food insecurity). Among the fourteen independent variables, income diversity (X_5) spotted to have highest positive direct effect (0.1592) and total effect (0.0863) followed by other variables and variable number of children (0.0003) had the lowest direct effect and total effect (0.0002). In addition expenditure pattern was having the highest indirect effect followed by other variables, whereas the variable education was having the lowest positive and income diversity was having lowest negative indirect effect on resilience to food insecurity. Furthermore material possession was observed to have lowest negative total effect and the details of the findings are presented in Table 4.45.

The epsilon being 0.62 and R^2=0.38, can be concluded that the independent variables considered could explain only 38 per cent of the variation in dependent variable.

Table 4.45: Path coefficient showing direct and indirect effect of explaining variables (independent variables) on resilience to food insecurity for overall result

Independent variables	DE	IE	TE
• Age (X_1)	0.0009	-0.0015	-0.0006
• Cosmopoliteness (X_2)	0.0350	0.0118	0.0468
• Land Ownership (X_3)	0.0676	0.0110	0.0786
• Food Source (X_4)	0.0079	-0.0049	0.0030
• Income diversity (X_5)	0.1592	-0.0729	0.0863
• Expenditure pattern (X_6)	0.0050	0.0159	0.0209
• Annual household Income (X_7)	0.0576	0.0149	0.0725
• Livestock Possession (X_8)	0.0207	0.0124	0.0331

• Material Possession (X_9)	0.0048	-0.0176	-0.0128
• Family Size (X_{10})	0.0104	-0.0193	-0.0089
• Family Type (X_{11})	0.0266	0.0129	0.0395
• Number of children (X_{12})	0.0003	-0.0001	0.0002
• Education (X_{13})	0.0030	0.0001	0.0031
• HHH (X_{14})	0.0166	-0.0010	0.0156
R^2=0.38 Epsilon=0.62			

Note: IE=Indirect Effect, DE=Direct Effect, TE=Total Effect

4.6. Constraints in achieving food security and suggestions from the households to overcome the constraints

4.6.1 Constraints in achieving food security

In every walk of life constraints are the hindrance in reaching any goal. The farmer of the study area had gone through several constraints in achieving food security. The constraints for the present study were categorized into four viz. Agro-economic constraints, Infrastructural constraints, Personal constraints/physical constraints and political constraints. The details of the analyzed constraints are presented in Table 4.46.

A. Agro-economic constraints:

Maximum farmer (98.75 per cent) reported that climatic change and variability was major constraints in overall result followed by low crop yield (97.50); limited access to land (73.75 per cent); crop/livestock loss/failure (58.75 per cent); shortage of farm labour (41.25 per cent); increase in input price (20.00 per cent) and market price fluctuation (10.63 per cent); While agro-climatic constraints faced by men headed household and women headed household was quite different. Major constraints faced by men headed household were similar to the overall result to some extent whereas cent per cent of farmers reported climatic change and variability as dominant constraints followed by low crop yield (96.83 per cent); limited access to land (68.25 per cent); crop/livestock loss/failure (54.76 per cent); shortage of farm labour (40.48 per cent); increase in input price (15.08 per cent) and market price fluctuation (6.35

per cent). Whereas from women headed household cent per cent of farmer reported low crop yield as major constraints followed by limited access to land (94.12 per cent); crop/livestock loss/failure (73.53 per cent); shortage of farm labour (44.12 per cent); increase of input price (38.24 per cent); and market price fluctuation (26.47 per cent).

B. Infrastructural constraints:

Table 4.45 shows that weak support services (68.13 per cent) was reported as main constraint in overall result followed by inadequacy and lack of access to improved agricultural inputs (seeds, fertilizer, agro-chemical, and irrigations (65.63 per cent); lack of labour saving devices (57.50 per cent); poor post-harvest processing and storage technologies(46.25 per cent); poor sanitation(21.25 per cent); lack of access to clean water (20.00 per cent); poor rural infrastructure (road and transport) (16.88 per cent) and poor health services (13.13 per cent). In men headed household reported constraints were similar to overall constraints results, which were weak support services (65.08 per cent) followed by inadequacy and lack of access to improved agricultural inputs (seeds, fertilizer, agro-chemical, and irrigations (59.52 per cent); lack of labour saving devices (53.97 per cent); poor post-harvest processing and storage technologies (38.10 per cent); poor sanitation (18.25 per cent); lack of access to clean water (15.87 per cent); poor rural infrastructure (road and transport) (9.52 per cent) and poor health services (8.73 per cent). Constraints from women headed households differed from men headed households, whereas inadequacy and lack of access to improved agricultural inputs (seeds, fertilizer, agro- chemical, and irrigations) (88.24 per cent) were major constraints as reported followed by weak support services (79.41 per cent); poor post-harvest processing and storage technologies (76.47 per cent); lack of labour saving devices (70.59 per cent); poor rural infrastructure (road and transport) (44.12 per cent); lack of access to clean water (35.29 per cent); poor sanitation (32.35 per cent); and poor health services (29.41 per cent).

C. Personal constraints/physical constraints:

As much as 94.38 per cent of farmer in overall result mentioned constraints against high food price, followed by lack of nutrition education (83.75 per cent); lack of consistent food supply (73.13 per cent); lack of education and skill (63.13 per cent); poor food habit (33.75 per cent); poor health status (25.63 per cent); lack of access to market (16.25 per cent); irregular work/lack of consistent income (14.38 per cent); chronic diseases (7.50 per cent); lack of diverse earning opportunities (6.25 per cent); lack of proper financial management (6.25 per cent); poverty (5.00 per cent); and food taboos (4.38 per cent). In men headed household high food price (94.44 per cent); lack of nutrition education (81.75 per cent); lack of consistent food supply (69.05 per cent); lack of education and skill (57.94 per cent); poor food habit (26.98 per cent); poor health status (23.02 per cent); irregular work/lack of consistent income (16.67 per cent); lack of access to market (11.11 per cent); lack of proper financial management (7.94 per cent); poverty (6.35 per cent); lack of diverse earning opportunities (6.35 per cent); chronic diseases (4.76 per cent) and food taboos (3.17 per cent)were the major constraints found. In women headed household high food price (94.12 per cent); lack of nutrition education (91.18 per cent); lack of consistent food supply (88.24 per cent); lack of education and skill (82.35 per cent); poor food habit (58.82 per cent); poor health status (35.29 per cent); lack of access to market (35.29 per cent); chronic diseases (17.65 per cent) and food taboos (8.82 per cent) were the major constraints spotted.

D. Political constraints:

Overall result presented in Table 4.46 highlighted that the political problems corruption, collusion, nepotism (75.00 per cent) were reflected more followed by rapid population growth (70.00 per cent) and religious/ethnic conflict (38.75 per cent). Whereas, in men headed household political problems (corruption, collusion, nepotism) (73.81 per cent); rapid population growth (66.67 per cent) and religious/ethnic conflict (34.92 per cent) were recorded more. In case of women headed household rapid population growth (82.35 per cent) was found more followed by political problems (corruption, collusion, nepotism) (79.41 per cent) and religious/ethnic conflict (52.9 per cent).

Table 4.46: Distribution of households according to the constraints faced in achieving food security

Sl. No.	Constraints	Overall (N=160)		Men HH (n=126)		Women HH (n=34)	
		F and %	Rank	F and %	Rank	F and %	Rank
A.	Agro-economic constraints						
1.	Climatic change and variability	158 (98.75)	I	126(100.00)	I	32 (94.12)	II
2.	Limited access to land	118 (73.75)	III	86 (68.25)	III	32 (94.12)	II
3.	Low crop yield	156 (97.50)	II	122 (96.83)	II	34 (100.00)	I
4.	Crop/livestock loss/ failure	94 (58.75)	IV	69 (54.76)	IV	25 (73.53)	III
5.	Market price fluctuation	17 (10.63)	VII	8 (6.35)	VII	9 (26.47)	VI
6.	Increase in input price	32 (20.00)	VI	19 (15.08)	VI	13 (38.24)	V
7.	Shortage of farm labour	66 (41.25)	V	51 (40.48)	V	15 (44.12)	IV
B.	Infrastructural Constraints						
8.	Lack of labour saving devices	92 (57.50)	III	68 (53.97)	III	24 (70.59)	IV
9.	Inadequacy and lack of access to improved agricultural inputs (seeds, fertilizer, agro-chemical,and irrigations	105 (65.63)	II	75 (59.52)	II	30 (88.24)	I
10.	Poor post-harvest processing and storage technologies	74 (46.25)	IV	48 (38.10)	IV	26 (76.47)	III
11	Poor sanitation	34 (21.25)	V	23 (18.25)	V	11 (32.35)	VII
12.	Poor rural infrastructure (road and transport)	27 (16.88)	VII	12 (9.52)	VII	15 (44.12)	V
13.	Weak support services	109 (68.13)	I	82 (65.08)	I	27 (79.41)	II

14.	Lack of access to clean water	32 (20.00)	VI	20 (15.87	VI	12 (35.29)	VI
15.	Poor health services	21 (13.13)	VIII	11 (8.73)	VIII	10 (29.41)	VIII
C.	Personal constraints/physical constraints						
16.	Lack of proper financial management	10 (6.25)	X	10 (7.94)	IX	0 (0.00)	X
17.	Lack of diverse earning opportunities	10 (6.25)	X	8 (6.35)	X	2 (5.88)	IX
18.	Irregular work/lack of consistent income	23 (14.38)	VIII	21 (16.67)	VII	2 (5.88)	IX
19.	Lack of access to market	26 (16.25)	VII	14 (11.11)	VIII	12 (35.29)	VI
20.	Lack of education and skill	101 (63.13)	IV	73 (57.94)	IV	28 (82.35)	IV
21.	Lack of Nutrition education	134 (83.75)	II	103 (81.75)	II	31 (91.18)	II
22.	Poor food habit	54 (33.75)	V	34 (26.98)	V	20 (58.82)	V
23.	Poor health status	41 (25.63)	VI	29 (23.02)	VI	12 (35.29)	VI
24.	Chronic diseases	12 (7.50)	IX	6 (4.76)	XI	6 (17.65)	VII
25.	Poverty	8 (5.00)	XI	8 (6.35)	X	0 (0.00)	X
26.	Food taboos	7 (4.38)	XII	4 (3.17)	XII	3 (8.82)	VIII
27.	Lack of consistent food supply	117 (73.13)	III	87 (69.05)	III	30 (88.24)	III
28.	High Food Price	151 (94.38)	I	119(94.44)	I	32 (94.12)	I
D.	Political Constraints						
29.	Rapid population growth	112 (70.00)	II	84 (66.67)	II	28 (82.35)	I
30.	Religious/ethnic conflict	62 (38.75)	III	44 (34.92)	III	18 (52.9)	III
31.	Political problems (corruption, collusion, nepotism)	120 (75.00)	I	93 (73.81)	I	27 (79.41)	II

Note: The figure in the parenthesis indicates percentage, F=Frequency, %=Percentage

4.6.2. Suggestions given by household heads based on their perceptions to overcome constraints in achieving food security:

The household heads from the study area suggested some solution to overcome their constraints in meeting food security in their household. Majority of the farmers in overall result presented in Table 4.46 prioritized suggestion on "safe guard against crop failure/livestock diseases (84.38 per cent), followed by nutrition education (67.50 per cent); awareness and scientific knowhow for better production/ training for scientific crop production (56.25 per cent); training for boasting additional income for women (55.00 per cent); toilet facility (43.13 per cent); regular earning option (41.25 per cent); transportation facility to take crop to market (36.25 per cent); better marketing option (25.63 per cent); introduction of flood resistant varieties (21.25 per cent); drinking water facilities (10.62 per cent) and better communication/connectivity (9.38 per cent).

In the men headed household, like the overall result, as much as 85.71 per cent of farmer suggested safeguard against crop failure/livestock diseases followed by nutrition education (69.05 per cent); awareness and scientific knowhow for better production/ training for scientific crop production (50.79 per cent); toilet facility (48.41 per cent); training for boasting additional income to women (47.62 per cent); regular earning option (39.68 per cent); transportation facility to take crop to market (34.92 per cent); introduction of flood resistant varieties (23.81 per cent); better marketing option (22.22 per cent); drinking water facilities (10.32 per cent) and better communication/connectivity (8.73 per cent).

Whereas in the women headed household, farmer has prioritized suggestion which is slight different compared to the men headed household. As much as 82.38 per cent of farmer emphasized on the suggestion related to training for boosting additional income for women followed by safeguard against crop failure/livestock diseases (79.41 per cent); awareness and scientific knowhow for better production/ training for scientific crop production (76.47 per cent) nutrition education (61.76 per cent); regular earning option (47.06 per cent); transportation facility to take crop to market (41.18 per cent); better marketing option (38.24 per cent); toilet facility (23.53

per cent); introduction of flood resistant varieties (11.76 per cent); drinking water facilities (11.76 per cent) and better communication/connectivity (11.76 per cent).

The farmers has emphasized on various suggestions might be due to several reasons prevailing there. The study area is frequently struck by natural calamity like drought, heavy rainfall, flood, hailstorm, and livestock diseases. Most of the villages were located in interior remote areas and farmer faces hindrance in transportation of their product to the market whereas the area also lacks connectivity/communication which deprived them in contact with other opportunities. The farmers lack knowledge and were less aware of nutritious food, where they mostly depends on seasonal/wild vegetables and fruits. Some parts of the study area were also deprived of basic facilities like electricity connection, drinking water facilities, and toilet facilities etc. The farmers had to go for distress sell of their product as there is lack of proper market In most of the men headed household, women finds themselves that they contribute least to the family annual income as they lack skill apart from their household chores.

Table 4.47: Distribution of households according to the suggestions to overcome the constraints

Sl. No.	Suggestions	Overall (N=160)	Men HH (n=126)	Women HH (n=34)
1.	Training for boasting additional income for women	88 (55.00)	60 (47.62)	28 (82.35)
2.	Regular earning opportunities	66 (41.25)	50 (39.68)	16 (47.06)
3.	Safeguard against crop failure/livestock diseases	135 (84.38)	108 (85.71)	27 (79.41)
4.	Introduction of flood resistant varieties	34 (21.25)	30 (23.81)	4 (11.76)
5.	Drinking water facilities	17 (10.62)	13 (10.32)	4 (11.76)
6.	Transportation facility to	58 (36.25)	44 (34.92)	14 (41.18)

	take crop to market			
7.	Nutrition education	108 (67.50)	87 (69.05)	21 (61.76)
8.	Awareness and scientific knowhow for better production/ Training for scientific crop production	90 (56.25)	64 (50.79)	26 (76.47)
9.	Better marketing option	41 (25.63)	28 (22.22)	13 (38.24)
10.	Better communication/ connectivity	15 (9.38)	11 (8.73)	4 (11.76)
11.	Toilet Facility	69 (43.13)	61 (48.41)	8 (23.53)

Note: The figure in the parenthesis indicates percentage, HH= Headed household

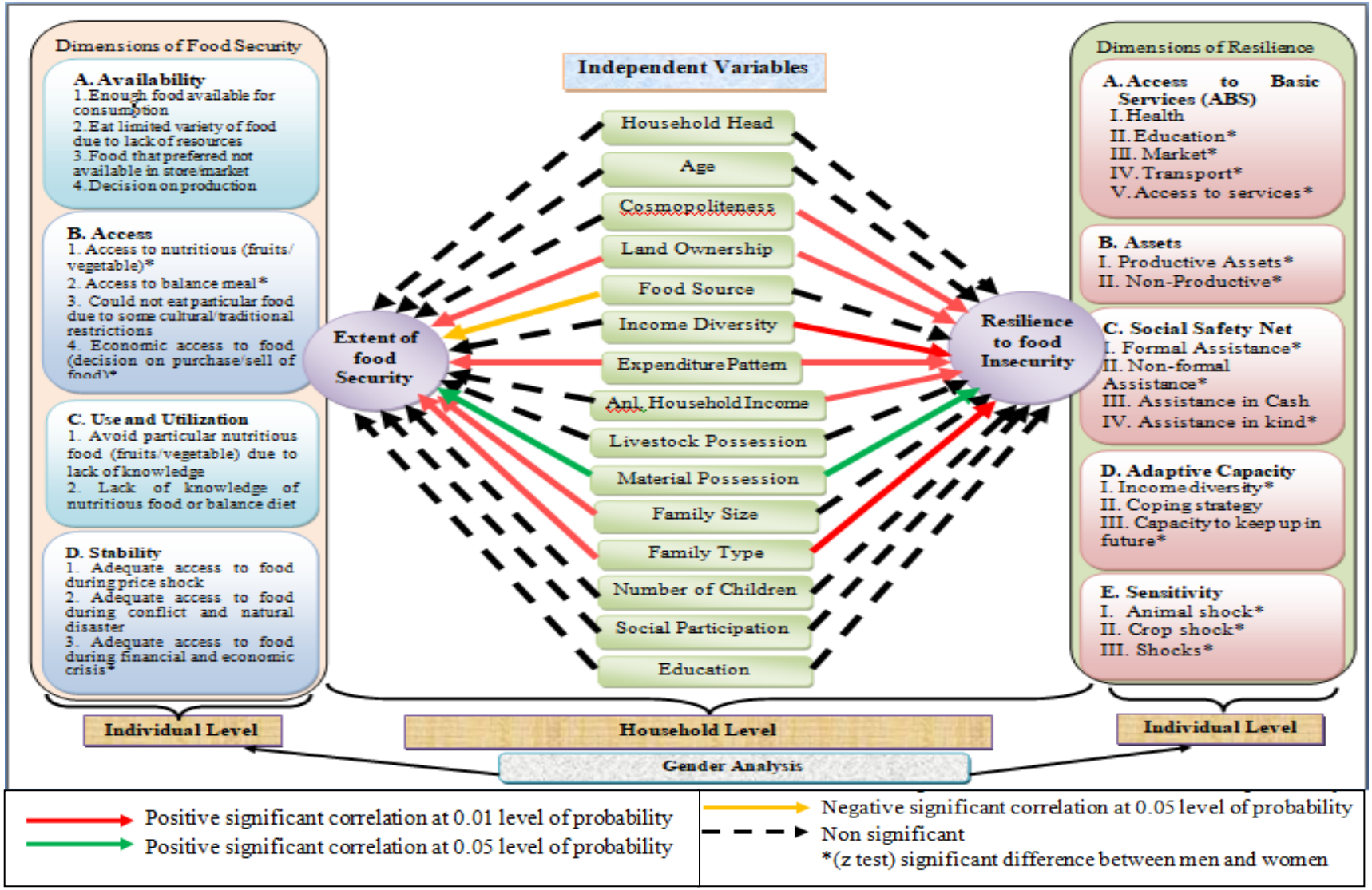


Fig. 4.19: Pictorial summary of the study

CHAPTER - V

SUMMARY AND CONCLUSIONS

To attain food security, has always been a priority for all the developing countries. There is also no universal cause of food insecurity and it varies across different countries and culture. Usually food insecurity or hunger, in developing countries like India, does not occur due to less production or lack of stock grain but mostly due to less income, less accessibility of food product and connectivity, etc. However, the household of producer farmers does not guarantee food security completely, even though farm households are more food secure than the non-agricultural households. Furthermore, food security also differed between men headed and women headed household; also between man and woman within the same household, which indicates the strong link between gender and food security. Though India has made tremendous developments, issues of growing population, poverty, food insecurity is still prevalent to a large extent in North-Eastern region of the country which lags much behind other states of the country in overall development and agriculture. But, the region exhibits a unique diversity in topography, ethnicity, biodiversity and livelihood. Agriculture is basically of sustenance nature and food security has been an issue. The region observed a deficit in food grains during the year 2014 against its 47.9 millions of populations (Roy *et al*. 2015). However, general observation indicates low gender disparity and higher women empowerment as compared to other parts of the country.

So, keeping all these in view the present ex-post facto investigation was conducted from end of 2017 to the end of 2018 to explore, analyze and understand the link between gender and food security, extend of food security in farm household, resilience of these households to food insecurity, factor contributing to food security, constraints that hinder in achieving food security and dimensions of food security and resilience through gender lens in the farm household of two purposively selected Northeastern states *viz*., Tripura and Meghalaya.

5.1. Objective of the study

The Study entitled "Gender Perspective analysis of Farm Households in respect to Food Security in North Eastern India" was taken up with following objectives:

1. To assess the level of food security of the rural households
2. To find out the resilience to food insecurity of the households
3. To carry out gender analysis of various dimensions of food security and resilience in the households
4. To find out the factors contributing to the level of food security
5. To explore the constraints in achieving food security and seek suggestions from the households to overcome the constraints

5.2. Sampling Procedure and data collection

The study was carried out in the North East Region (NER) of India. Two states, Tripura and Meghalaya were selected purposively among the eight north eastern states of India. Tripura is home to 19 different tribal groups (31.76 per cent) and non tribal groups (68.2 per cent). While, Meghalaya is home to many tribal ethnic group of having majority are *Khasi (*34.00 per cent), *Garo* (30.5 per cent) and *Jantia* (18.5 per cent) (Census, 2011). Just like any other place Tripura has a partrilineal society while the major tribes of Meghalaya are famous for their matrilineal culture. Two districts from each state were selected randomly based on the ethnic group. From Tripura one tribal and one non tribal district were selected randomly. The selected districts were Dhalai and Sepahijala. While, from Meghalaya, one district habitat with *Khasi* tribe and one with *Garo* tribe was selected randomly. The selected districts were East Khasi hills and South-West Garo hills respectively. Two rural development blocks from each district and 2 villages from each rural development block were randomly selected which comprises of 8 blocks and 16 villages in total. From each village, 10 farm households (total 160 households, having both primary men and women were prioritized) were selected randomly. From each household two respondent one woman and man was interviewed making sample size of 320 respondents. The data was collected personally through pre-tested interview schedule. Collected data was

tabulated and processed by using appropriate statistical tools and methods like mean, frequency, percentage, 'z' test, ranking, standard deviation, correlation, regression, step wise regression, and path analysis.

5.3. Salient findings

The salient findings of the study are presented under the following head.

5.3.1 Profile of households and individuals under study area

5.3.1.1 Profile of households

- The sampled households comprised of 78.75 per cent households headed by men and the remaining 21.25 per cent households headed by women. There was relatively higher percentage of female headed household in Meghalaya (32.50 per cent) than Tripura (10.00 per cent).
- In all the result (overall, Tripura, Meghalaya, men headed and women headed household) more than fifty per cent of the household head belongs to medium age (35 to 50 years) group. And most of the household head has medium level of education (5^{th} to 10^{th} standard).
- More than sixty per cent of household head did not have social participation (formal). Whereas more than sixty per cent of household head have active participation in non formal village activity. Maximum of the household had one to three children and medium family size of four to six members.
- Above fifty per cent of the households belongs to nuclear family and almost all the households had annual household income between ₹. 55000 to 88000 /-.
- The mean annual household expenditure was found to be ₹. 129766 /-, ₹.159623.20 /-, ₹. 99908.70 /-, ₹. 142953.2 and ₹. 80895.53/- in overall, Tripura, Meghalaya, men headed and women headed household respectively.
- Most of the households have medium level of material possession, livestock possession between three to five numbers, income diversity between three to four, medium level of food source (having source of cereal mostly from own stock, market and government fair price shop while vegetable source was mostly from own production, market and from wild source), small land

ownership between one to two hectare, and medium level of cosmopoliteness.

- State wise comparison indicates that significantly differences exist between Tripura and Meghalaya in the attributes education of household head and food source at 0.05 level of probability, while family size, household expenditure, material possession, income diversity and cosmopoliteness were significantly different at 0.1 level of probability. There was no variation in the attributes, age of household head, social participation, number of children, family type, annual household income, livestock possession and land ownership, among the households of two states.
- Furthermore, significant differences was observed between men headed and women headed households in attributes family size, expenditure pattern, material possession, and income diversity at 0.01 level of probability, and whereas cosmopoliteness was significantly different at 0.05 level of probability. However, no variation was observed among men and women headed households in the attributes age of household head, education of household head, social participation, number of children, family type, annual household income, livestock possession, food source and land ownership.

5.3.1.2 Profile of individual respondents

A. Socio-personal attributes

- Maximum percentage of respondents both men and women fell under medium age group in all the results.
- There were more percentage of women having education below 5^{th} standard compared to their men counterpart
- Percentage of women having membership in one organization in formal organization was found to be somewhat more compared to their men counterparts but in case of non formal village activity participation of men was slightly more.
- There were more number of respondents in medium cosmopoliteness in both women and men in case of all the section overall, Tripura, Meghalaya, men

headed and women headed household, followed by low and high cosmopoliteness.

- Maximum percentage of both men and women were classified under medium dietary diversity in all the results. But there was more percentage of men having high diversity than women, while percentage of women was more than men in low dietary diversity. In case of women headed household, low dietary diversity was not noticed in women, even the percentage of men category was also less.
- For all the respondent categories, the amount of micronutrient intake (plant based vitamin A, Animal based vitamin A, and iron) was more for men then their women counterparts in the present investigation.
- Maximum percentage of the women and men in the households was found to have medium level of access to resources/assets. In addition, it was also observed that women of women headed households and Meghalaya has high access to resources/assets and at the same time low access to resources in men headed households.
- There were maximum number of both men and women respondents in medium control over resources/assets. But men counterpart outnumbered women in the category high control over resources/asset, also, there were more women in low control over resources/asset category than men. Interestingly, in women headed household, there were no respondents having low control over resources/assets.
- Decision on food purchase/sell was taken almost equally by both the gender as responded by women (43.75 per cent) and men (43.12 per cent). While 36.25 per cent of women and 40.62 per cent of men agreed that the decision was taken by only men. On the other hand 19.37 per cent of women and 16.25 per cent of men i.e. some per cent lesser than women, responded that decision was taken only by women. In women headed household slight different result was observed, where both men (52.94 per cent) and women (50.00 per cent) agreed that decision on food purchase/sell was taken by only women. Less than fifty per cent women and men agreed that decision is

taken by both women and men. And marginal per cent of women (5.88 per cent) agreed that decision was taken by only men.

- Men respondents were found to be significantly higher than women in age, education, social participation, cosmopoliteness, dietary diversity, control on resources, and decision on food purchase/sell. However, women respondents were found to be significantly higher than men in and access to resources/assets.

B. Socio-economic attributes

- Percentage of women and men in having medium income diversity (2 to 3 number) was observed to be more. At the same time percentage of men having income diversity higher than women was more in all the households except in Meghalaya and women headed households.
- Maximum percentage of both men and women was found to have annual income between ₹.1000 to 33000 /-. But compare to men percentage of women having annual income ₹.1000 to 33000 /- and very less per cent which was around only 5.00 per cent of women were having annual income more than ₹.1, 50,000 /-.
- In material possession percentage of women was found to be more than men in medium and low category of material possession, but in case of high material possession category percentage of men were found to more than women. Furthermore in Meghalaya and women headed household, percentage of men was more in low material possession and less in high material possession compared to women.
- Almost more than fifty per cent of the men respondent reported that they do not own any livestock whereas only 24.38 per cent of women reported for the same.
- Maximum percentage of both men and women were marginal land holders. Differences in land ownership between men and women were also spotted.
- Among the socio-personal attributes, age, education, cosmopoliteness, and control over resources were found significantly different between men and women at 0.01 level of probability. In addition social participation and dietary diversity was significantly different at 0.05 level of probability

between men and women. Furthermore mean score of men was found to be higher women in age, education, social participation, cosmopoliteness, control on resources and decision on food purchase/sell

- All the five six attributes (income diversity, annual individual income, material possession, livestock possession and land ownership) was significantly different between men and women at 0.01 level of probability. And interestingly, mean score of women was higher than men in livestock possession or land ownership.

5.3.2 Level of food security of the rural farm households

- 50.63 per cent of the households in the study were food insecure without hunger. Only 33.75 per cent of the households were food secure; 12.50 per cent household were food insecure with moderate hunger and only 3.13 per cent of the household were food insecure with severe hunger.
- In state-wise food security status, one-third of the households were food secure in the Tripura (33.75 per cent) and Meghalaya (33.75 per cent). There was higher proportion of households having food insecurity without hunger in both the Tripura (50.00 per cent) and Meghalaya (51.25 per cent). Food insecurity with moderate hunger was found to be more in Meghalaya compared to Tripura. On the other hand households having food insecurity with severe hunger was found more in Tripura.
- Men headed households were slightly more foods secure than women headed households. There was more proportion of women headed households having food insecurity without hunger while there was almost equal proportion of both men and women headed household in the category food insecure with moderate hunger. Interestingly not a single household was found to be food insecure with severe hunger in women headed household whereas in case of men headed household 3.94 per cent of household was found food insecure with severe hunger.

5.3.3 Resilience to food insecurity of the households

- Social safety net was having highest significant correlation with resilience to food insecurity model at 0.01 level of probability followed by four other dimension of resilience.

- Only 38.8 per cent of the households were found to be resilient in the overall households. While in comparative study percentage of resilient household was spotted more in Meghalaya (42.50 per cent) and slightly more in men headed households (38.89 per cent) compared to Tripura (35.00 per cent) and women headed households (38.24 per cent) respectively.

5.3.4 Gender analysis of various dimensions of food security and resilience in the households

5.3.4.1 Gender analysis of various dimensions of food security:

- There was no significant difference between women and men in 'availability' and 'use and utilization' dimension of food security. But significant difference was observed in three items [Access to nutritious vegetable/fruit significant at 0.05 level of probability, access to balance meal and economic access to food (decision on purchase/sell of food) significant at 0.01 level of probability] of dimension 'Access' and one item (Adequate access to food during financial and economic crisis) of 'Stability' at 0.05 level of probability. Under "access" dimension item "access to nutritious vegetable/fruit", "access to balance meal" and "economic access to food (decision on purchase/sell of food)" showed to have significantly higher in men compared to their women counterparts. While, in the dimension "stability" only "adequate access to food during financial and economic crisis" spotted to have significant differences, in which men were found to be higher than women.

5.3.4.2 Gender analysis of dimension of resilience to food insecurity

- Significant differences was spotted between men and women in dimension 'Access to basic services' (Education, market, transportation and access to services), 'Assets' (productive assets and non-productive assets), 'Social safety net' (formal assistance, informal assistance, and assistance in kind), 'adaptive capacity' (income diversity, capacity to keep up in future), and 'sensitivity' (animal shock, and crop shock) at 0.01 level of probability, but accept the indicator shock of dimension sensitivity which was significant at 0.05 level of probability.

5.3.5 Factors contributing to the level of food security and resilience to food insecurity

5.3.5.1 Factor contributing to the level of Food security

Overall

- In the overall result, independent variables, land ownership, expenditure pattern, annual household income**,** family size, family type material possession and gender of household head had positive significant relationship, while the variable, food source has negative significant association with extent of food security.
- From the stepwise regression it was evident that Model 1explained 19.00 per cent of variation in dependent variable (extent of food security) having significant 'F' value at 0.01 level of probability which also meant that variation in extent of food security can be explained by considered 5 independent variables (annual household income, family size, expenditure pattern, household head).
- The fourteen variables considered, statistically significantly predicted food security by 33.00 per cent and only two variables (annual household income, expenditure pattern, family size and household head) were found statistically significantly to the prediction in regression model. And in path analysis the independent variable, expenditure pattern ($X_{6)}$ has the highest positive direct effect (0.0502) and annual household income as highest total effect on food security.

Tripura and Meghalaya:

- In Tripura, eight variables (age, land ownership, annual expenditure, annual household income, material possession, family type, family size and livestock possession) were found to have positive and two variables (food source and social participation) negative significant relation with the dependent variable. Whereas in Meghalaya five variables (annual household income, annual expenditure, family size, education of household head and material possession) has positive and one variable (food source) negative correlation with food security.

- In stepwise regression model, in Tripura Model I described variation of 35.00 per cent in dependent variable and in Meghalaya, Model I explained 13.8 per cent variation in extent of food security.
- In multiple regressions analysis the considered fourteen variables predicted 47 per cent and 36 per cent in extent of food security in Tripura and Meghalaya respectively.

Men headed and women headed household:

- In men headed household, six variables (land ownership, annual expenditure, annual household income, family size, material possession, and family type) were found to have a positive and one variable (food source) negative significant correlation with dependent variable. While in women headed household, only three variables were found to have positive significant relation.
- Whereas in men headed and women headed household, the result of stepwise regression showed that Model I explained a variation in extent of food security by 22.30 per cent and 31.80 per cent respectively.
- The considered thirteen variables for multiple regression analysis predicted 32.00 per cent and 51.00 per cent contribution to the extent of food security in men and women headed household respectively.

5.3.5.2 Factor contributing to the resilience to food insecurity

Overall

- In the overall household, seven variables (cosmopoliteness, land ownership, income diversity, expenditure pattern, annual household income, material possession, and family type) were having positive significant correlation with resilience to food insecurity.
- In stepwise regression Model I explained 9.10 per cent of variation in dependent variable (Resilience to food insecurity) which have significant 'F' value at 0.01 level of probability. Variation in resilience to food insecurity has been explained by considered 4 independent variables (Annual household income, income diversity, cosmopoliteness, land ownership, and household head).

- The considered fourteen variables for the study predicted 38.00 per cent of the variation. Among the fourteen variables, six variables (cosmopoliteness, land ownership, income diversity, annual household income, livestock possession and family type) were found statistically positive significant to the prediction. Among the thirteen independent variables considered for path analysis, income diversity (X_5) spotted to have highest positive direct effect and total effect whereas expenditure pattern was having highest indirect effect.

Tripura and Meghalaya

- In Tripura, seven variables (landownership, income diversity, expenditure pattern, annual household income, material possession, family size, and family type) were spotted to have positive significant correlation, with the resilience to food insecurity. While, in Meghalaya out of 15 independent variables, six variables (cosmopoliteness, land ownership, expenditure pattern, annual household income, livestock possession and material possession) were spotted to have positive significant relation at 0.01 level of probability, while other one variable (gender of household head) was found to be negatively significant at 0.01 level of probability.
- In Tripura, Model I described variation of 30.00 per cent in dependent variable, whereas, in Meghalaya, variation in dependent variable was described by considering 3 independent variables (cosmopoliteness, household head and annual household income). And Model I in Meghalaya explained 17.70 per cent variation.
- Result of regression analysis showed that the variables in the model contributed 62.00 per cent and 41.00 per cent in Tripura and Meghalaya respectively for the prediction of resilience to food insecurity.

Men headed and women headed household

- In men headed household six variables (Land ownership, income diversity, expenditure pattern, annual household income, family size and family type) were observed to have positive significant correlation with dependent variable. While, in women headed household five variables (cosmopoliteness, landownership, expenditure pattern, livestock possession

and material possession) were found to have positive significant correlation with resilience to food insecurity.

- Based on stepwise analysis in men headed and women headed household, Model I explained a variation in resilience to food security by 10.00 per cent and 19.00 per cent respectively.
- Multiple regression analysis result showed that variables considered in men headed household predicted 37.00 per cent of the variation whereas in women headed household 62.00 per cent and only two variables (cosmopoliteness and annual household income) was spotted to be significant at 0.1 level of probability.

5.3.6 Constraints in achieving food security and suggestions from the households to overcome the constraints

5.3.6.1 Constraints:

- Climatic change and variability, weak support services, high food price and political problems under agro-economic constraint, infrastructural constraints personal constraints/physical constraints and political constraints respectively were the major constraints found in overall result.
- In case of men headed household climatic change and variability Weak support services High Food Price Political problems (corruption, collusion, nepotism) were the constraints spotted under Agro-economic constraint, Infrastructural constraints Personal constraints/physical constraints and Political constraints respectively
- While, in women headed household, constraints mostly faced by them were low crop yield, inadequacy and lack of access to improved agricultural inputs [seeds, fertilizer, agro- chemical, and irrigations] high food price, rapid population growth were major constraints identified under agro-economic constraint, infrastructural constraints, personal constraints/physical constraints and political constraints apiece.

5.3.6.1 Suggestions:

- Need for safe guard against toward crop failure/livestock diseases was suggested by majority of farmer in overall result and men headed household.

Whereas, training for boosting additional income for women were more, as suggested by head of women headed household.

CONCLUSION:

The present study tried to understand the food security status, level of resilience to food insecurity, factors responsible for variation in food security and resilience among the farm households and constraints faced by the farmers in the achieving food security in Northeastern India. Furthermore it also tried to explore the gender differences among the dimensions of food security and resilience. As the result of investigation it was found that only one third of the total household was food secure and men headed households was more food secure than women headed household. whereas in case of resilience to household food insecurity less than forty per cent of households were resilient in addition to it households of Meghalaya and men headed households was more resilient compared to households of Tripura and women headed households. Moreover a significant difference was also spotted between men and women in all the dimensions of food security and resilience to food insecurity. On the other hand climatic change and variability, weak support services, high food price and political problems were major constraints which challenged food security in the study area.

RECCOMENDATIONS:

The present findings highlighted that there is need for important and concrete policy intervention and implications in the study area. So, based on discovery of the key finding the following recommendations have been made.

1. Since the percentage of the food secure households was less. There is significant need to focus on the households to improve their household income through government's intervention in assisting farmers to loom up more market oriented agriculture, climate smart agricultural practices and investment in infrastructure.
2. To strengthen resilience to food insecurity government and policy makers required to look upon all the dimensions of resilience to food insecurity. In this regard social safety nets played vital role in resilience to food insecurity in study area. Social safety net can be improved through formal assistance from

government by launching more effective programs like MNREGA, which can assist them during lean period or during crisis and stress.

3. It also important to consider women as a farmer along with men farmer before framing any policy and giving access to improved agricultural inputs and extra subsidy for women farmers, technology intervention for improving crop yield without effecting the environment can improve food security status in women headed household.
4. Provisioning of training for cottage industries to improve the income of women and build confidence among women to improve decision making ability in household can help in closing differences between men and women.
5. Providing timely veterinary health care services network for preventive and curative measures of livestock, which also as a result can improve backyard livestock production.

SUGGESTIONS FOR FUTURE RESEARCH WORK

Future Scope of Research

- There is lots of socio-cultural agro-ecological diversity among the states of North-East India. As the present study covered only two states, among the eight northeastern states, the findings of the study definitely cannot represent the scenario of the entire region. Similar studies covering other states and other ethnic groups may be conducted.
- Studies on food security, resilience to food insecurity and gender in context of climate change and other natural and man-made disasters can also be carried out since there is a close association among these things.
- A deeper study on household food and nutritional status, covering household members of all age and gender categories may also provide a deeper understanding of household dynamics.
- A comparative study for household food security between farm household and non farming household; rural household and urban households can also be taken up. In addition comparative household food security study and gender study among different crop grower can also be attempted.
- Study on the competency of extension-service providers regarding food and nutrition-sensitive extension service can also be carried out.

REFERENCES

Abdullah, Zhou, D. Shah, T. Ali, S. Ahmad, W. Ud Din, I. and Ilyas, A. 2019. Factors affecting household food security in rural northern hinterland of Pakistan. J. of the Saudi Society of Agri. Sci., 18(1): 201-210.

Adger, W. 2006. Vulnerability. Global Environmental Change, 16: 268–281.

Ado, A.M. Savadogo, P. and Abdoul-Azize, H.T. 2019. Livelihood strategies and household resilience to food insecurity. Insight from a farming community in Aguie District of Niger. Agric. Hum., p: 1-15.

Agada, M.O. and Igbokwe, E. M. 2014. Constraints to achieving Household Food Security in North Central Nigeria. J. Agri. and Eco. Res. Int., 2(1):80-89.

Aijaz, R. 2017. Preventing hunger and malnutrition in India. ORF Issue Brief., 182: 1-12.

Akadiri, S.S. Nwaka, I.D. and Jenkins, G.P. 2018. Are Female-Headed Households less food secure. Evidence from Nigeria and Ethiopia. AFEA Session-Allied Social Sci. Assn., Philadelphia, p: 1-32.

Akpan**,** E.O. 2009. Oil Resource management and food insecurity in Nigeria. European Report on Devp. (ERD) Conf. Accra, Ghana, p: 1-29**.**

Al Qahtani, H.B.M .2009. Food Security as a Constraint on National Policy Decision Making in the Arab Region: A Case Study on Food Security in Sudan. MMS Thesis, Marine Corps University, Quantico, Virginia.

Alexander, D.E. 2013. Resilience and disaster risk reduction: An etymological journey. Nat. Hazards Earth Syst. Sci., 13: 2707–2716.

Ali, A. and Khan, M.A. 2013. Livestock ownership in ensuring rural household food security in Pakistan**.** J. Animal Plant Sci., 23(1): 313-318.

Alinovi, L. D'errico, M. Mane, E. and Romano, D. 2010b. Livelihoods strategies and household resilience to food insecurity: An empirical analysis to Kenya. Proceeding of Int. Con. European Report of Devp., Dakar, Senegal: 28-30.

Alinovi, L. Mane, E. and Romano, D. 2010a. Measuring Household Resilience to Food Insecurity: Application to Palestinian Households. Chapter 21

Book Editor(s): Roberto Benedetti , Marco Bee , Giuseppe Espa, Federica Piersimoni, Agricl. Survey Methods**.**

Amaza, P.S. Umeh, J.C. Helsen, J. and Adejobi, A.O. 2006. Determinants and measurement of Food Insecurity in Nigeria: Some Empirical Policy Guide. Proceeding of Int. Assn. Agricl. Econ. Con., Gold Coast, Australia, p: 1-15.

Babatunde, R.O. Omotsho, O.A. Olorunsanya, E.O. and Owotoki, G.M. 2008. Determinants of Vulnerability to Food Insecurity: A Genderbased Analysis of Farming Households in Nigeria. Ind. J. of Agri. Econ. 63(1): 116-125.

Bansal, S.B. Dixit, S. Shivram, G. Pandey, D. Saroshe, S. 2014. A Study to compare various aspects of members of Joint and Nuclear Family. J. of Evolution of Medical and Dental Sci., 3(3): 641-648.

Barrett, C. B. and Constas, M. A. 2012. Resilience to avoid and Escape Chronic Poverty: Theoretical Foundations and Measurement Principles. Proceeding of Roundtable of Resilience, CARE, USA.Washington DC, p: 1-40.

Bashir, M.K. Schilizzi, S. Pandit, R. 2013. Impact of socio-economic characteristics of rural households on food security: the case of the Punjab, Pakistan. JAPS, J. Animal Plant Sci., 23(2): 611–618.

Bhaumik, S. 2013. "Meghalaya: Where women call the shots". Aljazeera, p: 1.

Bickel, G. Nord, M. Price, C. Hamilton, W. Cook, J. 2000. Measuring Food Security in the United States: Guide to Measuring Household Food Security Revised 2000. Office of Analysis, Nutrition, and Evaluation Food and Nutrition Service, USDA, p: 1-82.

Biotechnology and biological sciences research council. 2018. The challenge. Global food Security, United Kingdom, p: 1-3.

Bogale, A. 2012. Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia**.** Food Security, 4(4): 581-591.

Boukary, A.G. Diaw, A. and Wunscher, T. 2016. Factors Affecting Rural Households' Resilience to Food Insecurity in Niger. Sustainability, 8(181): 1-10.

Brown, L. 2013. Global Food Security: 10 challenges. The Globalist, p: 1.

Brown, L.R. 2009. Women and Food Security: Roles, Constraints and Missed opportunities. The Role of Food, Agric., Forestry and Fisheries in Human Nutrition, 3: 1-6.

Chakrabarty, M. 2016. Climate change and food security in India. Issue briefs and special reports. Observer Res. Foundation, 157: 1-12.

Chang, Y. Chatterjee, S. and Kim, J. 2014. Household finance and food insecurity. J. Fam. Econ. Issues, 35(4): 499-515.

Chyne, D. A. L. Meshram, I. I. Rajendran, A. Kodali, V. Getti, N. Roy, P. Kuhnlein, H. V. and Longvah, T. 2017. Nutritional status, food insecurity, and biodiversity among the Khasi in Meghalaya, North- East India. Maternal and child Nutrition. 13(S3): 1-10

Ciani, F. and Romano, D. 2014. Testing for Household Resilience to Food Insecurity: Evidence from Nicaragua. Proceeding of Third Congress, Italian Assn. of Agril. Applied Econ., Alghero, Italy, p: 1-30.

CIMMYT. 2014. Food security as a gender issue: Why are female-headed households worse off compared to similar male-headed counterparts? Socioeconomics Program. Policy Brief No., 1: 1-4.

D'Erricco, M. Pietrelli, R. and Romano, D. 2016. Household Resilience to Food insecurity: Evidence from Tanzania and Uganda. 90th Annual Conf. Agricl. Econ. Society, Warwick University, Conventry, UK, p: 1 to 28.

D'Errico, M. Romano, D. and Pietrelli, R. 2018. Household resilience to food insecurity: evidence from Tanzania and Uganda. Food Security. 10(4): 1033–105.

Deitchler, M. Ballard, T. Swindale, A. and Coates, J. 2010. Validation of a Measure of Household Hunger for Cross-Cultural Use. Food and Nutrition Technical Assistance II Project (FANTA-2) Washington DC, p : 1-65.

Dhraief, M. Z. Dhehibi, B. Hassen, H. D. Zlaoui, M. Khatoui, C. Jemni, S. Jebali, O. and Rekik, M. 2019. Livelihoods Strategies and Household Resilience to Food Insecurity: A Case Study from Rural Tunisia. Sustainability, 11: 1-17.

DiStefano, C. Zhu, M. and Mindrila, D. 2009. Understanding and using factor scores: considerations for applied researchers. Pract. Assess. Res. Eval. 14: 1-11.

Ellena, R. and Nongkynrih K. A. 2017. Changinggender roles and relations in food provisioning among matrilin-eal Khasi and patrilineal Chakhesang Indigenous rural people ofNorth- East India.Matern Child Nutr. 13(S3):1-14.

Ellis, F. 2000. Rural Livelihoods and Diversity in Developing Countries. 1st Edition. Oxford University Press, USA, p: 292.

Fall, M. T. 2018. Factors Affecting Farmers' Resilience to Food Insecurity in the Peanut Belt of Senegal. Forum of Int. Devp. Studies, 48(10): 1-17.

FAO, IFAD, UNICEF, WFP and WHO. 2018. The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO. Licence: CC BY-NC-SA 3.0 IGO.

FAO. 1983. World Food Security: a Reappraisal of the Concepts and Approaches. Director General's Report. Rome. AGRIS, p: 30.

FAO. 1996. Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit 13-17 November.

FAO. 2001. Gender: Key to Sustainability and food security. FAO Plan of Action for Women Devp., p: 1-36.

FAO. 2008. The Challenges of Food Security. Barilla center for food and nutrition.

FAO. 2010.Measuring Resilience: A Concept Note on the Resilience Tool.

FAO. 2016a. Gender. FAO Programme: Food security.

FAO. 2016b. Resilience analysis in Senegal Matam. Analysing resilience for better targeting and action. Resilience analysis No. 7.

FAO. 2017. Food security 2017. Women play a decisive role in household food security, dietary diversity and children's health. FAO Programme

FAO. 2018. FAO Regional Office for Near East and North Africa.

FAO. 2019. FAO in India: India in Glance. http://www.fao.org/india/fao-in-india/india-at-a-glance/en/. Accessed on May, 2019.

Felker-Kantor, E. and Wood, C. H. 2012. Female-headed households and food insecurity in Brazil. Food Security, 4(4): 607–617.

Frongillo Jr, E.A. Olson, C.M. Rauschenbach, B.S. and Kendall, A. 1997. Nutritional Consequences of Food Insecurity in a Rural New York State County. Institute for Research on Poverty, 1120, p: 97.

Ganguly, J. B. 1993. The Status of Tribal Women in the Post-Jhuming State of Tribal Economy in Tripura in Das Gupta, Malabika (ed.), Status of Tribal Women in Tripura, New Delhi: Vikas Publishing House, p: 34-46.

Ghosh, B. and Choudhuri, T. 2011. Gender, Space and Development:Tribal Women in Tripura. Econ. & Political Weekly, 16:74-78.

Ghosh, M. M. and Ghosh, A. G. 2014. Analysis of Women Participation in Indian Agriculture. J. Humanities Social Sci., 19(5): 1-6.

GoI. 2011. Socio-Economic and Caste Census-Rural, Ministry Of Rural Development, Govt. of India

Goshu, M.T. 2016. Determinants of Rural Food Security and Child Nutrition: The Case Study of Gubalafto District of Amhara Regional State, Ethiopia. Thesis submitted to The Aligarh University, Aligarh, India.

Gundersen, C. and Gruber, J. 2001. The dynamic determinants of food insufficiency. Second Food Security Measurement Res. Conference, 2: 92-110.

Guo, B. 2011. Household assets and food security: Evidence from the survey of program dynamics. J. Family and Eco., 32(1): 98-110.

Gustafson, S. 2017. The future of Food and Agriculture: Trends and Challenges. Food Security Portal facilitated by IFPRI .

Hofferth, S. L. 2004. Persistence and Change in the food Security of Families with Children, 1997-99. Econ. Res. Service, U.S. Dept. Agric, Washington, DC.

Ibnouf, F. O. 2009. The Role of Women in Providing and Improving Household Food Security in Sudan: Implications for Reducing Hunger and Malnutrition. J. Int. Women's Studies, 10(4): 144-167.

Ibnouf, F. O. 2011. Challenges and possibilities for achieving household food security in the Western Sudan region: the role of female farmers. Food Security, 3(2): 215–231.

Ifeoma, J. I. and Agwu, E. A. 2014. Assessment of Food Security Situation among Farming Households in Rural Areas of Kano State, Nigeria. J. Central European Agric., 15(1): 94-107.

India Population, 2019. Population of Tripura 2018. India Population 2018.

India Population. 2019. Population of Meghalaya 2019: Demography of Meghalaya.

India, MLJ (Ministry of Law and Justice). 2013. National Food Security Act. New Delhi.

Jaswal, S. S. 2014. Challenges to Food Security in India. J. Humanities and Social Sci., 19(4): 93-100.

Jitendra, 2018**.** India claims to be self-sufficient in food production but facts say otherwise. Down to Earth.

Jones, L. and Tanner, T. 2015. Measuring Subjective Resilience: Using Peoples' Perceptions to Quantify Household Resilience. Overseas Development Institute, London, UK, 423.

Kadiyala, S. Harris, J. Headey, D. Yosef, S. and Gillespie, S. 2014. Agriculture and Nutrition in India: Mapping Evidence to Pathways. Annals of the New York Academy of Sci., 1331: 43–56.

Kalai, K. and Devarani, L. 2015. Gender Differences in Agricultural Empowerment: A Study of Farm Households in Tripura. Int. J. Exten. Edu., 11: 77-85.

Kalai, K. and Devarani, L. 2018. Gender Differences in Agricultural Empowerment: A Cross-cultural Study in Tripura. Ind. Res. J. Ext. Edu. 18(3): 76-82.

Kassie, M. Ndiritu, S.W. and Shiferaw, B. 2012. Determinants of Food Security in Kenya, a Gender Perspective. 86th Annual Conference Agricl. Econ. Society, University of Warwick, United Kingdom.

Kassie, M. Ndiritu, S.W. and Stage, J. 2014. What determines gender inequality in household food security in Kenya? Application of exogenous switching treatment regression. World Dev., 56: 153–171.

Khadka, S. 2018. Migration and Food Security: challenges and opportunities for India. Down to Earth.

Khan, R. E. A. and Gill, A. R. 2009. Determinants of food security in rural areas of Pakistan (Paper No. 17146). Munich Personal RePEc Archive. Retrieved from https:// mpra.ub.uni-muenchen.de/17146/

Kidane, H. Alemu, Z. G. and Kundhlande, G. 2005. Causes of household food insecurity in Koredegaga peasant association, Oromiya Zone, Ethiopia**.** Agrekon, 44(4): 543-560.

Kirkpatrick, N. 2015. Kingdom of girls: Women hold power in this remote Indian village. Washington Post.

Krishnaraj, M. 2005. Food Security: How and for Whom? Econ. Political Weekly, 40(25).

Kumar, S. K. and D. Hotchkis. 1988. Consequences of Deforestation for Women's Time Allocation, Agricultural Production, and Nutrition in Hill Areas of Nepal. Washington, DC: Int. Food Policy Res. Inst., Research Report, 69.

Loopstra, R. and Tarasuk, V. 2013. Severity of household food insecurity is sensitive to change in household income and employment status among low-income families**.** J. Nutr., 143(8): 1316-1323.

Maharjan, K. L. and Joshi, N. P. 2011. Determinants of Household Food Security in Nepal:A Binary Logistic Regression Analysis, J. of Mountain Sci., 8: 403-413.

Maji. S. 2017. Food Security Makes Headway in Tripura But Gaps Remain. The Wire.

Mallick, D. and Rafi, M. 2010. Are Female-Headed Households More Food Insecure? Evidence from Bangladesh. World Devp., 38(4): 593–605.

Mango, N. Zamasiya, B. Makate, C. Nyikahadzoi, K.. and Siziba, S. 2014. Factors influencing household food security among smallholder farmers in the Mudzi District of Zimbabwe**,** Devp. Southern Africa, 31(4): 625-640.

Map of India. 2011. Latitude and longitude of Meghalaya.

Maphosa, M. Dube, T. Dube, Z.L. Ncube, G. and Tshuma, N. 2014. Enhancing food security through micro-irrigation: Evaluating the contribution of

treadle pumps to household food security in Umzingwane district of Zimbabwe. Int. J. Devp. Sustainability, 3(5): 1043-1059.

Matemilola, S. and Elegbeda, I. 2017. The challenges of Food Security in Nigeria. Open Access Library Journal, 4(12): 1-22.

Mencher, J. P. 1988. Women's Work and Poverty: Women's Contribution to Household Maintenance in South India. In A Home Divided: Women and Income in the Third World, edited by D. Dwyer and J. Bruce, Stanford, CA, US: Stanford University Press, p: 99– 119.

Modirwa, S. and Oladele, O. I. 2012. Food Security among Male and Female-headed Households in Eden District Municipality of the Western Cape, South Africa. J. Human Ecology, 37(1): 29-35.

Mukherjee A. 2010. Food insecurities faced by women and girl children. CAPSA-ESCAP. Bogor, p: 11 (Occassional CAPSA paper no 2).

Mutisya, M. Ngware, M.W. Kabiru, C.W. and Kandala, N. 2016. The effect of education on household food security in two informal urban settlements in Kenya: a longitudinal analysis. Food Security**,** 8(4): 743-756.

Negussie, M. 2010. Household Resilience to Food Insecurity in Ethiopia: Panel Data Evidence, mimeo

Nongkynrih, P. 2015. Governance and Food Security: A Study of the working of Public Distribution System in the East Khasi Hills District of Meghalaya. J. Humanities Social Sci. 20(7): 41-46.

O'sullivan, K. 2012. The challenges of Food Security. Fair Observer: Make sense of the world.

Oluoko-Odingo, A.A. 2011. Vulnerability and adaptation to food insecurity and poverty in Kenya. Annals of the Assn. of American Geographers, 101(1): 1-20.

Owusu, V. Abdulai, A. and Abdul-Rahman, S. 2011**.** Non-farm work and food security among farm households in Northern Ghana**.** Food Policy, 36(2): 108-118.

Oxfam, 2013. No Accident: Resilience and the inequality of risk. Oxfam Briefing Paper, 172.

Oxfam. 2014. Resilience in times of Food Insecurity: Reflecting on the experiences of women's organizations. Oxfam Canada.

Palacios, A.C. and Mehta. P.K. 2011. Food Security and Gender: A Case of Mewat District of Haryana, India. Inst. Rural Res Devp. Haryana, p: 1-43.

Patnaik, U. 2008. Theorising Food Security and Poverty in the Era of economic Reforms. Social Scientist, p: 33.

Penders, C. L. and Staatz, J. M. 2001. The impact of household-level determinants on child health and nutrition: cross-country evidence from West Africa. Annual meeting of Agricl. Applied Econ. Assn., Chicago. Illinois.

Premanandh, J. 2011. Factor affecting food security and contribution of modern technologies in food sustainability. J. Sci. Food Agric., 91: 2707-2714.

Public service commission notes. 2017. Meghalaya Food Security.

Quisumbing, A. R. 1995. Gender Differences in Agricultural Productivity: Survey of Empirical Evidence. FCND Discussion Paper 5. Int. Food Policy Res. Inst.,Washington, DC.

Quisumbing, Agnes R. and McClafferty, Bonnie. 2006. Using gender research in development. Food Security in Practice Technical Guide Series 2. Int. Food Policy Res. Inst.,Washington, D.C.

Raihan, S. Fatehin, S. and Haque, I. 2009. Access to land and other natural resources by rural poor: The case of Bangladesh, 38621: 12-49

Rao, N. Pradhan, M. and Roy, D. 2017. Gender Justice and Food Security in India A Review.

Rao, N. 2011. Women's Access to Land, An Asian Perspective. Expert Group Meeting Enabling Rural Women's Econ. Empowerment. Inst., Opportunities and Participation. UN Women, Accra Ghana, pp. 1-20.

Rao, N. 2012. Male 'Providers' and Female 'Housewives': A Gendered co-performance in Rural North India. Development and Change. 43 (5): 1025-1048.

Ribar, D.C. and Hamrick, K. S. 2003. Dynamics of poverty and food sufficiency. U.S. Dept. Agric. Econ. Res. Service, Food Assist. Nutrition Res. Reports.

Rose, D. Gundersen, C. and Oliveira, V. 1998. Socio-Economic Determinants of Food Insecurity in the United States. U.S. Dept. Agric. Econ. Res., Technical Bulletin No., 1869.

Roy, R. Singh, N.U. Dkhar, D.S. Mohanty, A.K. Singh S.B. and Tripathi A.K. 2015. Food Security in North-East Region of India — A State-wise Analysis. Agricl. Econ. Res. Review, 28: 259-266

Sainath, P. 2014. Maharashtra Crosses 60,000 Farmer Suicides. Peoples archives of rural India.

Saravia-Matus, S. Paloma, S. G. Y. and Mary, S. 2012. Economics of Food Security : Selected issues. Bio-based Applied Econ., 1(1): 65-80.

Schwarz, A.M. Béné, C. Bennett, G. Boso, D. Hilly, Z. Paul, C. Posala, R. Sibiti, S. and Andrew, N. 2011. Vulnerability and resilience of remote rural communities to shocks and global changes, Empirical analysis from Solomon Islands. Global Environmental Change, 21(3): 1128-1140.

Singh, S. 2003. Contract Farming in India: Impacts on Women and Child Workers. London Int. Inst. Envt. Devp., p: 111.

Smith, L. C. and Haddad, L. 2002. How potent is economic growth in reducing undernutrition? What are the pathways of impact? New cross-country evidence. Econ. Devp. Cultural Change, **51**(1): 55-76.

Smith, L. C. and Subandoro, A. 2007. Measuring food security using household expenditure surveys. Food Security in Practice Technical guide series. Int. Food Policy Res. Inst. Washington, DC. pp. 147.

Smyth, I. and Sweetman, C. 2015. Introduction: Gender and Resilience. Gender Devp., 23(3): 405-414.

Temesgen, K. Jema, H. Belaineh, L. and Girma, M. 2016. Econometric Analysis of Rural Households' Resilience to Food Insecurity in West Shoa, Ethiopia. J. Food Security, 4(3): 58-67.

Tendall, D.M. Joerin, J. Kopainsky, B. Edwards, P. Shreck, A. Le, Q. B. Kruetli. P. Grant, M. and Six, J. 2015. Food system resilience. Glob. Food Sec., 6: 1723.

Tripathy, B. 2018. Lakshadweep, Meghalaya Have Most Women Land Holders; Punjab, West Bengal Fewest. India Spend.

Tripurainfo. 2019. Agriculture Scenario of Tripura. West Tripura, India.

UNDP. 2012. Habtezion, S. 2012. Gender, agriculture and food security, Gender and Climate Change. U.N. Devp. Prog., Training module 4.

UNICEF. 2018. Malnutrition rates remain alarming: stunting is declining too slowly while wasting still impacts the lives of far too many young children. Retrievedfrom http://data.unicef.org/topic/nutrition/malnutrition. Accessed in December 2018.

United Nations. 1975. Report of the World Food Conference, Rome, New York, 5-16 November 1974.

USAID. 2012. Building Resilience to Current Crisis: USAID Policy and Program Guidance, Washington, DC.

Usfar, A. A. Fahmida, U. and Februhartanty, J. 2007. Household food security status measured by the US Household Food Security/Hunger Survey Module (USFSSM) is in line with coping strategy indicators found in urban and rural Indonesia. Asia Pac. J. Clin. Nutr., 16(2): 368-374

Vaitla, B. Coates, J. Glaeser, L., Hillbruner, C. Biswal, P. and Maxwell, D. 2017. The measurement of household food security: Correlation and latent variable analysis of alternative indicators in a large multi-country dataset. Food Policy, 68: 193–205.

World Bank. 1986. Poverty and Hunger: Issues and Options for Food Security in Developing Countries. Washington DC.

Zahid, A. and Ahmed, M. 2013. Socio-Economic Determinants of Household Food Insecurity in Pakistan. Munich Personal Repec Archive. Pakistan, p: 1-21

APPENDIX-A

"GENDER PERSPECTIVE ANALYSIS OF FARM HOUSEHOLDS IN RESPECT TO FOOD SECURITY IN NORTH EASTERN INDIA"

INTERVIEW SHEDULE

(For household head)

Section A

1. GENERAL INFORMATION

Name of respondent

Gender: **Age**: Yrs

Household Identification No :

State: **:**

District: **:**

Village: **:**

Block: **:**

Phone number :

Household head men/women :

i. Family size (>14 years) Adult Male ----------

(Mention in number) Adult Female ----------

ii. Family type Nuclear family ☐

(Tick appropriate option) Joint family ☐

iii. Number of children (< 14 years) (mention in number) Boy ---------- Girl ----------

iv. Education

(Tick appropriate option)

a. Illiterate ☐

b. Only read ☐

c. Read and write ☐

d. Primary level (0-5 class) ☐

e. Middle level (6-8 class) ☐

f. High school level (9-10 class) ☐

g. Higher secondary level (11-12 class) ☐

h. Graduate and Above ☐

v. Annual household income/Income diversity of the household members (for resilience)

Sector	**Services/work/activity**	**No. of members**		**Approx annual income (₹.)**
		Men	**Women**	
Public	Government services			
	labour works (as MNREGA)			
Private	Farming			
	Business/trade			
	Livestock			
	Agricultural wage labour			
	Handicraft			
	Housemaid			
	Tailoring			
	Teaching in private School			
Other	Other Wage labour			
	Odd jobs			
	Any other specify			

vi. Assets (Resilience)/ (Material possession/Livestock possession)

a. Land ownership (area)

Type of land	**Upland (Ha)**	**Medium land (Ha)**	**Lowland(Ha)**	**Total area (Ha)**
Own land				
Lease in				
Lease out				
Total				

a.1. Do you or any of household members have land ownership? **Yes/No**

b. Productive Assets

Sl. No.	**Items**	**Numbers**	**Monetary Value (₹.)**
1.	Agricultural land (pieces/plot)		
2.	Large livestock (oxen, cattle)		
3.	Small livestock (goats, pigs, sheep)		
4.	Chickens, ducks, turkeys, pigeons		
5.	Fish pond or fishing equipment		
6.	Farm equipment (non-mechanized)		
7.	Farm equipment (mechanized)		

c. Non-Productive Assets

Sl. No.	Items	Numbers	Monetary Value (₹.)
1.	Non-farm business equipment		
2.	House (and other structure)		
3.	Large consumer durables (fridge, TV, sofa)		
4.	Small consumer durables (radio, cookware)		
5.	Cell phone		
6.	Other land not used for agricultural purposes (pieces, residential or commercial land)		
7.	Means of transportation (bicycle, motorcycle, car)		

vii. Cosmopoliteness (household head): (Tick appropriate option)

Frequency and purpose of visit to the nearest towns and city in the last 1 year

Particulars	Never	Seldom	Once a year	2-3 times year	Once a month	Once a week	2-3 times a week	Almost daily
General purpose								
Entertainment								
Personal								
Related to Agri.								
Grocery and ration								
Hospital/ check up								
Other								

viii. Social Participation (household head):

Formal		
Member of any social organization?	**Yes**	
	No	
Membership/office bearer at village/block level	**One**	
	More than one	
Membership/office bearer at district/state/national level	**One**	
	More than one	
Non-formal: Do you have active participation in any village activity?	**Yes**	
	No	

ix. Food Source (household):

Sl. No.	Items	(Tick appropriate option)			Amount in percentage		
		Cereals	**Vegetable**	**Other (Meat, fish, egg, etc)**	**Cereals**	**Vegetable**	**Non-Veg (Meat, fish, egg, etc)**
1.	Grow it and consume from their own stocks						
2.	Receive it as a transfer from relatives, members of the community, or foreign donors						
3.	Purchase it in the marketplace						
4.	Gather from forest/ponds/rivers						
5.	Grow it and consume from their own stocks + Purchase						
6.	Government ration shop						
7.	Other						

ix. Dietary Diversity

In normal days

Breakfast	*snack*	*Lunch*	*snack*	*Dinner*	*snack*

Sl. No.	Food group	Examples	YES=1 NO=0	Frequency (Weekly)	Amount intake weekly (Kg)
1	***CEREALS***	corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge or other grain products) + insert local foods e.g.			
2	***WHITE ROOTS AND TUBERS***	white potatoes, white yam, white cassava, or other foods made from roots			
3	***VITAMIN A RICH VEGETABLES AND TUBERS***	pumpkin, carrot, squash, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e.g. red sweet pepper)			
4	***DARK GREEN LEAFY VEGETABLES***	Dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, spinach			
5	***OTHER VEGETABLES***	other vegetables (e.g. tomato, onion, eggplant) + other locally available vegetables			
6	***VITAMIN A RICH FRUITS***	ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya, dried peach, and 100% fruit juice made from these + other locally available vitamin A rich fruits			
7	***OTHER FRUITS***	other fruits, including wild fruits and 100% fruit juice made from these			
8	***ORGAN MEAT***	liver, kidney, heart or other organ meats or blood-based foods			
9	***FLESH MEATS***	beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds, insects			

10	***EGGS***	eggs from chicken, duck, guinea fowl or any other egg			
11	***FISH AND SEAFOOD***	fresh or dried fish or shellfish			
12	***LEGUMES, NUTS AND SEEDS***	dried beans, dried peas, lentils, nuts, seeds or foods made from these			
13	***MILK AND MILK PRODUCTS***	milk, cheese, yogurt or other milk products			
14	***OILS AND FATS***	oil, fats or butter added to food or used for cooking			
15	***SWEETS***	sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes			
16	***SPICES, CONDIMENTS, BEVERAGES***	spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages			
Household level only		Did you or anyone in your household eat anything (meal or snack) OUTSIDE the home yesterday?			

x. Expenditure pattern:

Sl. No.	Food Items	Amount (₹./month)	Remarks
1	Cereals		
2	Vegetable (Tubers/roots/ Vitamin A Rich Vegetables/ Dark Green Leafy Vegetables/ Other Vegetables)		
3	Fruits (Vitamin A Rich Fruits like apples, papaya etc/other fruits)		
4	Meat and eggs (chicken/beef/Pork/organ meat)		
5	Fish And dryfish		
6	Legumes, Nuts And Seeds		
7	Milk And Milk Products		
8	Oils And Fats/ Spices, Condiments,		
9	Sweets		
10	Beverages		
	OTHER		
11	Habits, alcohol and cigarette, tobacco, beetle nut (pan)		
12	Education/school fees		
13	Consumer goods: cloths, cosmetics, ornamental/jewellery /yr		
14	Firewood/kerosene/gas		
15	Electricity		
16	Transport (fare/ petrol charges)		
17	Rituals/ceremonies (wedding, funeral and other ceremonies)		
18	Housing (repair/new/improvement)		
19	Productive investments: purchase/rent of land, input, livestock feed, vetenery expenses. Farm machinery/year		
20	Repay of loans		
21	Farm expenditure		
22	Medical expenditure		
	Total expenditure		

Section B

Food Security

No.	Questions	Response option	Code
1.	Which of these statements best describes the food eaten in your household in the last 12 months?	[1] Enough of the kinds of food we want to eat [SKIP 1a and 1b] [2] Enough but not always the kinds of food we want [SKIP 1a; ask 1b] [3] Sometimes not enough to eat [Ask 1a; SKIP 1b] [4] Often not enough [Ask 1a; SKIP 1b] [ ] DK or Refused (SKIP 1a and 1b)	

1a.	. [IF OPTION 3 OR 4 SELECTED, ASK] Some reasons why people don't always have enough to eat. Please tick appropriate reason			
		YES	**NO**	**DK**
	Not enough money for food			
	Not enough time for shopping or cooking			
	Too hard to get to the store			
	On a diet			
	No working stove available			
	Not able to cook or eat because of health problems			

1b.	[IF OPTION 2 SELECTED, ASK] Some reasons why people don't always have the quality or variety of food they want. Please tick appropriate reason if applicable			
	Not enough money for food			
	Kinds of food (I/we) want not available			
	Not enough time for shopping or cooking			
	Too hard to get to the store			
	On a special diet			

Preliminary screen
Stage 1(2-6 questions)

2.	Several statements that people have made about their food situation. For these statements, please tick whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months, that is, since last (name of current month). ("we" if household has more than one member, "I" if only one person in the household.				
	Questions	**Response Option**			
		Often true	**Sometimes true**	**Never true**	**DK or Refused**
	The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?				
3.	"The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?				
4.	"(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?				
[IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q5 - 6; OTHERWISE SKIP TO 1st-Level Screen.]					
5.	"(I/we) relied on only a few kinds of low-cost food to feed (my/our) child/the children) because (I was/we were) running out of money to buy food." Was that				

	often, sometimes, or never true for (you/your household) in the last 12 months?				
6.	"(I/We) couldn't feed (my/our) child/the children) a balanced meal, because (I/we) couldn't afford that." Was that often, sometimes, or never true for (you/your household) in the last 12 months?				

1st-level Screen (screener for Stage 2): If AFFIRMATIVE RESPONSE to ANY ONE of Questions 2-6 (i.e., "often true" or "sometimes true") OR response [3] or [4] to Question 1 (if administered), then continue to Stage 2; otherwise, skip to end.

Stage 2:

Questions 7-11 --ask households passing the 1st-level Screen:

[IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q7; OTHERWISE SKIP TO Q8]

		Often true	**Sometimes true**	**Never true**	**DK or Refused**
7	"(My/Our child was/The children were) not eating enough because (I/we) just couldn't afford enough food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?				

		Yes	**No (Skip 8a)**	**DK (Skip 8a)**
8	In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?			

		Almost every	**Some months but not**	**Only 1 or 2 months**	**DK or R**

		month	**every month**		
8a	[IF YES ABOVE, ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?				
			Yes	**No**	**DK or R**
9	In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?				
10	In the last 12 months, were you every hungry but didn't eat because you couldn't afford enough food?				
11	In the last 12 months, did you lose weight because you didn't have enough money for food?				

2nd-level Screen (screener for Stage 3): If AFFIRMATIVE RESPONSE to ANY ONE of Questions 7 through 11, then continue to Stage 3; otherwise, skip to end.

Stage 3: Questions 12-16 --ask households passing the 2nd-level Screen:

			Yes	**No (Skip 12a)**	**DK or R (SKIP 12a)**	
12	In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?					
		Almost every month	**Some months but not every month**		**Only 1 or 2 months**	**DK or R**
12a.	[IF YES ABOVE, ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?					

[IF CHILDREN UNDER 18 IN HOUSEHOLD ASK 13-16; OTHERWISE SKIP TO END.]

		Yes	No	DK
13.	The next questions are about children living in the household who are under 18 years old. In the last 12 months, since (current month) of last year, did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food?			
14.	In the last 12 months, did (CHILD'S NAME/any of the children) ever skip meals because there wasn't enough money for food?			

		Almost every month	Some months but not every month	Only 1 or 2 months	DK or R
14a	[IF YES ABOVE ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?				

		Yes	No	DK or R
15	In the last 12 months, (was your child/ were the children) ever hungry but you just couldn't afford more food?			
16	In the last 12 months, did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food?			

Section C

Resilience to Food Insecurity

1. Access to Basic Services (ABS):

Health

i. Physical Access to health care

		No access to services	**Got access to services after time limit**	**Got access to services after time limit within time limit**
A	Childhood and maternity health			
B	Infectious Disease			
C	Non-communicable disease			
D	Access to medicines			

ii. Health care Quality

		Good	**Neutral**	**Bad**
A	Complete Health check up			
B	Women Health Service			
C	Emergency medical service			
D	Preventive healthcare			
E	Comprehensive Health check			
F	Medical evacuation services			
G	Patient Health Record services			
H	Medical Physicist			
I	Health treatment services			
J	Medical Test Services			
K	Child medical treatment service			
L	Computer health check service			

a. Is your household member able to access quality health care services? Y/N

iii. Does your household have access to following services?

Sl. No.	**Items**	**YES/NO**
1	Drinking Water	
2	Electricity connection	
3	Solar Connection	
4	Toilet	
5	Cooking gas	
6	Telecommunication network	
7	Fixed landline	
8	Mobile Connection	

Education

A.	Do your children have access to school?		Yes/No
		Boy	
		Girl	
B.	Are any of children from household drop out from school?		

C. If yes, reasons

Sl. No.	ITEMS	Yes/No
1.	Far from home/ excessive distance from school	
2.	Conflict	
3.	Poor quality of school	
4.	Lack of teachers	
5.	Lack of basic facility (Blackboard, Table, Chair, toilets etc)	

D. Were you able to access quality education in your early life? **Y/N**

Quality of education

Sl. No.	**Services**	**Very poor**	**Poor**	**Fair**	**Good**	**Very Good**	**Excellent**
1.	Teaching						
2.	Basic Facilities						
3.	Infrastructure						
4.	Transportation facility						
5.	Behaviour of teacher towards students						
6.	Discipline						

Market

A. Is there any market near your locality? Yes/No.
B. How far (in km) from your home and how long does it take to reach?
Time…….. Distance…….Km

		Yes/No
C.	Access to market	
D.	Mode of travel	
	Bus	
	Private Vehicle	
	Auto	
	Two wheeler/motorcycle/scooty	
	Bicycle	
	Walk	

iv. Mobility and Transport limitations/quality of transportation services

Sl. No.	**Items**	**Yes/No.**	**Good**	**Neutral**	**Bad**
1.	Bus services				
2.	Train				
3.	Auto-rickshaw/Local Taxi				

2. Assets (A): [SKIP TO ASSETS/MATERIAL POSSESSION SECTION IN SECTION A]

3. Social safety net (SSN):

	Items	**Y/ N**	**In cash (Amnt. in Rs.)**	**In kind**	**Frequency of assistance in last 1 year**			**Quality of assistance**			
					Most of the time	**sometimes**	**Never**	**Excellent**	**Very good**	**Fair**	**Bad**
A.	**Formal**										
1.	International Agency										
2.	Charities										
3.	NGOs										
4.	Job assistance										
5.	Govt. Schemes										
B.	**Informal**										
1.	Friends										
2.	Relatives										
3.	Neighbours										

4. Adaptive capacity (AC):

a. **Diversity of income sources** [SKIP TO ANNUAL HOUSEHOLD INCOME IN SECTION A]

b. Coping strategy index

Sl. No.	**Coping Strategies**	**Y/N**	**Frequency**		
			Most of the time	**Sometime**	**Never**
1	Reducing quantity of food				
2	Collecting wild vegetables				
3	Sell cow/pig				
4	Mother skips a meal/eats less for children				
5	Reducing quality of food				
6	Taking money from savings				
7	Taking food loan				
8	Selling hens and ducks				
9	Eating rice with salt and/or chilies				
10	Eating once a day				
11	Selling goats and sheep				
12	Taking money loan with interest to buy food				
13.	Eating at relatives place				
14.	Migration				
15.	Begging house to house/ different village				
16.	Skip meals				
17.	Sell out household items				
18	Taking loan in exchange of gold jewellery/household valuable item (Mortgage)				

c. Capacity to keep up in future (Please Tick)

Very Small extent	**Small extent**	**Some extent**	**Somewhat great extend**	**Great extend**

5. Sensitivity

a. Animal Shock

Sl. No.	Items	No. of stolen/dead	Monetary Value (₹.)
1.	Large livestock		
2.	Small Livestock		

b. Crop Shocks

Sl. No.	Crop loss due to	Loses in Kg	Monetary Value (₹.)
1.	Drought		
2.	Flood		
3.	Crop Disease		
4.	Pest Out break		
5.	Fall in output prices		
6.	Increase in input prices		
7.	Water shortage		

c. *Shocks*

	Item	
a.	Whether affected by the shock for the first time in five years? Yes/No.	
b.	Number of shocks in a year (in number)	

Section D

1. Constraints

Sl. No.	Items	Y/N	Rank
A	**Agro-economic Constraints**		
1.	Climate change and variability		
2.	Limited access to land		
3.	Low crop yields		
4.	High food prices		
5.	Shortage of farm labour		
B	**Institutional constraints**		
6.	Lack of access to labour saving devices -		
7.	Inadequacy and lack of access to improved agricultural inputs (seeds, fertilizer, agro-chemicals and irrigation) -		
8.	Lack of education and skills		
9.	Lack of access to market		
10.	Weak support services (research, extension and finance)		
11.	Religious and ethnic conflicts		
12.	Poor nutrition education		
13.	Poor rural infrastructure (roads)		
14.	Poor sanitation		
C.	**Political constraints**		
15	Rapid population growth Limited access to land		
16.	Political problems (corruption, collusion and nepotism)		
17.	Lack of consistent food supply		
18.	Poor post-harvest processing and storage technologies		
29.	Chronic diseases such as HIV/AIDS		
D.	**Technological constraint**		

20.	Lack of access to clean water		
21.	Inadequacy and lack of access to improved agricultural inputs		
22.	Lack of access to labour saving devices		
23.	Poor health services		
24.	Food taboos		
25.	Poor food habits		
26.	Poor health status		

2. Suggestions

Sl. No.	**Suggestions**

APPENDIX-B

"GENDER PERSPECTIVE ANALYSIS OF FARM HOUSEHOLDS IN RESPECT TO FOOD SECURITY IN NORTH EASTERN INDIA"

INTERVIEW SHEDULE

(Individual respondent)

Section A

1. GENERAL INFORMATION

Name of respondent

Gender: **Age**: Yrs

Household Identification No :

State: **:**

District: **:**

Village: **:**

Block: **:**

Phone number :

i. **Education [Skip this for household head]**

(Tick appropriate option)

a.	Illiterate	☐
b.	Only read	☐
c.	Read and write	☐
d.	Primary level (0-5 class)	☐
e.	Middle level (6-8 class)	☐
f.	High school level (9-10 class)	☐
g.	Higher secondary level (11-12 class)	☐
h.	Graduate and Above	☐

ii. Annual individual income (₹.)

Sector	**Items**	**Approx income (monthly in (₹.)**
Public	Government services	
	Labour works (as MNREGA)	
Private	Farming	
	Business/trade	
	Livestock	
	Agricultural wage labour	
	Handicraft	
	Housemaid	
	Tailoring	
	Teaching in private School	
Other	Other Wage labour	
	Odd jobs	
	Any other specify	

v. **Assets (Resilience)/ (Material possession/Livestock possession**

Land ownership (area):

a. Do you have land ownership? **Yes/No**

Type of land	**Upland**			**Medium land**			**Lowland**			**Total area**
	Area (Ha)	**A**	**C**	**Area (Ha)**	**A**	**C**	**Area (Ha)**	**C**	**A**	
Own land										
Lease in										
Lease out										
Total										

Note: A=Access, C= Control

Productive Assets

Items	**Numbers**	**Monetary Value (₹.)**	**Access**	**Control**
Agricultural land (pieces/plot)				
Large livestock (oxen, cattle)				
Small livestock (goats, pigs, sheep)				
Chickens, ducks, turkeys, pigeons				
Fish pond or fishing equipment				
Farm equipment (non-mechanized)				
Farm equipment (mechanized)				

Non-Productive Assets

Items	**Numbers**	**Monetary Value (₹.)**	**Access**	**Control**
Non-farm business equipment				
House (and other structure)				
Large consumer durables (fridge, TV, sofa)				
Small consumer durables (radio, cookware)				
Cell phone				
Other land not used for agricultural purposes (pieces, residential or commercial land)				
Means of transportation (bicycle, motorcycle, car)				

Cosmopoliteness: (Skip for household head)

Frequency and purpose of visit to the nearest towns and city in the last 1 year

Particulars	Never	Seldom	2-3 times year	Once a year	Once a month	Once a week	2-3 times a week	Almost daily
General purpose								
Entertainment								
Personal								

Related to Agri.								
Grocery and ration								
Hospital/ check up								
Other								

Social Participation (Skip for household head):

Formal		
Member of any social organization?	**Yes**	
	No	
Membership/office bearer at village/block level	**One**	
	More than one	
Membership/office bearer at district/state/national level	**One**	
	More than one	
Non-formal:	**Yes**	
Do you have active participation in any village activity?	**No**	

Dietary Diversity:

In normal days

Breakfast	*snack*	*Lunch*	*snack*	*Dinner*	*snack*

Q. No.	Food group	Examples	YES=1 NO=0	Frequency (Weekly)	Amount intake weekly
1	***CEREALS***	Corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g. bread, noodles, porridge or other grain products) + insert local foods e.g.			
2	***WHITE ROOTS AND TUBERS***	white potatoes, white yam, white cassava, or other foods made from roots			
3	***VITAMIN A RICH VEGETABLES AND TUBERS***	pumpkin, carrot, squash, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e.g. red sweet pepper)			
4	***DARK GREEN LEAFY VEGETABLES***	Dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, spinach			
5	***OTHER VEGETABLES***	other vegetables (e.g. tomato, onion, eggplant) + other locally available vegetables			
6	***VITAMIN A RICH FRUITS***	ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya, dried peach, and 100% fruit juice made from these + other locally available vitamin A rich fruits			
7	***OTHER FRUITS***	other fruits, including wild fruits and 100% fruit juice made from these			
8	***ORGAN MEAT***	liver, kidney, heart or other organ meats or blood-based foods			

9	***FLESH MEATS***	beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds, insects			
10	***EGGS***	eggs from chicken, duck, guinea fowl or any other egg			
11	***FISH AND SEAFOOD***	fresh or dried fish or shellfish			
12	***LEGUMES, NUTS AND SEEDS***	dried beans, dried peas, lentils, nuts, seeds or foods made from these (eg. hummus, peanut butter)			
13	***MILK AND MILK PRODUCTS***	milk, cheese, yogurt or other milk products			
14	***OILS AND FATS***	oil, fats or butter added to food or used for cooking			
15	***SWEETS***	sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes			
16	***SPICES, CONDIMENTS, BEVERAGES***	spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages			
	Individual level	Did you eat anything (meal or snack) OUTSIDE the home yesterday?			

i. **Expenditure pattern:**

	Food Items	**Amount (Rs/month)**	**Remark**
1	Food and Beverages		
2.	Habits, alcohol and cigarette, tobacco, beetle nut (pan)		
3.	Consumer goods: cloths, cosmetics, ornamental/jewellery /yr		
4.	Transport (fare/ petrol charges)		
5.	Rituals/ceremonies (wedding, funeral and other ceremonies)		
6	Productive investments: purchase/rent of land, input, livestock feed, vetenery expenses. Farm machinery/year		
7.	Repay of loans		
8.	Farm expenditure		
9.	Medical expenditure		
	Total expenditure		

Section B

Dimensions of food security

1. Availability

Sl.	**Items**	**Yes/No**	**Code**
A.	Enough food available for consumption		
B.	Eat limited variety of food due to lack of resources		**Code**
C.	Food that preferred not available in store/market		
D.	Decision on production and harvest		
Code: Rare=1, Sometime=2, Often=3			

2. Access

Sl.	**Items**	**Yes/no**	**Code**
A.	Access to nutritious vegetable/fruit		
B.	Access to balance meal		
C.	Could not eat particular food due to some cultural/traditional restrictions		
D.	Economic access to food (decision on purchase/sell of food)		
Code: Rare=1, Sometime=2, Often=3			

3. Use and utilization

Sl.	**Items**	**Yes/No**	**Code**
A.	Avoid particular nutritious food (fruits/vegetables) due to lack of knowledge		
B.	Lack of knowledge of nutritious food or balance diet		
Code: Rare=1, Sometime=2, Often=3			

4. Stability

		Yes/No	**Code**
A.	Adequate access to food during price shock		
B.	Adequate access to food during conflict and natural disaster		
C.	Adequate access to food during financial and economic crisis		
Code: Rare=1, Sometime=2, Often=3			

Section C

Dimensions of Resilience

1. Access to basic services

Health

i. Physical Access to health care

a. Do you have access to health facilities? **Yes/No**

Sl. No.	Items	**Code**
1.	Access to services for infectious Disease	
2.	Access to services non-communicable disease	
3.	Access to medicines	
Code: No access to services=1 Got access to services after time limit=2 Got access to services after time limit within time limit=3		

v. Health care Quality

5.3.6.1 Were you able to access quality health care services? Y/N

Sl. No.	**Items**	**Good**	**Neutral**	**Bad**
1.	Complete Health check up			
2.	Women Health Service			
3.	Emergency medical service			
4.	Preventive healthcare			
5.	Comprehensive Health check			
6.	Medical evacuation services			
7.	Patient Health Record services			
8.	Medical Physicist			
9.	Health treatment services			
10.	Medical Test Services			
11.	Child medical treatment service			
12.	Computer health check service			

Education

Quality of education system

A. Were you able to access quality education in your early life? **Y/N**

Market and Transport

		Yes/No
C.	Access to market	
D.	Mode of travel Bus/private vehicle/auto/walk/bicycle/two wheeler to nearby city/town, market, hospital and work	

vi. Does your household have access to following services?

Sl. No.	**Items**	**YES/NO**
1	Drinking Water	
2	Electricity connection	
3	Solar Connection	
4	Toilet	
5	Cooking gas	
6	Telecommunication network	
7	Fixed landline	
8	Mobile Connection	

2. Assets: [Skip to section A Assets]

i. Productive assets

ii. Non productive assets

3. Social Safety nets

Items	**Y/ N**	**In cash (Amnt. in Rs.)**	**In kind**	**Frequency of assistance in last 1 year**			**Quality of assistance**			
				Most of the time	**sometimes**	**Never**	**Excellent**	**Very good**	**Fair**	**Bad**
Formal										
International Agency										
Charities										
NGOs										
Job assistance										
Govt. Schemes										
Informal										
Friends										
Relatives										
Neighbours										

1. **Adaptive capacity**
   - **c. Diversity of income sources [SKIP to section A]**
   - d. Coping strategy index

Sl. No.	**Coping Strategies**	**Y/N**	**Frequency**		
			Most of the time	**Sometime**	**Never**
1	Reducing quantity of food				
2	Collecting wild vegetables				
3	Sell cow/pig				
4	Skips a meal/eats less for children				
5	Reducing quality of food				
6	Taking money from savings				
7	Taking food loan				
8	Selling hens and ducks				
9	Eating rice with salt and/or chilies				
10	Eating once a day				
11	Selling goats and sheep				
12	Taking money loan with interest to buy food				
13.	Eating at relatives place				
14.	Migration				
15.	Begging house to house/ different village				
16.	Skip meals				
17.	Sell out household items				
18	Taking loan in exchange of gold jewellery/household valuable item (Mortgage)				

c. Capacity to keep up in future (Please Tick)

Very Small extent	**Small extent**	**Some extent**	**Somewhat great extend**	**Great extend**

2. Sensitivity

d. Animal Shock

Sl. No.	Items	No. of stolen/dead	Monetary Value (₹.)
1.	Large livestock		
2.	Small Livestock		

e. Crop Shocks

Sl. No.	Crop loss due to	Loses in Kg	Monetary Value (₹.)
1.	Drought		
2.	Flood		
3.	Crop Disease		
4.	Pest Out break		
5.	Fall in output prices		
6.	Increase in input prices		
7.	Water shortage		

f. Shocks

a. Whether affected by the shock for the first time in five years? Y/N

b. Number of shocks in the last one year

RESUME

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