HELVETAS
BANGLADESH

Final report

Study on Identification of Knowledge, Attitude and Practice Level Gaps in Nutrition Sensitive Agricultural Technologies and Their Practices, and Explore Possible Options to Address Gaps

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Study on Identification of Knowledge, Attitude and Practice Level Gaps in Nutrition Sensitive Agricultural Technologies and Their Practices, and Explore Possible Options to Address Gaps

For,

HELVETAS, Bangladesh

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We are very thankful to all the respondents of this study. Their contribution helped us in making a rigorous analysis which we believe will help Helvetas Swiss Intercooperation in its future endeavors in Bangladesh.

Acronyms

ACI	Advanced Chemical Industries
BDT	Bangladeshi Taka
BKB	Bangladesh Krishi Bank
CHT	Chattogram Hill Tracts
CHTDB	Chittagong Hill Tracts Development Board
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GAP	Good Agricultural Practices
HH	Household
IDI	In-depth Interview
IGA	Income Generating Activity
IU	International Unit
KG	Kilogram
KII	Key Informant Interview
LEAN	Leadership to Ensure Adequate Nutrition
MATH	Modern Agriculture Technology for the Hill
MDD-W	Minimum Dietary Diversity for Women
MT	Metric Ton
NGO	Non-Governmental Organization
NSA	Nutrition Sensitive Agriculture
OFSP	Orange Flesh Sweet Potato
QPM	Quality Protein Maize
UAO	Upazila Agriculture Officer
ULO	Upazila Livestock Officer
UNDP	United Nations Development Programme

Executive summary

Background and objective: "Leadership to Ensure Adequate Nutrition (LEAN)" is a United Purpose led consortium project funded by The European Union. The aim of the project is to improve maternal and child health nutrition in the Chittagong Hill Tracts (CHT) of Bangladesh. The action will have three results to achieve and as a technical partner for result-3 titled "Strengthening horizontal and vertical alliances for nutrition sensitive and climate smart value chains" HELVETAS is assigned to bring technical expertise and experiences of working on market system and nutrition sensitive value chain development. The broader objective of this study is to identify knowledge, attitude and practice level gaps on climate change resilient technologies and methodologies which directly or indirectly contribute to nutrition and gender sensitive agriculture and value chain development and select suitable options to address those gaps in the context of CHT.

Methodology: This study followed qualitative research method to conduct the study. The study team analyzed primary data collected along with the available secondary data from valid sources. The assessment was conducted in 9 upazilas under three districts from the CHT area. The 9 upazilas are: Ruma and Rowangchari of Bandarban district; Lakshmichari and Mohalchari of Khagrachari district and Belaichchari, Juraichhari, Rajasthali, Barkal and Naniarchar of Rangamati district. The study was conducted in two stages: Identification of potential stakeholders involved in nutrition-sensitive agriculture and detailed assessment of the selected knowledge, attitude and practice of nutrition sensitive agriculture by the producers and producers' groups along with supports they are getting from local service providers. A total of **18 FGDs, 18 KIIs and 45 IDIs** with the key value chain actors and key stakeholders were conducted. The response of the participants (producers groups) was scored using 5-point Likert scale.

Findings: Nutrition sensitive agriculture is a food-based approach to agricultural development that puts nutritionally rich foods, dietary diversity, and food fortification at the heart of overcoming malnutrition and micronutrient deficiencies. The **knowledge level** of the respondents on different aspects of the nutrition-sensitive agriculture is presented below:

Upazila	Knowledge-level score
Ruma	1-4 (very low to good)
Rowangchari	1-4 (very low to good)
Lakshmichari	1-5 (very low to excellent)
Mohalchari	1-5 (very low to excellent)
Belaichchari	2-5 (Poor to excellent)
Juraichhari	2-5 (Poor to excellent)
Rajasthali	2-5 (Poor to excellent)
Barkal	2-5 (Poor to excellent)
Naniarchar	2-5 (Poor to excellent)

The respondents, overall, have very poor knowledge on nutrition sensitive agriculture related issues. Respondents identified survival, energy and nutrition as objectives of food consumption. Knowledge on food, nutritious food and safe food was observed to be very low among the respondents. In case of Khagrachari and Rangamati districts the knowledge of the respondents was reported to be better compared to the respondents of Bandarban district. Across the districts, the participants have poor knowledge on climate change and on its causes. The participants of the FGD have excellent knowledge on higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family. Respondents were reported to have average knowledge on improved production practices including GAP.

The **attitude level** of the respondents on different aspects of the nutrition-sensitive agriculture is presented below:

Upazila	Attitude-level score
Ruma	2-5 (Poor to excellent)

Rowangchari	2-5 (Poor to excellent)
Lakshmichari	3-5 (Average to excellent)
Mohalchari	3-5 (Average to excellent)
Belaichchari	3-5 (Average to excellent)
Juraichhari	3-5 (Average to excellent)
Rajasthali	3-5 (Average to excellent)
Barkal	3-5 (Average to excellent)
Naniarchar	2-5 (Poor to excellent)

The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods was, in general observed to be poor. Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation was reported to be good. When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits; such as different locally grown vegetables and fruits like mango, banana, pineapple etc. The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them. The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Decision in these respects is jointly taken by wife and husband. The participants' attitude towards women empowerment to improve production and consumption of nutritious foods in the HH appear to be good.

The **practice level** of the respondents on different aspects of the nutrition-sensitive agriculture is presented below:

Upazila	Practice-level score
Ruma	1-2 (Very poor to poor)
Rowangchari	1 (Very poor)
Lakshmichari	2 (poor)
Mohalchari	2 (poor)
Belaichchari	2 (poor)
Juraichhari	2 (poor)
Rajasthali	2 (poor)
Barkal	2 (poor)
Naniarchar	2 (poor)

The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry is very poor among the study respondents and problems of practicing improved production technology are very high. However the livestock group, comparatively have higher usage of GAP adaption practices, such as- usage of hatching pots for poultry. The participants, across the study area, have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Due to the seasonal impact, inhabitants preserve the dried up vegetables from the summer and winter harvest to use it during the rainy season. The participants reported that they do not keep the rice gruel (fen) after cooking rice and they clean the vegetables after cutting. Also they prepare most of the foods through cooking/boiling in high heat. The participants usually eat 3 times a day. Rice and vegetables is usual menu during the 3 meals. Consumption of chicken, beef, fish, milk and egg is very low among the inhabitants. Pork is consumed on a weekly basis, except for the Muslim inhabitants. Seasonal distribution of malnutrition problem/deficiency diseases in the area is common and the participants usually visit local Kabiraj, Ayurveda practitioner, local doctors and local hospitals for consultation.

Constraints: Healthy, well-nourished people are both the outcome of successful social and economic development as well as an essential input into the development process. Of the CHTs rural households, 66% depend mainly on agriculture for their livelihood. As such, food and nutrition security is unlikely to be achieved without considerable attention to the food and agriculture sector. A nutrition-sensitive approach can contribute to physiological, mental and social development, enhance learning potential, reduce nutritional disorders and contribute to the prevention of diet-related diseases later in life.

Nutrition-sensitive agricultural production can be implemented in three main areas:

1. **Making food more available and accessible**. Increasing agricultural production makes more food available and affordable, which improves both the health and the economic status of the community. Sustained income growth in turn has a sizeable effect on reducing malnutrition.
2. **Making food more diverse and production more sustainable.** Increasing diversity in food production and promoting sustainable production practices like conservation agriculture, water management and integrated pest management can improve nutrition levels without depleting natural resources. Family farming, home gardens and homestead food production projects can make a wider variety of crops available at the local level.
3. **Making food itself more nutritious.** Fortification can prevent micronutrient deficiencies by enhancing micronutrient content in foods through processing, plant breeding and improved soil fertility. Also in addition to changes in the agriculture sector, governments can promote nutrition-sensitive agriculture by incorporating nutrition-sensitive concepts into relevant farm policies and programs.

Major constraints across nine upazila of three districts of the present study appear to be more or less same with very small variations in upaxilas which are summarised below:

- Lack in diversity of the foods in the diet which is highly needed for healthy and active life
- Lack of improved production techniques including GAP involved in nutrition sensitive agriculture
- Lack of education affecting productivity and marketing of the nutrition sensitive agriculture commodities
- Lack of credits for production and marketing nutrition sensitive agriculture commodities
- Problems of transportation of inputs and outputs in the hilly areas of CHT need for nutrition sensitive agriculture system
- Lack of training programmes in the area affecting production, consumption and marketing of nutrition sensitive agriculture commodities
- Lack of associations impeding collective action from the producers and traders for nutrition sensitive agriculture commodities
- Lack of linkage between private companies and local input and output sellers
- Lack manpower and transportation for government sector service provider for effective delivery of services needed for production, consumption and marketing of nutrition sensitive agriculture commodities
- Lack of short term preservation facilities for nutrition sensitive agriculture commodities in the local markets causes difficulties for the traders
- Lack of collection centers causes trading difficulties of nutrition sensitive agriculture commodities
- Lack of usage of modern technologies such as platforms for production and trading of nutrition sensitive agriculture commodities
- Absence of effective linkage of the producers of nutrition sensitive agriculture commodities and traders both at local and national level ultimately reduces profitability of the producers and reduce their enthusiasm for production of nutrition sensitive agriculture commodities.

Recommendations: Considering three aspects of the nutrition sensitive agriculture and in the light of the constraints identified during the study, the following recommendations are proposed for consideration by the authority of the LEAN project for implementation in the project area:

Knowledge

- Training on modern production technology, post-harvest handling, processing, consumption and marketing of nutrition sensitive agriculture commodities viz. nutritious crops, livestock, dairy and poultry following improved production practices including GAP for the beneficiaries of the project.
- Training on scaling up of the digital platforms such as use mobile-phone, Facebook based applications to receive support from the government agencies as well as trading of the inputs and outputs by both the producers and traders in the area as well for establishment of linkage and exchange of trade information between private company input suppliers with the village-level input sellers.

Awareness

- Awareness building training for the beneficiaries on knowledge, attitude and practice on nutrition sensitive agriculture and commodities
- Designing the nutrition sensitive agriculture production system in such a manner that harvest/returns can obtained during June to August, the lean period of food supply in the hilly area as the harvest from the Jhum is low or unavailable.
- Establishment of functional linkage of producers and traders groups for production and marketing of nutrition sensitive agricultural commodities.
- Establishment of functional linkage of the producers and other stakeholders for effective collaboration from the government agencies to scale-up their support services.
- Establishment of collection centres/points in the hard-to-reach areas for marketing nutrition sensitive agricultural commodities.

Practice

- Arrangement of credits from MFIs and government banks for the producers, input and output sellers involved in the production and marketing nutrition sensitive agriculture value chains.
- Promotion of modern agriculture technology in the hill (MATH) model of crop production in the project area by the beneficiaries to control soil erosion, conservation of soil moisture and water for higher yield of crops, conservation of nature and control of climate change impacts.
- Promotion of homestead production system of nutrition sensitive agriculture commodities such as homestead gardening for year round production of vegetables, fruits, and spices; beef fattening, sheep (Garole) and goat rearing, pig rearing by the tribal beneficiaries as IGAs; small scale dairy for production and consumption of milk and milk products by the HH members and poultry rearing following semi-scavenging model for increased consumption meat and eggs as well as for sale by beneficiaries of the project as IGAs.
- Promotion of field production of nutrition sensitive crops and crop varieties such Zn biofortified rice, QPM maize, OFSPs, legumes and pulses along with modern varieties of the existing field crops, vegetables, fruits and spices as (cash crops.
- Promotion of water saving irrigation technologies such as drip irrigation/fertigation in the area for production nutrition sensitive high value crops or at least pitcher method of irrigation where water is very scarce in the hilly area.
- Production of ecofriendly/drought resistant crops and planting methods such as pit method of planting using vine crops such as cucurbits for less disturbance to control soil erosion and drought resistant crop like wheat, barley, gram, lentil, grass pea and zero tillage method planting.

- Promotion of multi-strata cropping system using shade loving plant like ginger, turmeric in lowest stratum, semi-shade loving plan like betel nut in middle stratum and sun loving plant mango, jackfruit in the upper most stratum.
- Establishment of preservation facilities in the local markets for short-term storage of perishable nutrition sensitive agriculture commodities like vegetables, fruits, eggs etc.

Conclusions: Nutritional status of the inhabitants of the study area is poor. Poverty, lack of knowledge, low attitude towards nutrition sensitive agriculture commodities and lack of practice of production and consumption of nutrition sensitive agriculture commodities and ultimately resulting in low intake of nutritious food of the inhabitants of the study area. In order to increase the nutritional status of the CHT dwellers, it is important to support them through lessening the constraints mentioned to improve their livelihoods. Increase in production of nutrition sensitive agriculture commodities and increase awareness of nutrition will increase consumption of nutritional foods and ultimately ensure food and nutrition security of the inhabitants in the project area. However, implementation of food and nutritional program in an area is a multi-sectoral activity and appropriate liaisons with the Government and Non-Government support service provider organizations and financial institutions and active participation of the project beneficiaries and other stakeholders is needed for successful implementation of the appropriate and timely needed interventions for production, consumption and marketing of nutrition sensitive agriculture commodities which can ensure sustainable growth of the beneficiaries of the LEAN project in three hill districts. Also along with proper implementation of the appropriate and timely needed interventions, proper monitoring of the system to scale-up the activities among the dwellers there can significantly help in improving their nutritional status.

Contents

Chapter 1: Introduction

1.1 Background

"Leadership to Ensure Adequate Nutrition (LEAN) is a United Purpose led consortium project funded by The European Union. The aim of the project is to improve maternal and child nutrition in the Chittagong Hill Tracts (CHT) of Bangladesh. The action will have three results to achieve and as a technical partner for result-3 titled "Strengthening horizontal and vertical alliances for nutrition sensitive and climate smart value chains" HELVETAS is assigned to bring technical expertise and experiences of working on market system and nutrition sensitive value chain development. Contributions of HELVETAS can lead to achieve the program outcomes through three possible impact pathways namely (i) Income pathway (ii) Own production pathway and (iii) Market pathway. The project area includes 18 upazilas (Panchari, Dighinala, Lakshmichhari, Mahalchhari and Guimara under Khagrachari district; Baghaichari, Langadu, Belaichchari, Juraichhari, Rajasthali, Barkal, Nannerchar and Kawkhali under Rangamati district; and Alikodom, Thanchi, Ruma, Rowangchari and Naikhangchari under Bandarban district) in the Chittagong Hill Tracts (CHT).

1.2 Rationale of the study

Identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices will support the project initiatives by informing key opportunities and constraints as a way to address the target population's nutrition issues. In addition, it will help to identify and suggest specific interventions and strategies that will help a wide range of beneficiaries with access to a diverse and healthy diet that will contribute to an improves nutritional status in the targeted areas. The specific strategies will be recommended based on the knowledge, attitude and practice level gaps of the inhabitants. The outcome of the study will help the project implementers to undertake specific activities in order to achieve project objectives.

1.3 Objectives of the study

The broader objective of this study is to identify knowledge, attitude and practice level gaps on climate change resilient technologies and methodologies which directly or indirectly contribute to nutrition and gender sensitive agriculture and value chain development and select suitable options to address those gaps in the context of CHT.

In light of this, the specific objectives of the study are:

- Assessing the extent to which the local knowledge and attitude of the relevant stakeholders influence nutrition sensitive agricultural production and food safety.
- Assessing respective stakeholders' knowledge and attitude, identify stakeholders existing practices and gaps in use of gender sensitive, and climate resilient agricultural technologies and practices.
- Assessing local norms, formal and informal rules, social, cultural and religious practices' influence on consumption behaviour and food intake and the extent of influence of these factors in local production in nutrition sensitive agricultural value chains.
- Assessing differences in consumption behaviour and food intake between men and women and reasons behind the differences.
- Assessing to what extent nutritious food consumption behaviour and food intake influence the local nutrition sensitive agricultural production system.
- Assessing the constraint/root causes on positive and negative influence.
- Assessing the gaps and constrains in use of gender sensitive, and DRR and climate change resilient technologies and methods for nutrition sensitive agricultural production

- Recommend activities and strategies to address the gaps and constrains in relation to promotion of gender sensitive, DRR and climate change resilient technologies in CHT districts.

1.4 Scope of the report

This report presents the findings from the assessment of the knowledge, attitude and practice level gaps in nine selected upazilas of Chittagong Hill Tracts (CHT) area. The analysis is based on the Focus Group Discussions (FGDs), In-Depth Interviews (IDIs) and Key Informant Interviews (KIIs) with key value chain actors and key stakeholders. This report provides a detailed findings of the critical gaps with regards to nutrition-specific knowledge, attitude and practice of the inhabitants and recommends strategies and activities to address the constraints.

Chapter 1	Chapter 2	Chapter 3	Chapter 4	Chapter 5
Introduction	Methodology	Key findings of the study	Constraints and Recommendations	Conclusions

1.5 Structure of the report

1.6 Limitations

This report summarizes the findings from the qualitative assessment undertaken with key value chain actors and key stakeholders from the nine upazilas of CHT region. In addition to primary data collected through the FGDs, IDIs and KIIs; different literature have been reviewed to collect production data of the selected food items in the targeted upazilas. The study team has successfully captured all the major aspects required for this study. However, there were some limitations. This study could not provide quantitative data as evidence for the results and measures for identifying critical gaps on knowledge, attitude and practice that directly or indirectly contribute to nutrition and gender sensitive agriculture and value chain development. The data and quantitative analysis presented in this report are based on

Secondary literature and production data collected from Upazila Agriculture and Livestock offices.

The study team could not retrieve some critical data from the interviews or from the secondary literature. The analysis presented in this report is based on the qualitative data collected through the stakeholder interviews. Updated production data was not available in case of some of the upazilas. The study team had to use the latest available secondary information for the analysis.

Chapter 2: Methodology

This study followed qualitative research method focusing on the key objectives of the assignment- knowledge, attitude and practice of the dwellers, core market actors and value chain actors in the target regions. The study team analyzed primary data collected along with the available secondary data from valid sources. The frameworks that were used in the study are explained in the next section, as well as the data collection process, sample size and the steps associated to this study.

2.1 Strategic framework

2.1.1 Market Systems Development

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The study team applied the Market Systems Development (MSD) approach for the analysis and intervention idea generation. The objectives of the study were best addressed through MSD approach. We used the Market System Donuts to identify the core market actors and other value chain actors to analyse the knowledge, attitude and practices of the same. We also looked into rules and norms associated to these markets and their take on the three core aspects of the assignment.

Any market systems Programme needs to start with two questions:

- What is the relevant system? And,
- How does the Programme aim to influence it?

A 'systemic approach' starts off by seeking to understand the system as best as possible - accepting that a full understanding is impractical. It attempts to diagnose what the problems are with this system, the 'critical constraints' that prevent the system from operating effectively. It then searches for existing actors in the system who could change their practices and address the critical constraints. The Programme attempts to avoid becoming a player itself in the system. Instead, it seeks to facilitate change from existing or new actors, creating sustainable solutions.

For this assignment, we used the **'Operational Guide for M4P Approach'** developed by the Springfield Centre as a guiding document. However, we recognize the reality and the complexities in CHT area. As no single handbook can provide all the necessary guidance, therefore, it is important we remain pragmatic and flexible, adopting ideas based on their merit rather than their fit with theoretical best practices.

2.1.2 Gender analysis

The study did not consider gender as a stand-alone topic; rather, the approach was to analyse gender within the market systems. However, considering women face specific constraints and opportunities, we used the **'Access' and 'Agency' Framework**[1]. The framework includes a set of qualitative and quantitative indicators to understand women's access to economic opportunities, and agency issues in the workplace, community and home. For example, access-related indicators could include: the number of jobs or new enterprises started by women, access to loans, access to marketplaces, and access to skills and training. Agency-related indicators could include expectations from husbands and communities to conduct household chores vs. working outside the house, influence to make household economic decisions, and relationships with supervisors in the workplace.

2.1.3 Climate Resilience

The climate resilience aspect was considered as an integrated concept throughout the assessment of this study. We utilized the **Climate Resilience Framework (CRF)[2] from ISET-International** to understand and analyse the systems-based approach to building resilience to climate change. The goal of this structured framework is to build networked resilience that is capable of addressing emerging, indirect, and slow-onset climate impacts and hazards, which was a pivotal aspect for this study.

2.2 Study method

The study was conducted following a qualitative method. The strategic frameworks were incorporated in the study method. The approaches of the assignment will best describe the study method it followed. The approaches are as follows:

Firstly, market systems of the selected sub-sectors was unpacked to identify the various actors from the supply side, demand side and different supporting functions. We analysed market system donuts for each of the selected markets and developed a list of system actors. We identified and analysed the key support functions and rules that contribute to the core market systems. Analysis of support functions and rules helped us to identify key market failures, root causes of the constraints, and opportunities to leverage.

This step also helped us to identify the different stakeholders in related to rules and norms existing in the subsectors. Below is the list of tentative market actors for the value chains in the targeted regions.

[1]https://beamexchange.org/uploads/filer_public/06/1e/061e6f5c-aaac-48a4-9dc9-63b837137f8e/wee_mdf_compressed.pdf

[2] https://www.i-s-e-t.org/climate-resilience-framework#:~:text=The%20Climate%20Resilience%20Framework%20%28CRF%29%20is%20an%20analytical%2C,emerging%2C%20indirect%2C%20and%20slow-onset%20climate%20impacts%20and%20hazards.

- **Supply Side Actors:** Farmers, Producer groups etc.
- **Demand Side Actors:** End customers, Retailers, Wholesalers, etc.
- **Supporting Functions:** Input sellers, Traders, Upazila Agriculture Office (UAO), Upazila Livestock Office (ULO) etc.
- **Rules:** Local government regulations, relevant laws, informal indigenous norms, and practices etc.

Secondly, we tried to identify the current perception and knowledge base of these identified market actors, on nutrition sensitive agricultural production and food safety. We unpacked the consumption behaviors and food intake pattern, awareness of the consumers about nutrition, popularity trend of nutritious items, and their influence on the local nutrition sensitive agricultural production system. We conducted interviews with the market actors mentioned above. The use of existing technologies was also a part of the analysis. We also explored the existing gaps, gender sensitivity and climate resilience in the selected sectors, in terms of practices and agricultural technologies.

At the next stage of the assignment, we were able to unpack the extent to which nutritious food consumption behaviour and food intake influence the local agricultural production system. The key constraints of the positive and negative influence were identified at this stage. All the steps above helped us to fully comprehend the systemic constraints and opportunities, the barriers to overcome for market systems to grow, and promote the usage of gender sensitive, climate change resilient technologies and practices in CHT districts. We investigated the capacity and incentive of current market actors and potential for new entrants and subsequently propose intervention ideas with potential partners who can take up these ideas.

2.3 Data collection

2.3.1 Secondary literature review

The study team reviewed available literature and statistics on crop production scenario in CHT. National production data of the selected food items was also reviewed in order to understand the comparative production scenario in CHT. In addition, relevant project documents and literature were thoroughly reviewed. The literature review set the context of the study and guided the study towards achieving its objectives. Relevant literature were also reviewed prior to developing data collection tools to best capture the study objectives.

2.3.2 Primary data collection

Data collection method

Identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices and explore possible options to address gaps was conducted following a qualitative approach. Focus Group Discussions (FGDs), Key Informant Interviews (KIIs) and In-depth interviews (IDIs) with the key value chain actors, producers and with the upazila agriculture and livestock officials were conducted to meet the study objectives. Separate questionnaires were prepared for different kinds of actors for the detailed assessment. Questionnaires are attached as Annex-1.

Sample size and distribution

Producers, input suppliers and output market actors were interviewed from the study areas. In addition to that, Upazila Agriculture Officers and Upazila Livestock Officers were interviewed. Sample size details is presented in the table below.

Table 1: Sample size of the study

IDI and KII sample (3 from each upazila)			
Value Chain Actor		**Means of data collection**	**Sample**
Producers		IDI	9
Input Suppliers			9
Retailers			9
Small Traders			9
Large Traders			9
Upazila Agriculture Officer		KII	9
Upazila Livestock Officer			9
Total			**63**
FGD sample			
District	**Upazila**	**Number of FGDs**	**Number of participants**
Bandarban	Ruma	**2**	**17**
	Rowangchari	**2**	**17**
Khagrachari	Lakshmichari	**2**	**18**
	Mohalchari	**2**	**14**
Rangamati	Belaichchari	**2**	**18**
	Juraichhari	**2**	**15**
	Rajasthali	**2**	**20**
	Barkal	2	**17**
	Naniarchar	2	**22**
Total		**18**	**158**
Total sample of the study			**221**

2.4 Data analysis and reporting

The data collected was 'coded' according to the specific responses of the questions. Initial codes were designated to similar responses received for a question. Following that similar responses were be grouped, and a pattern was recognized. The quantitative household level data available to the consulting team was be used to understand the households to provide an overview of the income level, education, work experience and capacities, HHs expenditures and coping mechanisms. In addition, the qualitative data collected through the interviews were thoroughly reviewed before analyzing. Based on the analysis, this report was developed to summarize the key findings and to recommend strategies and activities that can best address the key constraints.

2.5 Geographical Area

The assessment was conducted in the 9 selected Upazilas of three districts of the CHT area. The 9 Upazilas are:

- Ruma and Rowangchari under **Bandarban district.**
- Lakshmichari and Mohalchari under **Khagrachari district**; and
- Belaichchari, Juraichhari, Rajasthali, Barkal and Naniarchar under **Rangamati district.**

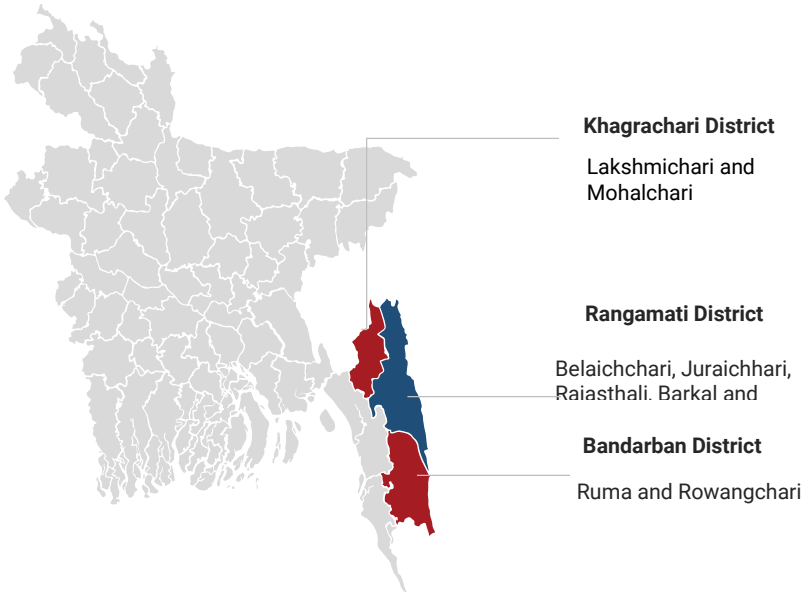

Figure 1: Study locations

2.6 Key Definitions

Nutrition-Sensitive Agriculture: Nutrition sensitive agriculture is a food-based approach to agricultural development that puts nutritionally rich foods, dietary diversity, and food fortification at the heart of overcoming malnutrition and micronutrient deficiencies.

Nutrition sensitive Value Chain: A nutrition-sensitive value chain is a food value chain that has been shaped to alleviate constraints in supply or demand of food as they relate to nutrition problems.[3]

In order to identify nutrition-sensitive Value Chains, Minimum Dietary Diversity of women (MDD-W, FAO) is set to be the standard of measurement for the assignment.

MDD-W: The proportion of women 15–49 years of age who consumed food items from at least five out of ten defined food groups the previous day or night.[4] FAO identified 10 food groups necessary for meeting minimum requirement of dietary diversity of women. The following table illustrates the 10 food groups with examples of food items from each group:

Knowledge: It is a familiarity, awareness, or understanding of someone or something, such as facts (descriptive knowledge), skills (procedural knowledge), or objects (acquaintance knowledge).

Attitude: A feeling or opinion about something or someone, or a way of behaving that is caused by this.

Practice: The act of doing something regularly or repeatedly to improve skill at doing it.

2Source: http://www.fao.org/3/as601e/as601e.pdf

[3]Source: https://www.ifad.org/documents/38714170/40804965/NSVC+A+guide+for+project+design+-+Vol.+I.+Web+filepdf.pdf/5177a3c0-a148-4b1f-8fff-967a42f51ce8

[4] Source: https://www.snrd-africa.net/wp-content/uploads/2017/07/GIZ_Nutrition-Baseline-Survey-Summary-Report.pdf

Chapter 3: Key findings

3.1 Knowledge on nutritious foods, good agricultural practices, nutrition sensitive agriculture and related issues

Nutrition sensitive agriculture is a food-based approach to agricultural development that puts nutritionally rich foods, dietary diversity, and food fortification at the heart of overcoming malnutrition and micronutrient deficiencies. According to FAO, nutrition-sensitive agricultural production can be implemented in three main areas.

These are:

1. **Making foods more available and accessible**. Increasing agricultural production makes more food available and affordable, which improves both the health and the economic status of the community. Sustained income growth in turn has a sizeable effect on reducing malnutrition;
2. **Making food more diverse and food production more sustainable.** Increasing diversity in food production and promoting sustainable production practices like conservation agriculture, water management and integrated pest management can improve nutrition levels without depleting natural resources. Family farming, home gardens and homestead food production can make a wider variety of crops available at the local level and

3. **Making food itself more nutritious.** Fortification can prevent micronutrient deficiencies by enhancing micronutrient content in foods through processing, plant breeding and improved soil fertility. Considering the above aspects, FGDs were conducted at growers' level to know their knowledge, attitude and practice regarding nutrition sensitive agriculture.

The district and upazila-based findings on knowledge of the FGD participants have been summarized and presented in Table-2.

Table 2: Findings on knowledge of the FGD participants on NSA and related issues

Items/Parameters of discussion	Bandarban		Khagrachari		Rangamati				
	Ruma	Rowangchari	Lakshmichari	Mohalchari	Belaichchari	Juraichhari	Rajasthali	Barkal	Naniarchar
Knowledge on									
1. Nutrition sensitive agriculture	1	1	3	4	4	3	2	3	3
2. Purpose of eating foods	3	2	4	3	4	3	3	3	2
3. Nutritious and safe foods	1	1	4	3	3	3	2	3	2
4. Sources of nutritious and safe foods in the locality	2	1	4	4	4	3	3	4	2
5. Improved production practices including good agricultural practices (GAP)	1	1	3	3	3	2	4	3	2
6. Deficiency symptoms of vitamins & minerals	1	2	3	4	4	4	3	3	3
7. Vitamins & micronutrient containing natural foods	1	4	4	4	3	4	3	3	2
8. Sources of knowledge about production and consumption of nutritious foods	LSPs	Books	Books, LSPs, NGOs	Books, LSPs	LEAN project	LEAN project DAE staff	LEAN project training, TV, internet	LSPs, Books	LSPs, Books
9. Processing and storage techniques of foods in indigenous ways	2	1	4	1	2	2	3	2	2
10. Advantages of those indigenous techniques with ingredients	1	1	4	1	2	2	3	2	2
11. Climate change	1	2	3	4	3	3	4	3	2
12. Causes of climate change	1	1	3	3	3	2	4	3	2

13. Adaptation with the climate change for production of nutritious foods	1	1	4	2	3	3	4	3	2
14. Techniques to adapt with the climate change for production of nutritious foods	1	1	4	2	3	3	4	3	2
15. Risks of disaster for production of nutritious foods in the study area	4	2	3	3	3	4	4	4	4
16. Techniques to mitigate the risks for production of nutritious foods in the study your area	1	1	3	3	2	4	4	2	4
17. Women between 15-49 years of age, lactating mothers and U5 years children eat more nutritious foods	3	4	5	5	5	5	5	5	5
18. Reasons for that	2	3	5	2	5	5	5	3	3

* Note: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent

District	Bandarban	Upazila	Ruma

Knowledge: Two FGDs were conducted with vegetable and livestock (native chicken) group. Respondents are engaged with vegetable gardening in the homestead, commercial cultivation in agricultural land and in Jhum cultivation. The knowledge levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 1-4 (very low to good for different aspects as discussed during the FGDs.

Primary objective of food consumption and sources nutritious and safe foods: The participants have very poor knowledge on nutrition sensitive agriculture and they think that they have to eat foods for survival. Knowledge on food, nutritious food and safe food was observed to be very low among the respondents. As sources of nutritious and safe foods, respondents mentioned their own produced foods, foods received from the neighbors and foods procured from the marketplace. Vegetables are considered as nutritious food items to the respondents. Respondents' usual meal is rice and vegetable. They consume eggs, pork (depending upon their religious belief), chicken etc. once in a week or once in two weeks. Due to hilly landscape of the villages, plain land farming is difficult and subsistence farming in

household yards is not widespread. However, some respondents reported that they cultivate vegetables through homestead gardening.

Knowledge on improved production practices including GAP: Respondents have very poor knowledge on improved production practices including GAP. They cultivate in Jhum (once yearly) and mostly cultivate vegetables such as- tomato, radish, banana, taro, elephant foot yam, gourd etc. Participants of the FGDs have very poor knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and the foods rich in micronutrients appear to be very poor and opined that vegetables and locally produced food items are enriched with micronutrients including vitamins and minerals. LSPs in area are considered as the most important source of knowledge for improved production practices as well as consumption of nutritious food.

Knowledge on traditional method of preserving/processing food: The participants have poor knowledge on traditional method of preserving/processing foods. However, participants reported an indigenous and traditional food item known as KAIRBO or KAIRDA made of vegetables particularly brinjal and meat as nutritious and delicious food to them.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The participants have very poor knowledge on climate change and on its causes and adaptation for production of nutritious foods and could not able to tell any things about this aspect. Similar findings were observed for knowledge on risks of disaster and techniques for mitigation for production of nutritious foods.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 children and the old and reasons for that: The participants of the FGD had poor to average knowledge in these aspects.

District	Bandarban	Upazila	Rowangchari

Knowledge: Two FGDs were conducted with vegetable and livestock (native chicken) group. The respondents are engaged with vegetable gardening in the homestead, commercial cultivation in agricultural land and in Jhum cultivation. The knowledge levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 1-4 (very low to good for different aspects as discussed during the FGDs.

Primary objective of food consumption and sources nutritious and safe foods: The participants have very poor knowledge on nutrition sensitive agriculture and have poor knowledge on purpose of eating foods. They think that foods are eaten for survival. Knowledge on food, nutritious food and safe food was observed to be very low among the respondents. As sources of nutritious and safe foods, respondents mentioned their own produced foods, foods received from the neighbors and foods procured from the marketplace. Participants' knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and the foods rich in micronutrients appear to be good and mentioned that pumpkin contains Vitamin-A, chili contains Vitamin-C and fish contains protein. Respondents' usual meal is rice and vegetable. They occasionally consume eggs, pork (depending upon their religious belief), chicken etc. once. Due to hilly landscape of the villages, plain land farming is difficult and subsistence farming in household yards is not widespread. However, some respondents reported that they cultivate vegetables through homestead gardening.

Knowledge on improved production practices including GAP: Respondents have very poor knowledge on improved production practices including GAP. They cultivate in Jhum (once a yearly) and mostly cultivate vegetables. Their knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and the foods rich in micronutrients appear to be good. Books are considered as the most important source of knowledge for improved production practices as well as consumption of nutritious food.

Knowledge on traditional method of preserving/processing food: The respondents participated in the

FGD have poor knowledge on traditional method of preserving/processing foods.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The participants have poor knowledge on climate change, very poor knowledge on its causes and adaptation for production of nutritious foods and could not able to tell any things about this aspect. Similar findings were observed for knowledge on risks of disaster and techniques for mitigation for production of nutritious foods.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 year's children and the old and reasons for that: The participants of the FGD have good knowledge on higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family. But they very poor knowledge for the reason behind that.

District	Khagrachari	Upazila	Lakshmichari

Knowledge: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The FGD participants are engaged with vegetable gardening both in homestead and in agricultural land. The knowledge levels of the participants varied from 1-5 (very low to excellent).

Primary objective of food consumption and sources nutritious and safe foods: The participants average knowledge on nutrition sensitive agriculture and have good knowledge on purpose of eating foods. They think that foods are eaten for proper nutrition and energy. Knowledge on foods, nutritious food and safe food was observed to be among the participants. As sources of nutritious and safe foods, respondents mentioned their own produced foods, foods received from the neighbors and foods procured from the marketplace. Spinach, bamboo shoot, taro, banana and hilly potatoes are identified as nutrition enriched food items by the participants. Participants' knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and the foods rich in micronutrients appear to be average and good respectively and they are able to identify Vitamin-C deficiency as reason behind oral ulcer, iron deficiency for weakness, and vitamin-A deficiency for night blindness of the children. They occasionally consume eggs, pork and other meats (depending upon their religious belief), chicken etc. once in week or two.

Knowledge on improved production practices including GAP: Respondents have very average knowledge on improved production practices including GAP use compost, vermi-compost and follow he practice of sowing seeds in line for crop production and use elevated platform in the room for rearing chicken and small livestock. They cultivate in Jhum (once a yearly) and mostly cultivate vegetables. LSPs, books and LEAN project are mentioned by the participants as the most important sources of knowledge for improved production practices as well as consumption of nutritious foods.

Knowledge on traditional method of preserving/processing food: The respondents participated in the FGD have good knowledge on traditional method of preserving/processing foods.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The participants have average knowledge on climate change and its causes and good knowledge on adaptation for production of nutritious foods. The participants appear to have average knowledge on risks of disasters and techniques for mitigation for production of nutritious foods.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 year's children and the old and reasons for that: The participants of the FGD appear to have excellent knowledge for higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family with excellent knowledge for the reason behind that.

District	Khagrachari	Upazila	Mohalchari

Knowledge: Two FGDs were conducted with vegetable group. The respondents are engaged in vegetable

gardening in the homestead as well as in the field. The knowledge levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 1-5 (average to excellent) for different aspects as discussed during the FGDs.

Primary objective of food consumption and sources nutritious and safe foods: The participants have average knowledge on nutrition sensitive agriculture and also average knowledge on purpose of eating foods and knowledge on nutritious food and safe food. As sources of nutritious and safe foods, the respondents mentioned vegetables, fruits, fish and meat as nutritious foods. They think the foods they produce, receive from neighbor or buy from markets are nutritious and safe. Participants' have good knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and the foods rich in micronutrients and mentioned that pumpkin contains Vitamin-A and lemon contains Vitamin-C. They were also able to mention that iron is necessary for the pregnant women and adolescent girls.. They occasionally consume eggs, pork (depending upon their religious belief), chicken etc. once. Due to hilly landscape of the villages, plain land farming is difficult and subsistence farming in household yards is not widespread. However, some respondents reported that they cultivate vegetables through homestead gardening.

Knowledge on improved production practices including GAP: Respondents have average knowledge on improved production practices including GAP. They cultivate in Jhum (once a yearly) and mostly cultivate vegetables. Books and LSPs are considered as the most important source of knowledge for improved production practices as well as consumption of nutritious food.

Knowledge on traditional method of preserving/processing food: The respondents participated in the FGDs have poor knowledge on traditional method of preserving/processing foods and its advantages with ingredients.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The participants have poor knowledge on climate change and poor knowledge on its causes and very poor knowledge on adaptation of climate for production of nutritious foods. But they have average knowledge on disaster risk and its causes and poor knowledge on techniques to adapt for production of nutritious foods.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 year's children and the old and reasons for that: The participants of the FGD have excellent knowledge on higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family with excellent knowledge on the reason behind that.

District	Rangamati	Upazila	Belaichchari

Knowledge: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The FGD participants are engaged with vegetable gardening both in homestead and in agricultural land. The knowledge levels of the participants varied from 2-5 (Poor to excellent) on various issues discussed during the FGDs.

Primary objective of food consumption and sources nutritious and safe foods: The participants appear to have good knowledge on nutrition sensitive agriculture and also good knowledge on purpose of eating foods and average knowledge on nutritious food and safe food. As sources of nutritious and safe foods, the respondents mentioned vegetables, fruits, fish and meat as nutritious foods. They think the foods they produce, receive from neighbor or buy from markets are nutritious and safe. They also think spinach, taro leaves, bamboo shoots, potato, banana, and papaya, mushroom as nutritious food items. Participants' have average knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and good knowledge on foods rich in micronutrients. They were also able to mention that iodine deficiency causes Goiter, calcium deficiency results in bone degenration and nutrition deficiency causes weakness. Due to hilly landscape of the villages, plain land farming is difficult and subsistence farming in

household yards is not widespread. However, some respondents reported that they cultivate vegetables through homestead gardening.

Knowledge on improved production practices including GAP: Respondents have average knowledge on improved production practices including GAP. LEAN project and LSPs are considered as the most important source of knowledge for improved production practices as well as consumption of nutritious foods by the participants.

Knowledge on traditional method of preserving/processing food: The respondents participated in the FGD have poor knowledge on traditional method of preserving/processing foods and its advantages with ingredients.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The participants have average knowledge on climate change and average knowledge on its causes and mentioned deforestation as the main behind climate change; planting trees is required to combat climate change related challenges and average knowledge on adaptation for climate change for the production of nutritious crops/foods. Also they very average knowledge on disaster risk and its causes and techniques to adapt for production of nutritious foods.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 year's children and the old and reasons for that: The participants of the FGD have excellent knowledge on higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family and excellent knowledge for the reason behind that.

District	Rangamati	Upazila	Juraichhari

Knowledge: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The FGD participants are engaged with vegetable gardening both in homestead and in agricultural land. The knowledge levels of the participants varied from 2-5 (Poor to excellent) on various issues discussed during the FGDs.

Primary objective of food consumption and sources nutritious and safe foods: The participants appear to have average knowledge on nutrition sensitive agriculture and also average knowledge on purpose of eating foods and nutritious food and safe food. As sources of nutritious and safe foods, they mentioned the crops they grow and those foods collected from the forests and grow in wild conditions. They think the foods they produce, receive from neighbor or buy from markets are nutritious and safe. They also think banana, papaya, mushroom, pulses and Indian gooseberry as nutritious food items. Participants' have average knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and good knowledge on foods rich in micronutrients. They were also able to mention that causes and symptoms of iodine deficiency and symptoms of calcium deficiency Due to hilly landscape, they practice subsistence farming in the Jhum and homestead farming. However, some respondents reported that they cultivate vegetables in the field where possible.

Knowledge on improved production practices including GAP: Respondents have average knowledge on improved production practices including GAP. DAE and LEAN project staff are considered as the most important sources of knowledge for improved production practices as well as consumption of nutritious foods by the participants.

Knowledge on traditional method of preserving/processing food: The respondents participated in the FGD have poor knowledge on traditional method of preserving/processing foods and its advantages with ingredients.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The

participants have average knowledge on climate change and poor knowledge on its causes and mentioned deforestation as the main behind climate change; planting trees is required to combat climate change related challenges. They have average knowledge on adaptation for climate change for the production of nutritious crops/foods. Also they have good knowledge on disaster risk and mentioned flood, untimely heavy rain and excessive heat during summer as the risk factors and its causes and techniques to adapt for production of nutritious foods. They Respondents cultivate crops in higher lands and avoid cultivation in low-lying lands during monsoon as climate adaptive cultivation techniques to avoid crop loss due to flood.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 year's children and the old and reasons for that: The participants of the FGD have excellent knowledge on higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family and excellent knowledge for the reason behind that.

District	Rangamati	Upazila	Rajasthali

Knowledge: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The FGD participants are engaged with vegetable gardening both in homestead and in agricultural land. The knowledge levels of the participants varied from 2-5 (Poor to excellent) on various issues discussed during the FGDs and the findings are narrated below.

Primary objective of food consumption and sources nutritious and safe foods: The participants appear to have average knowledge on nutrition sensitive agriculture and also average knowledge on purpose of eating foods and nutritious and safe food. As sources of nutritious and safe foods, they mentioned the crops they grow and those foods collected from the forests and grow in wild conditions. They also think taro, spinach, ferns, bamboo shoots, Bathua shak, Gunguni pata and Indian gooseberry as nutritious food items. Participants' have average knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and average knowledge on foods rich in micronutrients. They were also able to mention that causes and symptoms of iodine deficiency and symptoms of calcium deficiency Due to hilly landscape, they practice subsistence farming in the Jhum and homestead farming. However, some respondents reported that they cultivate vegetables in the field where possible.

Knowledge on improved production practices including GAP: Respondents appear to have good knowledge on improved production practices including GAP and mentioned the usage of organic compost, machineries in agricultural production, hatching pot, vaccinating poultry. However, the respondents use organic composts in small scale and believe that use of chemical fertilizers will increase the production. DAE, LEAN project staff, TV and internet are mentioned as the most important sources of knowledge for improved production practices as well as consumption of nutritious foods by the participants.

Knowledge on traditional method of preserving/processing food: The respondents participated in the FGD have average knowledge on traditional method of preserving/processing foods and its advantages with ingredients.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The participants have average knowledge on climate change and its causes and mentioned deforestation as the main behind climate change; planting trees is required to combat climate change related challenges. However, they appear to have good knowledge on adaptation for climate change for the production of nutritious crops/foods. Also they have good knowledge on disaster risk and mentioned flood, untimely heavy rain and excessive heat during summer as the risk factors and its causes and techniques to adapt for production of nutritious foods. They Respondents cultivate crops in higher lands and avoid cultivation in low-lying lands during monsoon as climate adaptive cultivation techniques to avoid crop loss due to flood.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 year's children and the old and reasons for that: The participants of the FGD have excellent knowledge on higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family and excellent knowledge for the reason behind that.

District	Rangamati	Upazila	Rajasthali

Knowledge: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The FGD participants are engaged with vegetable gardening both in homestead and in agricultural land. The knowledge levels of the participants varied from 2-5 (Poor to excellent) on various issues discussed during the FGDs and the findings are narrated below.

Primary objective of food consumption and sources nutritious and safe foods: The participants appear to have average knowledge on nutrition sensitive agriculture and also average knowledge on purpose of eating foods and nutritious and safe food. As sources of nutritious and safe foods, they mentioned the crops they grow and those foods collected from the forests and grow in wild conditions. They mentioned names of some fruits like guava, Indian gooseberry, Indian jujube, Bael as nutritious foods. They also think taro, spinach, ferns, bamboo shoots, Bathua shak and Indian gooseberry as nutritious food items. Participants' have average knowledge on micronutrients deficiency symptoms (iron, calcium, vitamin and iodine) and good knowledge on foods rich in micronutrients. They were also able to mention that causes and symptoms of iodine deficiency and symptoms of calcium deficiency Due to hilly landscape, they practice subsistence farming in the Jhum and homestead farming. However, some respondents reported that they cultivate vegetables in the field where possible.

Knowledge on improved production practices including GAP: Respondents appear to have average knowledge on improved production practices including GAP. LSPs and books are mentioned as the most important sources of knowledge for improved production practices as well as consumption of nutritious foods by the participants.

Knowledge on traditional method of preserving/processing food: The respondents participated in the FGD have poor knowledge on traditional method of preserving/processing foods and its advantages with ingredients.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The participants have average knowledge on climate change and its causes and mentioned deforestation as the main behind climate change; planting trees is required to combat climate change related challenges. However, they appear to have average knowledge on adaptation for climate change for the production of nutritious crops/foods. Also they have good knowledge on disaster risk and mentioned flood, untimely heavy rain and excessive heat during summer as the risk factors and its causes and techniques to adapt for production of nutritious foods.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 year's children and the old and reasons for that: The participants of the FGD have excellent knowledge on higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family and excellent knowledge for the reason behind that.

District	Rangamati	Upazila	Naniarchar

Knowledge: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The FGD participants are engaged with vegetable gardening both in homestead and in agricultural land. The knowledge levels of the participants varied from 2-5 (Poor to excellent) on various issues discussed during the FGDs and the findings are narrated below.

Primary objective of food consumption and sources nutritious and safe foods: The participants appear

to have average knowledge on nutrition sensitive agriculture and also poor knowledge on purpose of eating foods and nutritious and safe food. As sources of nutritious and safe foods, they mentioned the crops they grow and those foods collected from the forests and grow in wild conditions. Taro leaves and hilly potatoes are considered as nutritious food items by the participants. With regards to knowledge on micronutrients, respondents were able to respond that calcium deficiency results in bone degeneration, iodine deficiency results in goiter. Due to hilly landscape, they practice subsistence farming in the Jhum and homestead farming. However, some respondents reported that they cultivate vegetables in the field where possible.

Knowledge on improved production practices including GAP: Respondents appear to have poor knowledge on improved production practices including LSPs and books mentioned as the most important sources of knowledge for improved production practices as well as consumption of nutritious foods by the participants.

Knowledge on traditional method of preserving/processing food: The respondents participated in the FGD have poor knowledge on traditional method of preserving/processing foods and its advantages with ingredients.

Knowledge on climate change, causes and adaptation for production of nutritious foods: The participants have poor knowledge on climate change and its causes and mentioned deforestation as the main cause behind climate change; planting trees is required to combat climate change related challenges. They appear to have poor knowledge on adaptation for climate change for the production of nutritious crops/foods. But they have good knowledge on disaster risk and mentioned flood, untimely heavy rain and excessive heat during summer as the risk factors and its causes and techniques to adapt for production of nutritious foods.

Knowledge on higher intake of nutritious foods by women between 15-49 years of age, lactating mothers and U5 year's children and the old and reasons for that: The participants of the FGD have excellent knowledge on higher intake of nutritious foods by women of 15-49 years of age, U5 children and the old in the family and excellent knowledge for the reason behind that.

3.2 Attitudes on issues related to nutrition sensitive agriculture, nutritious foods, improved production practices including GAP practices, and related issues

The district and upazila-based FGD findings on attitude of the inhabitants in different aspects of GAP and nutrition sensitive agriculture and foods consumption have been summarized and presented in Table-3.

Table 3: Findings on attitude of the FGD participants in different aspects of GAP and nutrition sensitive agriculture and foods Consumption

Items/Parameters of discussion	Bandarban		Khagrachari		Rangamati				
	Ruma	Rowangchari	Lakshmichari	Mohalchari	Belaichchari	Juraichhari	Rajasthali	Barkal	Nanianchar
Attitude towards:									
1. Need to follow improved production practices including	2	2	3	3	3	3	3	3	2

GAP for cultivation of crops and rearing of nutritious and safe foods									
2. Need of washing hands before food preparation, consumption and drinking of water	5	5	5	5	5	5	5	5	5
3. Need for preparation of nutritious and safe foods for cooking such as washing before cutting with clean water, cutting in large pieces, boiling rather cooking with high heat	4	4	4	4	3	3	3	4	3
4. Preferences for special nutritious foods in your area	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. If yes, what are those special nutritious foods? Please mention	Vegetables and fruits	Vegetables and fruits	Vegetables and fruits	Fruits and vegetables	Vegetates and fruits	Vegetables and fruits	Vegetables and fruits	Vegetables and Fruits	Vegetables and fruits
6. Any cultural/ religious barrier for consumption of any of nutritious food items	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
7. If yes, what are those? Please mention	Pork and beef prohibited	Pork and beef prohibited	Beef prohibited	Beef and pork prohibited	Beef and pork prohibited	Beef and pork prohibited	Beef and Pork prohibited	Beef and pork prohibited	**Beef and pork prohibited**
8. Cultural barrier in the area for consumption of any of nutritious food items by the HH members and special group such as the pregnant women or lactating mother or children	No	No	No	No	No	No	No	No	No
9. Discrimination of allocation of foods among the family members in respect of age, gender special group such as the pregnant women or lactating mother or children	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10. Decision for food items preparation, composition and distribution in the HH jointly by wife and husband	4	4	4	4	4	4	4	4	4

11. Women empowerment and decision making by women will improve production and consumption of nutritious foods in the HH	4	4	4	4	4	4	4	4	4

* Note: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent

District	Bandarban	Upazila	Ruma

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 2-5 (Poor to excellent) for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is poor.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation appear to be good

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits; such as different locally grown vegetables and fruits like mango, banana, pineapple etc.

Culture and religious barriers for food consumption: The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the family members.

Decision for food items preparation, composition and distribution in the HH: Decision in these respects appears to be good and is jointly taken by wife and husband.
Women empowerment to improve production and consumption of nutritious foods in the HH: The participants' attitude towards women empowerment to improve production and consumption of nutritious foods in the HH appear to be good.

District	Bandarban	Upazila	Rowangchari

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 2-5 (Poor to excellent for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is poor.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation appear to be excellent.

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits, such as- mango, banana, pineapple etc.

Culture and religious barriers for food consumption: The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the family members.

Decision for food items preparation, composition and distribution in the HH: Attitude towards joint decision appears to be good and decision for food items preparation, composition and distribution in the HH is jointly taken by wife and husband.

Women empowerment to improve production and consumption of nutritious foods in the HH: The participants' attitude towards women empowerment to improve production and consumption of nutritious foods in the HH appears to be good.

District	Khagrachari	Upazila	Lakshmichari

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 3-5 (Average to excellent) for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is average.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation, respectively appear to be excellent and good.

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits respondents mentioned mostly spinaches, bamboo shoots, taro, hilly potatoes and banana, pineapple etc.

Culture and religious barriers for food consumption: The respondents do not have any cultural barrier or

practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the family members.

Decision for food items preparation, composition and distribution in the HH: Decision in these respects appears to be good and is jointly taken by wife and husband.
Women empowerment to improve production and consumption of nutritious foods in the HH: The participants' attitude towards women empowerment to improve production and consumption of nutritious foods in the HH appear to be good.

District	Khagrachari	Upazila	Mohalchari

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 3-5 (Average to excellent) for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is average.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation, respectively appear to be excellent and good.

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits respondents mentioned mostly spinaches, bamboo shoots, taro, hilly potatoes and banana, pineapple etc. They consume 3 meals per day. Usually the meals contain vegetable and rice. Meat and eggs are consumed once a week.

Culture and religious barriers for food consumption: The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the

family members.

Decision for food items preparation, composition and distribution in the HH: Decision in these respects appears to be good and is jointly taken by wife and husband.
Women empowerment to improve production and consumption of nutritious foods in the HH: The participants' attitude towards women empowerment to improve production and consumption of nutritious foods in the HH appear to be good.

District	Rangamati	Upazila	Belaichchari

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 3-5 (Average to excellent) for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is good.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation, respectively appear to be excellent and average.

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits respondents mentioned mostly spinaches, bamboo shoots, taro, hilly potatoes and banana, pineapple etc.

Culture and religious barriers for food consumption: The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the family members.

Decision for food items preparation, composition and distribution in the HH: Decision in these respects appears to be good and is jointly taken by wife and husband. However, sometimes preference is given to male household head's choices.

District	Rangamati	Upazila	Juraichhari

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 3-5 (Average to excellent) for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is average.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation, respectively appear to be excellent and average.

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits respondents mentioned mostly spinaches, bamboo shoots, taro, hilly potatoes and banana, pineapple etc.

Culture and religious barriers for food consumption: The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the family members.

Decision for food items preparation, composition and distribution in the HH: Decision in these respects appears to be good and is jointly taken by wife and husband in general.

District	Rangamati	Upazila	Rajasthali

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 3-5 (Average to excellent) for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is average.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation, respectively appear to be excellent and average.

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits respondents mentioned mostly spinaches, bamboo shoots, taro, hilly potatoes and banana, pineapple etc.

Culture and religious barriers for food consumption: The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the family members.

Decision for food items preparation, composition and distribution in the HH: Decision in these respects appears to be good and is jointly taken by wife and husband in general. However, women also can take decision on what foods to be prepared for the family.

District	Rangamati	Upazila	Barkal

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 3 -5 (Average to excellent) for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is average.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation, respectively appear to be excellent and average.

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits respondents mentioned mostly spinaches, bamboo shoots, taro, hilly potatoes and banana, pineapple etc.

Cultural and religious barriers for food consumption: The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the family members.

Decision for food items preparation, composition and distribution in the HH: Decision in these respects appears to be good and is jointly taken by wife and husband in general. However, in many households, women usually take decisions on cultivation and consumption of nutrition-rich foods as they women understand better than men about what food is required for the family member(s).

District	Rangamati	Upazila	Naniarchar

Attitude: Two FGDs were conducted, one with vegetable and another one with poultry rearing (native chicken) group. The attitude levels of the participants were judged through FGD using 1-5 Likert scale where: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent where applicable) and varied from 2-5 (Poor to excellent) for different issues as discussed during the FGDs and the findings are narrated below.

Attitude towards improved production practices including GAP: The attitude of the participants for following improved production practices including GAP for cultivation of crops and rearing animals for production of nutritious foods is poor.

Washing hands and practice of food preparation: Participants' attitude towards of washing hands before food preparation and consumption & practice of food preparation, respectively appear to be excellent and average.

Preference of food type: When asked about the preferences of nutritious food items, respondents mentioned mostly vegetables and fruits respondents mentioned mostly spinaches, bamboo shoots, taro, hilly potatoes and banana, pineapple etc.

Culture and religious barriers for food consumption: The respondents do not have any cultural barrier or practice and principle that restrict them to consume nutritional foods. However, the Muslims do not eat pork and other "haram" foods because of their religious belief and Hindus do not eat beef for their religious restrictions and though the Buddhist mainly follow the lacto-vegetarian diets, most of them consume meat and other animal products, as long as the animals are not slaughtered specifically for them.

Discrimination in regards to food distribution and intake: The respondents agreed to the fact that pregnant women, lactating mothers, U5 children and the old in the HH should be fed with nutritious food for their special requirement. Therefore, they follow that principle for food distribution of foods in the family i.e food distribution is done discriminately according to the age and requirement of the family members. This discrimination of distribution is for the good cause of the different categories of the family members.

Decision for food items preparation, composition and distribution in the HH: Decision in these respects appears to be good and is jointly taken by wife and husband in general. However, women also can take decision on what foods to be prepared for the family.

3.3 Practices followed for production of nutritious foods, improved production practices including GAP and nutrition sensitive agriculture and related issues

The district and upazila-based findings on practices followed by the FGD participants in different aspects of GAP and nutrition sensitive agriculture and foods produced thereof have been summarized and presented in Table-4.

Table 4: Practices followed by FGD participants for production of nutritious foods, GAP and nutrition sensitive agriculture and related issues

Items/Parameters of discussion	Bandarban		Khagrachari		Rangamati				
	Ruma	Rowangchari	Lakshmicha	Mohalchari	Belaichchari	Juraichhari	Rajasthali	Barkal	Naniarchar

			ri						
Practice on									
1. Improved production practices including GAP for cultivation/rearing of crops, livestock and poultry	1	1	3	2	2	2	2	2	2
2. Adoption of improved production practices including GAP for cultivation/rearing of crops, livestock and poultry	1	1	3	2	2	2	2	2	2
3 Problem in practicing improved production including GAP for cultivation/rearing of crops, livestock and poultry in the area	High	High	High	High	High	High	High	High	High
4. Problems	Water unavailability, Disaster, Lack of knowledge	Lack of knowledge	Lack of capital	Lack of detailed knowledge	Lack of machineries and knowledge	Lack of machineries and knowledge	Natural disasters, lack of machineries and knowledge	Lack of detailed knowledge, Natural disasters	Lack of detailed knowledge, agricultural machineries and Natural disasters
5. Problem in marketing of your crops/livestock/poultry in the area	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Storage your produces for future use	Yes	No	No	No	No	No	No	No	No
8. Number of major meals taken daily	3	2 meals +2 snacks	3	3	3	3	3	3	3
9. Major components of daily major meals	Rice & vegetables	Rice & vegetables	Rice & vegetab	Rice & veget	Rice, pulses & veget	Rice, pulses & veget	Rice, pulses & veget	Rice, pulses &	Rice, pulses & vege

			les	ables	ables	ables	ables	veg etab les	tabl es
10. Ways of making meals (Cooked, Boiled, Fresh)	Cooked	Cooke d	Coo ked	Cook ed	Cook ed	Cook ed	Cook ed	Coo ked	Coo ked
11. Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases	No	No	Yes	Yes	No	Yes	Yes	Yes	No
12. If yes, please mention	-	-	lem on, ban ana, taro and pum pkin	Vege table, tama rind, fruits		Tam arind to reduc e bone-pains ., drinki ng milk to gain stren gth.	Tam arind to gain appe tite, cons ume tama rind pickl e to reduc e bone joint pains	Fruit s and pick les	Tam arin d to gain app etite, con sum e tam arin d pickl e to redu ce bon e
13. Seasonal distribution of malnutrition problem/deficiency diseases in the area	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14. Mitigation methods	Kabiraj (local doctors)	Upazil a Health Compl ex	Doc tor	Visitn g doct ors and cons umpt ion of fruits, veget ables	Doct ors	Doct ors	Local doct ors	Diar rhea duri ng rain y sea son; Doc tors	Diarr hea, chol era duri ng rainy seas on; Doct ors

*Note: 1= Very poor, 2= Poor, 3=Average, 4= Good, 5=Excellent

District	Bandarban	Upazila	Ruma

Practice: The practice level varied from 1 (very poor)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry is very poor among the FGD participants and problems of practicing improved production technology are very high. However the livestock group reported to use hatching pots for poultry

Seasonal impact on food production: The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.

Food preservation: Due to the seasonal impact, inhabitants preserve the dried up vegetables from the summer and winter harvest to use it during the rainy season.

Cooking practice: The participants reported that they do not keep the rice gruel (fen) after cooking rice and they clean the vegetables after cutting. Also they prepare most of the foods through cooking/boiling in high heat

Usual dietary habit: The participants usually eat 3 times a day. Rice and vegetables is usual menu during the 3 meals. Consumption of chicken, beef, fish, milk and egg is very low among the inhabitants. Pork is consumed on a weekly basis.

Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: They do not practice of eating any indigenous/local nutritious food to over the deficiency symptoms of any nutrient.

Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common and the participants usually visit local kabiraj or Ayurveda practitioner for consultation.

Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved production techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

District	Bandarban	Upazila	Rowangchari

Practice: The practice level score is 1 (very poor)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry is very poor among the FGD participants and problems of practicing improved production technology are very high. However the livestock group reported to use hatching pots for poultry

Seasonal impact on food production: The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.

Food preservation: The participants reported that the do not preserve foods for the future because of the lack of preservation facilities and knowledge about how to preserve those.

Cooking practice: The participants reported that they do not keep the rice gruel (fen) after cooking rice and they clean the vegetables after cutting. Also they prepare most of the foods through cooking/boiling in high heat.

Usual dietary habit: The participants usually eat 4 times a day. Rice and vegetables are present in usual menu during the 2 main meals and biscuits, puffed rice are usually as morning and evening snacks.

Consumption of chicken, beef, fish, milk and egg is very low among the inhabitants. Egg, fish or meat is consumed once in a week.

Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: They do not practice of eating any indigenous/local nutritious food to over the deficiency symptoms of any nutrient.

Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common and the participants usually visit local upazila health complex for treatment.

Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

District	Khagrachari	Upazila	Lakshmichari

Practice: The score level for practice is 3 (Average)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry appear to be average among the FGD participants and problems of practicing improved production technology are very high. However, some of the participants reported to use improved production practices including GAP for crops, livestock and poultry such as mulching, maintaining standard spacing between plants and raised beds; use of shelters for their poultry and hatching pots for hatch eggs.

Seasonal impact on food production: The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.
Food preservation: The participants reported that preserve the dried up vegetables from the summer and winter harvest to use it during the rainy season. They preserve the dried vegetables for 6 to 12 months.
Cooking practice: The participants reported that they do not keep the rice gruel (fen) after cooking rice, wash the vegetables prior to cutting and make larger pieces, Also they prepare most of the foods through cooking/boiling in high heat.

Usual dietary habit: The participants usually eat 3 times a day. Rice and vegetables are present in usual menu. Consumption of chicken, beef, fish, milk and egg is very low among the inhabitants. Egg, fish or meat is consumed 3-4 times in a month.

Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: They consume honey and own produced fruits and vegetables such lemon, banana, taro and pumpkin as nutritious food when feel sick or feel the deficiency symptoms of nutrients.

Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common and the participants usually visit local upazila health complex for treatment.
Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, and frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

District	Khagrachari	Upazila	Mohalchari

Practice: The score level for practice is 2 (poor)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry appear to be poor among the FGD participants and problems of practicing improved production technology are very high. However, some of the participants reported to use improved production practices including GAP for crops such as use of vermin-compost, organic compost and organic pesticides/insecticides. They use informally imported seeds from India seeds along with local varieties of seeds available to there such as seeds from A.R Malik seed company and other private seed companies.

Seasonal impact on food production: The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.

Food preservation: The participants reported that preserve the dried up vegetables from the summer and winter harvest to use it during the rainy season. They preserve the dried vegetables for 6 to 12 months.

Cooking practice: The participants reported to keep rice gruel (mar) after cooking rice, wash the vegetables prior to cutting and make larger pieces, Also they prepare most of the foods through cooking/boiling in high heat.

Usual dietary habit: The participants usually eat 3 times a day. Rice and vegetables are present in usual menu. Consumption of chicken, beef, fish, milk and egg is very low among the inhabitants. Egg, fish or meat is consumed 3-4 times in a month.

Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: Respondents reported consume more water in case someone feels sick and during the summer days. They also consume tamarind during summer. During flu, they consume more milk, meat and eggs to recover faster.

Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common and the participants usually visit local upazila health complex for treatment.

Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, and frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

District	Rangamati	Upazila	Belaichchari

Practice: The score level for practice is 2 (poor)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry appear to be poor among the FGD participants and problems of practicing improved production technology are very high. However, some of the participants reported to use improved production practices including GAP for crops such as use of organic composts and reduced use of chemical composts and pesticides for crop production.

Seasonal impact on food production: The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.

Food preservation: As practice of processing and preservation of the processed foods, they prepare pickles from pickles from different fruits.

Cooking practice: The participants reported to keep rice gruel (mar) after cooking rice, wash the vegetables prior to cutting and make larger pieces, Also they prepare most of the foods through cooking/boiling in high heat.

Usual dietary habit: The participants usually eat 3 times a day. Rice, pulses and vegetables are present in usual menu. Consumption of chicken, beef, fish, milk and egg is very low among the participants. Egg, fish or meat is consumed 3-4 times in a month.
Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: Respondents reported consume more water in case someone feels sick and during the summer days. They also consume tamarind during summer to reduce joint pain. During flu, they consume more milk, meat and eggs to recover faster.
Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common and the participants usually visit local upazila health complex for treatment.

Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, and frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

District	Rangamati	Upazila	Juraichhari

Practice: The practice level score is 2 (poor)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry appear to be poor among the FGD participants and problems of practicing improved production technology are very high. However, some of the participants reported to use improved production practices including GAP by using organic composts and by reducing chemical composts and pesticides and by vaccinating their poultry.

Seasonal impact on food production: They consume their own produced food, collect foods from forest lands and also share among the neighbors. The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.

Food preservation: As practice of processing and preservation of the processed foods, they prepare pickles from pickles from different fruits.
Cooking practice: The participants reported to keep rice gruel (mar) after cooking rice, wash the vegetables prior to cutting and make larger pieces, Also they prepare most of the foods through cooking/boiling in high heat.

Usual dietary habit: The participants usually eat 3 times a day. Their usual meal contains rice, pulses and vegetables. Consumption of chicken, beef, fish, milk and egg is very low among the participants. Egg, fish or meat is consumed 3-4 times in a month.
Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: Respondents reported consume more water in case someone feels sick and during the summer days. They also consume tamarind during summer to reduce joint pain. During flu, they consume more milk, meat and eggs to recover faster.

Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common and the participants usually visit local upazila health complex for treatment.

Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, and frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

District	Rangamati	Upazila	Rajasthali

Practice: The practice level score is 2 (poor)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry appear to be poor among the FGD participants and problems of practicing improved production technology are very high. However, some of the participants reported to use improved production practices including GAP by using organic composts and by reducing chemical composts and pesticides and by vaccinating their poultry.

Seasonal impact on food production: They consume their own produced food, collect foods from forest lands and also share among the neighbors. The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.
Food preservation: As processed foods, respondents prepare pickles from different fruits (tamarind, Indian Jujube, mango etc.). They process and consume dry fish on a regular basis.
Cooking practice: The participants reported to keep rice gruel (mar) after cooking rice, wash the vegetables prior to cutting and make larger pieces, Also they prepare most of the foods through cooking/boiling in high heat.

Usual dietary habit: The participants usually eat 3 times a day. Their usual meal contains rice, pulses and vegetables. Consumption of chicken, beef, fish, milk and egg is very low among the inhabitants. Egg, fish or meat is consumed 3-4 times in a month.
Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: Respondents reported consume more water in case someone feels sick and during the summer days. They also consume tamarind during summer to increase appetite and reduce joint pain. During flu, they consume more milk, meat and eggs to recover faster.
Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common and the participants usually visit local upazila health complex for treatment.

Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, and frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

District	Rangamati	Upazila	Barkal

Practice: The practice level score is 2 (poor)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry appear to

be poor among the FGD participants and problems of practicing improved production technology are very high. However, some of the participants reported to use improved production practices including GAP by using organic composts and by reducing chemical composts and pesticides.
Seasonal impact on food production: They consume their own produced food, collect foods from forest lands and also share among the neighbors. The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.

Food preservation: As processed foods, respondents prepare pickles from different fruits (tamarind, Indian Jujube, mango etc.). They process and consume dry fish on a regular basis.
Cooking practice: The participants reported to keep rice gruel (mar) after cooking rice, wash the vegetables prior to cutting and make larger pieces, Also they prepare most of the foods through cooking/boiling in high heat.

Usual dietary habit: The participants usually eat 3 times a day. Their usual meal contains rice, pulses and vegetables. Consumption of chicken, beef, fish, milk and egg is very low among the inhabitants. Egg, fish or meat is consumed 3-4 times in a month. However, in case of livestock group, the frequency of eating eggs and meat is higher usually 2-3 times in a week.
Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: Respondents reported consume more water in case someone feels sick and during the summer days. They also consume tamarind during summer to increase appetite and reduce joint pain. During flu, they consume more milk, meat and eggs to recover faster.
Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common. Also they reported to face the problem of diarrhea during the rainy season. They usually visit the local upazila health complex for treatment.

Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, and frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

District	Rangamati	Upazila	Naniarchar

Practice: The practice level score is 2 (poor)

Adoption and Practicing of improved production practices including GAP: The practicing and adoption of improved production including GAP for cultivation of crops and of rearing livestock and poultry appear to be poor among the FGD participants and problems of practicing improved production technology are very high. However, some of the participants reported to use improved production practices including GAP by using organic composts and by reducing chemical composts and pesticides.

Seasonal impact on food production: They consume their own produced food, collect foods from forest lands and also share among the neighbors. The participants have difficulty in sourcing and cultivating food during the dry season because of lack of irrigation water. Fountains are the main sources of water for irrigation. Landslides and flash floods are major disasters as mentioned by the respondents. Communication is affected due to heavy rain and disasters during the rainy season. Due to landslides and flash floods, low-lying agricultural lands overflow, making cultivation difficult.

Food preservation: As processed foods, respondents prepare pickles from different fruits (tamarind, Indian Jujube, mango etc.). They process and consume dry fish on a regular basis.
Cooking practice: The participants reported to keep rice gruel (mar) after cooking rice, wash the

vegetables prior to cutting and make larger pieces, Also they prepare most of the foods through cooking/boiling in high heat.

Usual dietary habit: The participants usually eat 3 times a day. Their usual meal contains rice, pulses and vegetables. Consumption of chicken, beef, fish, milk and egg is very low among the inhabitants. Egg, fish or meat is consumed 3-4 times in a month. However, in case of livestock group, the frequency of eating eggs and meat is higher usually 2-3 times in a week.

Practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases: Respondents reported consume more water in case someone feels sick and during the summer days. They also consume tamarind during summer to increase appetite and reduce joint pain. During flu, they consume more milk, meat and eggs to recover faster.
Seasonal distribution of malnutrition problem/deficiency diseases in the area and measures to overcome those: Seasonal distribution of malnutrition problem/deficiency diseases in the area is common. Also they reported to face the problem of diarrhea during the rainy season. They usually visit the local upazila health complex for treatment.

Constraints: The major hindering factors, as identified by the respondents, are- lack of knowledge on improved techniques and nutrition, lack of capital to invest, unavailability of inputs, lack of communication and marketing of the produces, lack of storage facilities, and frequent natural disaster as the main constrains for cultivation of crops and rearing of livestock and poultry.

3.4 Climate Change and Disaster Risk Reduction

Chittagong Hill Tracts region is one of the most vulnerable area to global climate change. The area faces several challenges such as heavy rainfall, drought, flash floods, irregular or unpredictable rainfall, soil erosion, storm, tropical cyclone etc. The impact of climate change on indigenous communities is multifold such as livelihood problems emanating from drying up of streams and wells, groundwater depletion, depletion of wildlife, infertility of crops, the mortality of seedlings; disaster vulnerability resulting from irregular and heavy rainfall, storm surge, soil erosion, landslides; climate-induced diseases such as respiratory dysfunction, arsenic, skin diseases and social competition regarding scarce natural livelihood resources. In addition, land acquisition in name of development and tourism imperils the situation because the concept of eco-tourism has not developed yet in this country. The findings on the knowledge on climate change and its causes, adaptation with climate change for production of nutritious foods, risks of disaster for production of nutritious foods, techniques to mitigate the risks for production of nutritious foods in the study your area by the participants have been presented in Table 3.1. The knowledge on climate change of the participants varied from very poor to good depending the study upazila, the lowest score (very poor) was observed in Alikodom upazila of Bandarban district. FGD participants mostly mentioned deforestation as the cause of climate change. However, scores on knowledge for overall for adaptation with the climate for production of nutritious foods and knowledge on techniques for production of nutritious foods with climate change varied from very poor to poor depending upon the study area. Also the score for knowledge on risks of disaster for production of nutritious foods was found to be very poor in all the study area. However, the knowledge on techniques to mitigate the risks for production of nutritious foods in the study area varied from very poor to poor in different upazilas of the study area Table 3.1).

The impacts of climate change on the inhabitants of in the project area in CHT are many folds such as livelihood problems arising from drying up of streams and wells, groundwater depletion, depletion of wildlife, nutrition sensitive agriculture such low yield of crops/animals or total crop failure, the mortality of seedlings; disaster vulnerability resulting from irregular and heavy rainfall, fluctuation of other weather parameters such as temperature, humidity, wind speed, storm surge, soil erosion, landslides; climate-

induced diseases such as respiratory dysfunction man and animals, arsenic, skin diseases and social competition regarding scarce natural livelihood resources. Therefore, knowledge of the inhabitants of project beneficiaries on impacts of climate changes and risks arising from thereof and their mitigation techniques should be increased to survive there.

3.5 Gender, Women Empowerment and Nutrition Sensitive Agriculture

Reducing gender inequalities: Reducing gender inequalities is essential for sustainable development. Helvetas advocates for a world in which people can live in dignity, safety and autonomy. We cannot overcome poverty and social injustice until all people including men and women have equal rights and opportunities. Generally, women are in a much weaker position than men at a household level and even more so on at community or national levels. Women are for example key players in the agricultural sector, yet compared to men, they have less access to land, equipment and inputs, as well as to financial and extension services. Improving this situation is a challenging and long-term process as it needs not only improvement of capacities of women, but more importantly a change in culture and in beliefs, attitudes of men and women in the society. According to the OECD the positive correlation between gender equality and overall economic effects is staggering. While FAO indicates that all over the world women make up to 43% of the overall agricultural workforce and in many societies, they have the main responsibility for the production, processing and preparation of food for home consumption.

Reducing gender gap in nutrition-sensitive agriculture: The gender gap in nutrition sensitive agriculture means that women and men farmers have differential access to availability, access and utilization of nutritious foods. During the FGD, the participants (women) reported both husband and wife participate in crop production and rearing of animals in the homestead as well as in field and post-harvest handling, processing and utilization. Also both husband and wife make decision regarding different house activities including cooking of foods and their distribution among the family. Also the social mobility of the women in the study area is high compared to the plain land of Bangladesh

Increasing decision making capacities of women: Increasing decision making capacities at household level is necessary to ensure nutritional security in CHT. As compared to the other parts of the country, CHT is slightly advanced when it comes to women mobility and engagement in economic activities. Leveraging this advancement, Helvetas can ensure effective engagement of women in making dietary decisions for the family. Similar to other parts of the country, women here are primarily responsible for food preparation for the family. As such, empowering women through knowledge dissemination can impact at a greater level.

Ensuring proper nutrition for the adolescents: Due to less availability of healthcare facilities in the remote areas of CHT, adolescents often lack knowledge on their nutritional needs for proper growth. Communicating the need and necessity of food and nutritional intake to the adolescents, hence is essential for the CHT area. In addition, ensuring supply of nutritional foods (such as- iron enriched food items) to the CHT inhabitants is crucial to ensure nutritional security.

Ensuring proper pre and postnatal dietary practices: Dietary practices during the pre and postnatal period is poor among the CHT inhabitants. As such, pictographic demonstration on importance of proper dietary practices, especially during these time period can raise awareness among the mothers.

Focussing on homestead gardening of nutritional food items: Many of the women household members from CHT is engaged in homestead vegetable gardening. However, lack of knowledge and awareness restricts them to cultivate nutrition enriched food items. Dissemination of knowledge and improved practices will ensure gardening of nutrition enriched fruits and vegetables at the household level and consequently will ensure improved nutritional dietary habit for the inhabitants.

Chapter 4: Constraints and Recommendations

Healthy, well-nourished people are both the outcome of successful social and economic development as well as an essential input into the development process. Of the CHTs rural households, 66% depends mainly on agriculture for their livelihood (UNDP, 2009). As such, food and nutrition security is unlikely to be achieved without considerable attention to the food and agriculture sector. A nutrition-sensitive approach can contribute to physiological, mental and social development, enhance learning potential, reduce nutritional disorders and contribute to the prevention of diet-related diseases later in life. Nutrition-sensitive agricultural production can be implemented in three main areas: 1. making food more available and accessible. Increasing agricultural production makes more food available and affordable, which improves both the health and the economic status of the community. Sustained income growth in turn has a sizeable effect on reducing malnutrition. 2. Making food more diverse and production more sustainable. Increasing diversity in food production and promoting sustainable production practices like conservation agriculture, water management and integrated pest management can improve nutrition levels without depleting natural resources. Family farming, home gardens and homestead food production projects can make a wider variety of crops available at the local level. 3. Making food itself more nutritious. Fortification can prevent micronutrient deficiencies by enhancing micronutrient content in foods through processing, plant breeding and improved soil fertility. Also in addition to changes in the agriculture sector, governments can promote nutrition-sensitive agriculture by incorporating nutrition-sensitive concepts into relevant farm policies and programs.

4.1 Constraints

Major constraints across nine upazila of three districts of the present study appear to be more or less same with very small variations from one upazila to another upazila which are summarised below:

- Lack in diversity of the foods in the diet which is highly needed for healthy and active life
- Lack of knowledge and awareness about the nutrition sensitive agriculture
- Lack of attitude towards use of nutrition sensitive agriculture
- Lack of practices involved in nutrition sensitive agriculture such as improved production practices including GAP
- Lack of education affecting productivity and marketing of the nutrition sensitive agriculture commodities
- Lack of credits for production and marketing nutrition sensitive agriculture commodities
- Problems of transportation of inputs and outputs in the hilly areas of CHT need for nutrition sensitive agriculture system
- Lack of training in the area affecting production, consumption and marketing of nutrition sensitive agriculture commodities
- Lack of associations impeding collective action from the producers and traders for nutrition sensitive agriculture commodities
- Lack of linkage between private companies and local input and output sellers
- Lack manpower and transportation for government sector service provider for effective delivery of services needed for production, consumption and marketing of nutrition sensitive agriculture commodities
- Lack of short term preservation facilities for nutrition sensitive agriculture commodities in the local markets causes difficulties for the traders
- Lack of collection centers causes trading difficulties of nutrition sensitive agriculture commodities

- Lack of usage of modern technologies such as digital platforms for production and trading of nutrition sensitive agriculture commodities
- Absence of effective linkage of the producers of nutrition sensitive agriculture commodities and traders both at local and national level ultimately reduces profitability of the producers and reduce their enthusiasm for production of nutrition sensitive agriculture commodities.

4.2 Recommendations

Considering three aspects of the nutrition sensitive agriculture and in the light of the constraints identified during the study, the following recommendations are proposed for consideration by the authority of the LEAN project for implementation in the project area:

Knowledge

- Training on modern production technology, post-harvest handling, processing, consumption and marketing of nutrition sensitive agriculture commodities viz. nutritious crops, livestock, dairy and poultry following improved production practices including GAP for the beneficiaries of the project.
- Training on scaling up of the digital platforms such as use mobile-phone, Facebook based applications to receive support from the government agencies as well as trading of the inputs and outputs by both the producers and traders in the area as well for establishment of linkage and exchange of trade information between private company input suppliers with the village-level input sellers.

Awareness

- Awareness building training for the beneficiaries on knowledge, attitude and practice on nutrition sensitive agriculture and commodities
- Designing the nutrition sensitive agriculture production system in such a manner that harvest/returns can obtained during June to August, the lean period of food supply in the hilly area as the harvest from the Jhum is low or unavailable.
- Establishment of functional linkage of producers and traders groups for production and marketing of nutrition sensitive agricultural commodities.
- Establishment of functional linkage of the producers and other stakeholders for effective collaboration from the government agencies to scale-up their support services.
- Establishment of collection centres/points in the hard-to-reach areas for marketing nutrition sensitive agricultural commodities.

Practice

- Arrangement of credits from MFIs and government banks for the producers, input and output sellers involved in the production and marketing nutrition sensitive agriculture value chains.
- Promotion of modern agriculture technology in the hill (MATH) model of crop production in the project area by the beneficiaries to control soil erosion, conservation of soil moisture and water for higher yield of crops, conservation of nature and control of climate change impacts (Procedure and steps growing crops using MATH model have been provided in Annex 2).
- Promotion of homestead production system of nutrition sensitive agriculture commodities such as homestead gardening for year round production of vegetables (provided in annex 3 and 4), fruits, and spices; beef fattening, sheep (Garole) and goat rearing, pig rearing by the tribal beneficiaries as IGAs; small scale dairy for production and consumption of milk and milk products by the HH members and poultry rearing following semi-scavenging model for increased consumption meat and eggs as well as for sale by beneficiaries of the project as IGAs (Name of

varieties of the crops, cattle, goat and sheep breeds, poultry breeds have been provided in Annex-2 of this report).

- Promotion of field production of nutrition sensitive crops and crop varieties such Zn biofortified rice, QPM maize, OFSPs, legumes and pulses along with modern varieties of the existing field crops, vegetables, fruits and spices as (cash crops) (A list of the different varieties of crops and strains of animal have been provided in Annex 5 if needed for selection of varieties/strains for homestead and field production the project authority at present or in future).
- Promotion of water saving irrigation technologies such as drip irrigation/fertigation in the area for production nutrition sensitive high value crops or at least pitcher method of irrigation where water is very scarce in the hilly area.
- Production of ecofriendly/drought resistant crops and planting methods such as pit method of planting using vine crops such as cucurbits for less disturbance to control soil erosion and drought resistant crop like wheat, barley, gram, lentil, grass pea and zero tillage method planting.
- Promotion of multi-strata cropping system using shade loving plant like ginger, turmeric in lowest stratum, semi-shade loving plan like betel nut in middle stratum and sun loving plant mango, jackfruit in the upper most stratum.
- Establishment of preservation facilities in the local markets for short-term storage of perishable nutrition sensitive agriculture commodities like vegetables, fruits, eggs etc.

The following table illustrates upazila-specific recommendations to ensure nutritional security of the inhabitants. Due to similarities in findings and proposed recommendations, upazilas are grouped together for similar recommended activities for implementation.

Upazila	Recommendations
Ruma **Rowangchari**	• Knowledge on nutritious food intake and on micronutrients is particularly poor in Ruma and Rowangchari upazilas. Training on nutritional awareness and on GAP is essential. • Due to remoteness of Ruma, trading of the agricultural products is affected. Market price of agricultural products is significantly high. As such, it is important to focus on domestic production of nutrition-enriched food products. In addition, market linkage with the district-level traders can enhance the income potential of the farmers. • As source of knowledge on nutritional habits and on GAP is not much available, deploying LSPs for dissemination of such knowledge can be useful. • Climate change impacts, like the other upazilas, are impacting agricultural production and marketing. Climate-smart production and marketing techniques need to be implemented in Ruma and Rowangchari for sustainability. • Engagement of community people through the LSPs to disseminate knowledge and to ensure good practices can be effective in these upazilas.
Lakshmichari **Mohalchari**	• Knowledge on nutrition is comparatively better in Lakshmichari and Mohalchari upazilas as compared to other upazilas of the study area. As such, the key focus should be on maintaining the knowledge flow among the community dwellers and on ensuring proper dietary habit practices. • Mohalchari upazila is slightly lagging behind when it comes to preservation of food or food processing. Given the remoteness of the hilly areas, food processing techniques should be communicated to the residents for effective outcome. • Adaptation with the climate change techniques is poor, especially in Mohalchari upazila. Climate-smart production and marketing techniques need to be implemented for sustainability. • Knowledge and practice on GAP is poor in both the upazilas. Training on knowledge and practice of GAP should be provided.

Belaichari **Jurachari** **Rajasthali** **Barkal**	• Belaichari, Jurachari, Rajasthali and Barkal upazilas are slightly more advanced in knowledge on nutrition. Leveraging the good knowledge base on future implementation activities will be effective for the upazilas. However, knowledge and practice on GAP was found to be poor among the residents. Nutritional food promotion and ensuring good agricultural practices, as such, should be on focus in case of these upazilas. • These upazilas are lagging behind when it comes to preservation of food or food processing. Given the remoteness of the hilly areas, and transportation difficulty through the water bodies, food processing techniques should be communicated to the residents for effective outcome. • Adaptation with the climate change techniques is poor in these upazilas. Climate-smart production and marketing techniques need to be implemented for sustainability. • Given the geographic position, these upazilas require attention on marketing of food products through the water channels. • Due to costly transportation, focus on household production of nutritious foods can generate better outcome on nutritional status. • Climate smart technologies, with respect to flood and landslide, should be introduced both in cases of food production and marketing. • Establishment of collection centers and linkage with the traders can be effective in case of product marketing and greater economic outcome for the farmers. • Communicating GAP techniques through the LSPs and proper monitoring of the progress is key to improving nutritional status in these upazilas.
Nanirarchar	• Knowledge and awareness on nutritional food habit is poor among the Naniarchar residents. Knowledge dissemination on nutritional food production and dietary habit through the LSPs is essential. Demonstration through improved practice habit can be effective for the residents. • Food preservation and processing is not widespread in this upazila. Proper preservation and processing techniques need to be communicated to the residents. • Adaptation with the climate change techniques is poor in this upazila. Climate-smart production and marketing techniques need to be implemented for sustainability. • Knowledge and practice on GAP is poor in this upazilas. Training on knowledge and practice of GAP should be provided. • Training on basic hygiene and cooking practices should be provided.

Chapter 5: Conclusion

The Chittagong Hill Tracts (CHT), located in southeastern Bangladesh. It covers about 13,184sq. km, of which 92% is highland, 2% medium highland, 1% medium lowland and 5% residential areas and bodies of water (Bala *et al*., 2017). Agriculture is the main source of livelihood and the incidence of poverty is very high. Non-farm income opportunities are very limited, and in some areas, non-existent. Nutritional status of the inhabitants of the study area is poor. Poverty, lack of knowledge, low attitude towards nutrition sensitive agriculture commodities and lack of practice of production and consumption of nutrition sensitive agriculture commodities and ultimately resulting in low intake of nutritious food of the inhabitants of the study area. In order to increase the nutritional status of the CHT dwellers, it is important to support them through lessening the constraints mentioned to improve their livelihoods. Increase in production of nutrition sensitive agriculture commodities and increase awareness of nutrition will increase consumption of nutritional foods and ultimately ensure food and nutrition security of the inhabitants in the project area. However, implementation of food and nutritional program in an area is a multi-sectoral activity and appropriate liaisons with the Government and Non-Government support service provider organizations and financial institutions and active participation of the project beneficiaries and other stakeholders is needed for successful implementation of the appropriate and timely needed interventions for production, consumption and marketing of nutrition sensitive agriculture commodities which can ensure sustainable growth of the beneficiaries of the LEAN project in three hill districts. Also along with proper implementation of the appropriate and timely needed interventions, proper monitoring

of the system to scale-up the activities among the dwellers there can significantly help in improving their nutritional status.

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Annex-1: Question guides

Study on identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices, and explore possible options to address gaps

Questionnaire for FGDs

Selection Criteria:

1. **Female member of the beneficiary households of Helvetas from different ethnic back ground in the upazila in the age group of 15-49 years**

Thank you for agreeing to be part of this interview. I am …… from **Innovision Consulting Private Limited**. We have been assigned by **HELVETAS Swiss Intercooperation (HSI)** to undertake a study on **"identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices, and explore possible options to address gaps"** You, being one of the project beneficiaries, are requested to provide information on some key aspects with regards to the study. We ensure that your individual responses will not be shared to anyone; overall results will be included in reports. Your name will not appear anywhere to ensure that your responses cannot be linked to you. Our interview is likely to take between 50-60 minutes. Do you consent to be a respondent?

Yes	
No	

A. General information

Interviewer's name			
Type of respondent (value chain)			
District		Upazila	
Union		Village	
Date		Time	

Sl. No.	Name of the participants	Age	Education	Status of cultivation/rearing of nutrition sensitive agricultural commodities (Crop livestock and poultry	Mobile phone	No. of children	Age of children	Remarks

				Crops		Livestock / Poultry				
				In Homestead	In Field/ *Jhum*					
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										

- **Ice-breakers:**

  Raise your hands if, in your household:
  - You wake up before everyone else
  - You enjoy free time every day
  - Men and boys help with the washing of clothes
  - Somebody cooks for you

B. Knowledge

1. Why do you eat foods?
2. How many of you know about food and nutritious and safe foods?
3. What are the sources of nutritious and safe foods in your locality?
   i. Own production-
   ii. Bought from market-
   iii. Collect from forest-
   iv. Collect from neighbour-

4. Do you have any idea about nutrition sensitive agriculture?
5. Do you know about improved production techniques including good agricultural practices (GAP) for production and post-harvest handling of nutritious foods? Please mention some of the practice you follow in your area.
6. If yes, why do you need to follow improved production techniques including GAP for production and post-harvest handling of nutritious foods?
7. Do you know the deficiency symptoms of vitamins such as iron, iodine, calcium, vits B, C etc?

8. Can you say some vitamins & micronutrient containing natural foods those are produced in your area?
9. How do you gather knowledge about production and consumption of nutritious food? Please mention some of the sources-
10. Please mention consumption and disposal patterns of the nutritious foods produced by you
    i. Own consumption-
    ii. Sale in the market-
    iii. Gift to the neighbour-
    iv. Processing and storage-
    v. for future use-
    vi. Loss due to lack of preservation-
    vii. Others-

11. How do you market your produces?
    i. From farm gate-
    ii. From home-
    iii. In local market-
    iv. In distant market-

12. Do you face any problem in marketing of your produces? Yes/No
13. If yes, please mention those
14. Can you explain the processing and storage techniques of foods in indigenous ways in your locality?
15. Can you explain the advantages of those indigenous techniques with ingredients?
16. How any of you think climate change is taking place?
17. How many of you know the causes of climate change on the earth? Please mention some of the causes? What are those causes? Please mention.
18. How many of you know how to adapt with the climate change for production of nutritious foods?
19. Can you mention some of the techniques to adapt with the climate change for production of nutritious foods?
20. What are the risks of disaster for production of nutritious foods in your area? Please mention five risks.
21. What are techniques used to mitigate those risks for production of nutritious foods in your area? Please mention
22. Do you agree that women between 15-49 years of age, lactating mothers and children of U 5 years of age should eat more nutritious foods? Yes/No
23. If yes, do you know the reasons of it?

C. Attitude/Perspective

1. Do you think we need to follow improved production techniques including GAP (Good agricultural practices) for production of nutritious and safe foods Yes/No
2. If yes, what are the reasons?
3. How many of you follow the practices of washing of hands before food preparation, consumption and drinking of water? Yes/No
4. How do you prepare nutritious and safe foods for cooking such as washing before cutting with clean water, cutting in large pieces, boiling rather cooking with high heat?
5. Do you have any preferences for special nutritious foods in your area? Yes/No
6. If yes, what are those special nutritious foods? Please mention
7. Does any cultural/religious barrier exist your area regarding consumption of any of nutritious food items such as eggs, milk, meat, fish, pulses other food items in your area? Yes/No
8. If yes, what are those? Please mention
9. Does any cultural/religious barrier exist in your area regarding consumption of any of nutritious food items such as eggs, milk, meat, fish, pulses other food items by the HH

members and special group such as the pregnant women or lactating mother or children? Yes/No
10. If yes, what are those? Please mention
11. Is there any discrimination of allocation of foods among the family members in respect of age, gender special group such as the pregnant women or lactating mother or children? Yes/No
12. If yes, what are those? Please mention
13. Who does decide the food items, composition and distribution in your HH? Man/Woman
14. Do you believe that women empowerment and decision making by women will improve production and consumption of nutritious foods in the HH? Yes/No
15. If yes, please mention the reasons
16. If no, please mention the reasons

D. Practices

1. Do you practice improved production techniques including GAP for cultivation/rearing of crops, livestock and poultry? Yes/No
2. If yes, how many practice improved production techniques including GAP for cultivation/rearing of crops, livestock and poultry in your area?
3. Do you face any problem in practicing improved production techniques including GAP for cultivation/rearing of crops, livestock and poultry in your area? Yes/No
4. If yes, please mention those
5. Do you face any problem in marketing of your crops/livestock/poultry produce following improved production techniques including GAP in your area? Yes/No
6. If yes, please mention those
7. How do you store your produces for future use in your area?
8. How many meals do you take daily in your area?
9. What are the typical components of each meal in your area? Please mention with average amount per person.

Break fast	Lunch	Evening snack	Dinner

10. Usually, in how many ways you prepare nutritious foods for your family in your area?
    i. Cooked-
    ii. Boiled-
    iii. Fresh-
    iv. Fermented-
    v. Other (If any)-
11. Do you practice of eating any indigenous/local nutritious foods for overcoming the problems of malnutrition problems/ deficiency diseases? Yes/No
12. If yes, what are those, please mention
13. Is there any seasonal distribution of malnutrition problem/deficiency diseases in your area? Yes/No
14. If yes, how do you mitigate those problems?
15. Do you have suggestions to improve production/rearing nutritious foods in your area to ensure food and nutrition security? Please mention

Thank you very much for your valuable inputs.

End of the FGD

Study on identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices, and explore possible options to address gaps

Questionnaire for input/output traders

Thank you for agreeing to be part of this interview. I am …… from **Innovision Consulting Private Limited**. We have been assigned by **HELVETAS Swiss Intercooperation** (HSI) to undertake a study on **"identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices, and explore possible options to address gaps"** You, being one of the key stakeholders, are requested to provide information on some key aspects with regards to the study. We ensure that your individual responses will not be shared to anyone; overall results will be included in reports. Your name will not appear anywhere to ensure that your responses cannot be linked to you. Our interview is likely to take between 50-60 minutes. Do you consent to be a respondent?

Yes	
No	

General information

Interviewer's name			
Name of the interviewee			
Type of respondent (value chain)			
Age		Education	
Gender		Contact no.	
District		Upazila	
Union		Village	
Date		Time	

1. What are the inputs/products are traded for agriculture and livestock sectors in your upazila?
2. What are the problems/Challenges you face in trading those products? Are there differences between women and men?
3. How do you solve those problems? What supports do you require?
4. What are the outputs/products are traded in agriculture and livestock sectors in your upazila?
5. From where do you get the outputs? Do you produce the outputs or buy from others?
6. Do you provide any additional services other than selling products? If yes, what are those?
7. Do your customer demand any additional services? Yes/No.
8. If yes, what services do they ask for? If you can't provide the demanded services, what are your main challenges? What do you require?
9. Which companies' products do you usually sell? Which companies' products are most demanded by the inhabitants? (for input traders)

10. Do you face any challenge acquiring products from these particular companies? If yes, what are those? What can be done to resolve the challenges? (for input traders)
11. Is there any demand of any particular product that is not supplied in this area? If yes, what are those? Why those are not supplied?
12. Where do you sell your products? Do you sell to multiple traders/districts? If yes, can you plesase share with us whether you face any challenge with a particular buyer? (for output traders)
13. What are the challenges/problems of trading agricultural outputs in your area?
14. How do you solve those problems?
15. Do you face shortage in supply? If yes, is it during a particular time of the year? If yes, what are the reasons?
16. Are you member of any association? If yes, can you please name those?
17. What are the activities of the association?
18. Do you have any suggestion/recommendation to improve the trading of inputs/outputs in agriculture and livestock sector in your area?
19. If yes, please mention those
20. What would you say your most urgent need at this moment?

Thank you very much for your valuable inputs.

End of the interview

Study on identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices, and explore possible options to address gaps

Questionnaire for UAO

Thank you for agreeing to be part of this interview. I am …… from **Innovision Consulting Private Limited**. We have been assigned by **HELVETAS Swiss Intercooperation** (HSI) to undertake a study on **"identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices, and explore possible options to address gaps"** You, being one of the key stakeholders, are requested to provide information on some key aspects with regards to the study. We ensure that your individual responses will not be shared to anyone; overall results will be included in reports. Your name will not appear anywhere to ensure that your responses cannot be linked to you. Our interview is likely to take between 20-30 minutes. Do you consent to be a respondent?

Yes	
No	

1. **General information**

Name of Interviewee			Date:	
Name of Upazila		District		
Designation				
Contact Details:	Address			
	Mobile phone			
Name of Interviewer				

2. What are the main crops grown in your upazila?
3. What are the main cropping patterns of the upazila?
4. From your view point what are the nutrition sensitive crops/varieties which can be grown in your upazila?
5. Who are your main beneficiaries?
6. What type of services is available for the producers?
7. Which services are most availed by the producers?
8. Do you face any problems in providing those services?
9. Are there any specific services for women only?
10. What are the main challenges/problems of production and marketing of nutrition sensitive crops/varieties in your area?
11. What are your recommendations to face and solve those challenges/problems?
12. Any further suggestions/recommendations for production and marketing of nutrition sensitive crops/varieties considering local perspective

Thank you for your input

End of the interview

Study on identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices, and explore possible options to address gaps

Questionnaire for ULO/Veterinary surgeon

Thank you for agreeing to be part of this interview. I am …… from **Innovision Consulting Private Limited**. We have been assigned by **HELVETAS Swiss Intercooperation** (HSI) to undertake a study on **"identification of knowledge, attitude and practice level gaps in nutrition sensitive agriculture technologies and their practices, and explore possible options to address gaps"** You, being one of the key stakeholders, are requested to provide information on some key aspects with regards to the study. We ensure that your individual responses will not be shared to anyone; overall results will be included in reports. Your name will not appear anywhere to ensure that your responses cannot be linked to you. Our interview is likely to take between 20-30 minutes. Do you consent to be a respondent?

Yes	
No	

1. **General information**

Name of Interviewee			Date:	
Name of Upazila		District		
Designation				
Contact Details:	Address			
	Mobile phone			
Name of Interviewer				

2. What are the main livestock and poultry species rear in your upazila?
3. What are the methods of rearing of those?
4. Do you think milk, meat, eggs and other livestock and poultry can produced and consumed locally in your upazila?
5. Who are your main beneficiaries?
6. What type of services is available for the livestock and poultry producers?
7. Which services are most availed by the producers?
8. Do you face any problems in providing those services
9. Are there any specific services for women only?
10. What are the main challenges/problems of production and marketing of livestock and poultry in your area?
11. What are your recommendations to face and solve those challenges/problems?
12. Any further suggestions/recommendations for production and marketing of nutrition sensitive crops/varieties considering local perspective

Thank you for your input

End of the interview

Annex 2. Khagrachari model of homestead vegetable production (mainly leafy vegetables) in hilly areas

Bed	Rabi (Oct-Feb)	Kharif-1 (March-May)	Kharif-2 (June-Sept)
Bed-1	Raishak/Red Amaranth	Red Amaranth	BARI Panikachu-2
Bed-2	Red Amaranth-Stem Amaranth	Sweet Gourd Leaf)	Indian Spinach
Bed-3	Radish-Sweet Gourd	Indian Spinach	Gima Kalmi

Bed size: 5 (10.0 hat) x 1.3 (3 hat) m with 50 cm (1 hat) drain around bed.

Annex 3 Proposed homestead crop production model using different vegetables, fruits and spices in the hilly areas

Place in the homestead	Bed	Rabi (Oct-Feb)	Kharif-1 (March-May)	Kharif-2 (June-Sept)
Open Place	Bed-1	Tomato+ Red Amaranth	Radish	Indian Spinach
	Bed-2	Cabbage/Broccoli/Cauliflower	Okra	Gima Kalmi
	Bed-3	Radish+ Carrot	Cowpea	BARI Panikachu-2
	Bed-4	French bean	Red Amaranth	Cowpea
Trellis		Country bean	Teasel Gourd	Teasel gourd
		Bottle Gourd	Ridge gourd	Smooth Gourd
Under Trellis		Turmeric/Ginger	Turmeric/Ginger	Country bean
			Mukhi kachu	Country bean
Shady Place		Ginger and Turmeric	Ginger and Turmeric	
Roof top		Sweet Gourd	Ash Gourd	Smooth Gourd
Tree		Smooth Gourd	Yam	Yam
At the border		Drum stick	Drum stick	Drum stick
Around the house		Papaya	Papaya	Papaya

Annex 4: Steps in implementation of MATH in hilly area: The procedure of preparation of the field for MATH model has given in Figure 2 and steps have given below:

Step 1. Cultivation of "Jhum" crops through selection of proper land

Step-2 As per MATH model, planting of quick growing fruits crops such as papaya,banana,short duration fruit crops guava, lemon, and long duration crops such jack fruit, litchi, mango, pumelo, Malta and forest species at a time in the "Jhum" during the onset of first rain.

Step-3. Planting of pineapple, Pigeon pea acress the "Jhum" as per slope after the harvest of rice, Marfa, Foxtail millet (Kaon), maize, sesame etc from the "Jhum".

Step-4 After harvest of the main "Jhum" crops, cultivation of different seasonal vegetables such as, aroids, Yard long bean, French bean, brinjal, tomato, chilli, radish, red amaranth, stem amaranth, Rai shak, Indian spinach cruciferous vegetables cucurbits and spices like ginger, turmeric, onion, garlic, coriander etc.

Step-5 Cultivation of quick growing cover crops such as cowpea along with vegetables after cleaning the Jhum to control soil erosion.

Step-6 Marketing of crops produced using MATH through Central Procurement and Distribution Point (CPDP) using MATH by formation growers association for better price

Step-7 The MATH is applicable to first and second class hills among the three categories of hills as per SRDI other it is applicable to existing "Jhums"

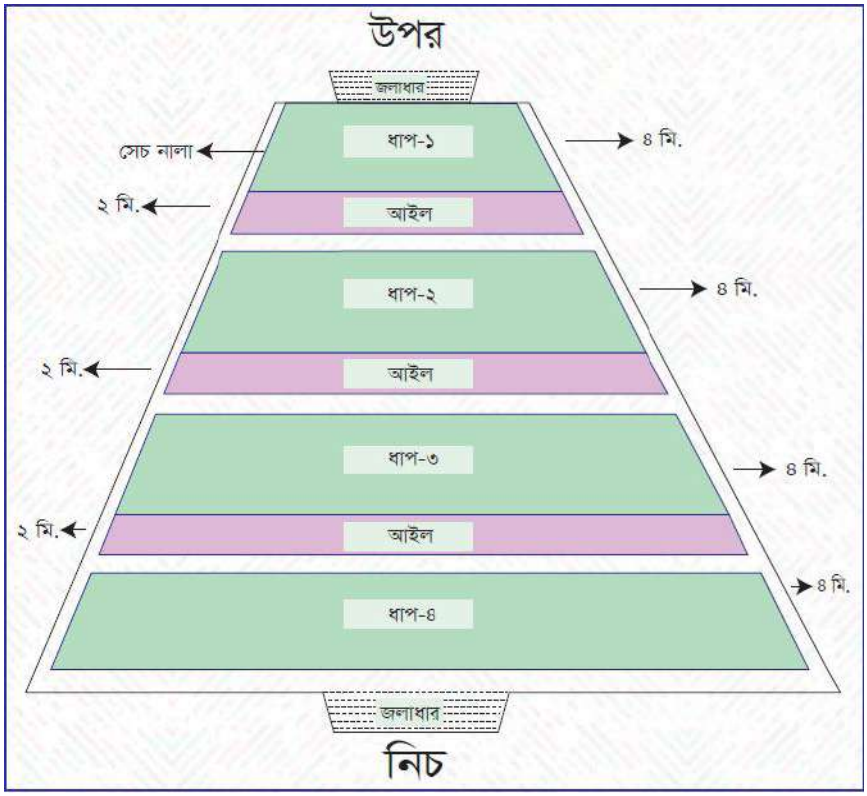

Figure 2. Preparation of land on the hill using MATH model

Annex-5: List of crops/ crop varieties, livestock and poultry breeds that can be considered for production/rearing in the project area

Crop types	Name of crop	Name of varieties
Field crops	Rice	Short duration rice varieties released from BRRI and BINA including Zn-fortified varieties BRRI dhan62, BRRI dhan64, BRRI dhan72, BRRI dhan74, BRRI dhan84, and BRRI dhan100
	Wheat	BARI Gam-25, BARI Gam-26, BARI Gam-27, BARI Gam-28, BARI Gam-29, BARI Gam-30, BARI Gam-31, BARI Gam-32, BARI Gam-33 released by BARI for cultivation all over Bangladesh
	Maize	BARI Bhutta-5 (QPM maize variety), BARI Bhutta-7, BARI Bhutta-9, BARI Bhutta-9, BARI Bhutta-10, BARI Bhutta-11, BARI Bhutta-12, BARI Bhutta-13 BARI Bhutta-14, BARI Bhutta-15 & BARI Bhutta-16 and other hybrid varieties of maize marketed by different companies and NGOs in Bangladesh
	Barley	BARI Barley-1 to BARI Barley-7 (Total 7 varieties released by BARI)
	Foxtail millet	Titas, BARI Kaun-2, BARI Kaun-3
Pulses	Lentil	BARI Masur-1 to BARI Masur-8 (Total 8 varieties released by BARI)
	Gram	BARI Chola-2 to BARI Chola-11 (Total 10 varieties released by BARI)
	Mung	BARI-Mung-2 to BARI-Mung-8 (Total 7 varieties released by BARI)
	Grass pea (Kheari)	BARI Khesari-1 to BARI Khesari-5 (Total 5 varieties released by BARI)
	Black Gram (Mash Kalai)	BARI Mash-1 to BARI Mash-4 (Total 4 varieties released by BARI)
	Felon	BARI Felon 1 and 2
Oil seeds	Mustard	BARI released mustard varieties available in the market
	Sesame	BARI released sesame varieties available in the market
	Groundnut	BARI and BINA released Groundnut varieties available in the market
	Soybean	BARI and BAU released soybean varieties available in the market
Roots & tubers	Potato	BARI released potato varieties
	Sweet potato	OFSP varieties released by BARI
	Mukhi Kachu	Bilashi and BARI Mukhi Kachu-2
	Carrot	Available varieties in the market
	Radish	BARI released radish varieties and other varieties available in the market
Leafy vegetables	Red amaranth	BARI released varieties and other varieties available in the market
	Stem amaranth	BARI released varieties and other varieties available in the market
	Indian Spinach	BARI released varieties and other varieties available in the market
	Spinach	BARI released varieties and other varieties available in the market
	Bati shak	BARI released varieties and other varieties available in the market
	China shak	BARI released varieties and other varieties available in the market
	Rai shak	BARI released varieties and other varieties available in the market
	Gima kalmi	BARI released varieties and other varieties available in the market
	Lettuce	BARI released varieties and other varieties available in the market
Cucurbits	Bottle gourd	BARI released varieties and other varieties available in the market

	Sweet gourd	BARI released varieties and other varieties available in the market
	Bitter gourd	BARI released varieties and other varieties available in the market
	Pointed gourd	BARI released varieties and other varieties available in the market
	Ridge gourd	BARI released varieties and other varieties available in the market
	Snake gourd	BARI released varieties and other varieties available in the market
	Smooth gourd	Varieties available in the market
	Ash gourd	BARI released varieties and other varieties available in the market
Legumes	Country bean	BARI released varieties and other varieties available in the market
	French bean	BARI released varieties and other varieties available in the market
	Yard long bean	BARI released varieties and other varieties available in the market
	Cowpea	BARI released varieties and other varieties available in the market
	Pea	BARI released varieties and other varieties available in the market
Solanaceous vegetables	Brinjal	BARI released varieties and other varieties available in the market
	Tomato	BARI released varieties and other varieties available in the market
	Sweet pepper	BARI released varieties and other varieties available in the market
Cruciferous vegetables	Cabbage	BARI released varieties and other varieties available in the market
	China cabbage	BARI released varieties and other varieties available in the market
	Cauliflower	BARI released varieties and other varieties available in the market
	Broccoli	BARI released varieties and other varieties available in the market
	Knolkhol	BARI released varieties and other varieties available in the market
Fruits	Water melon	BARI released varieties and other varieties available in the market
	Melon (Marfa)	BARI released varieties and other varieties available in the market
	Dragon fruit	BARI released varieties and other varieties available in the market
	Banana	BARI released varieties and other varieties available in the market
	Papaya	BARI released varieties and other varieties available in the market
	Pineapple	BARI released varieties and other varieties available in the market
	Guava	BARI released varieties and other varieties available in the market
	Jujube	BARI released varieties and other varieties available in the market
	Lemon	BARI released varieties and other varieties available in the market
	Orange	BARI released varieties and other varieties available in the market
	Malta	BARI released varieties and other varieties available in the market
	Pumelo	BARI released varieties and other varieties available in the market
Spices	Chilli	BARI released varieties and other varieties available in the market
	Ginger	BARI released varieties and other varieties available in the market
	Turmeric	BARI released varieties and other varieties available in the market
	Onion	BARI released varieties and other varieties available in the market
	Garlic	BARI released varieties and other varieties available in the market
	Long leaf coriander (Bilati Dhania)	BARI released varieties and other varieties available in the market
Livestock and poultry		
Name	**Breed**	
Cattle	Red Chittagong (Both for meat and milk purpose)	
Goat	Black Bengal	
Sheep	Garole and indigenous	
Poultry	Sonali (Meat and egg), Cobb-500 (Broilers), ISA Brown (Layers) and ISA White (Layers) etc	
Pig/Swine	Indigenous (Ghori)	