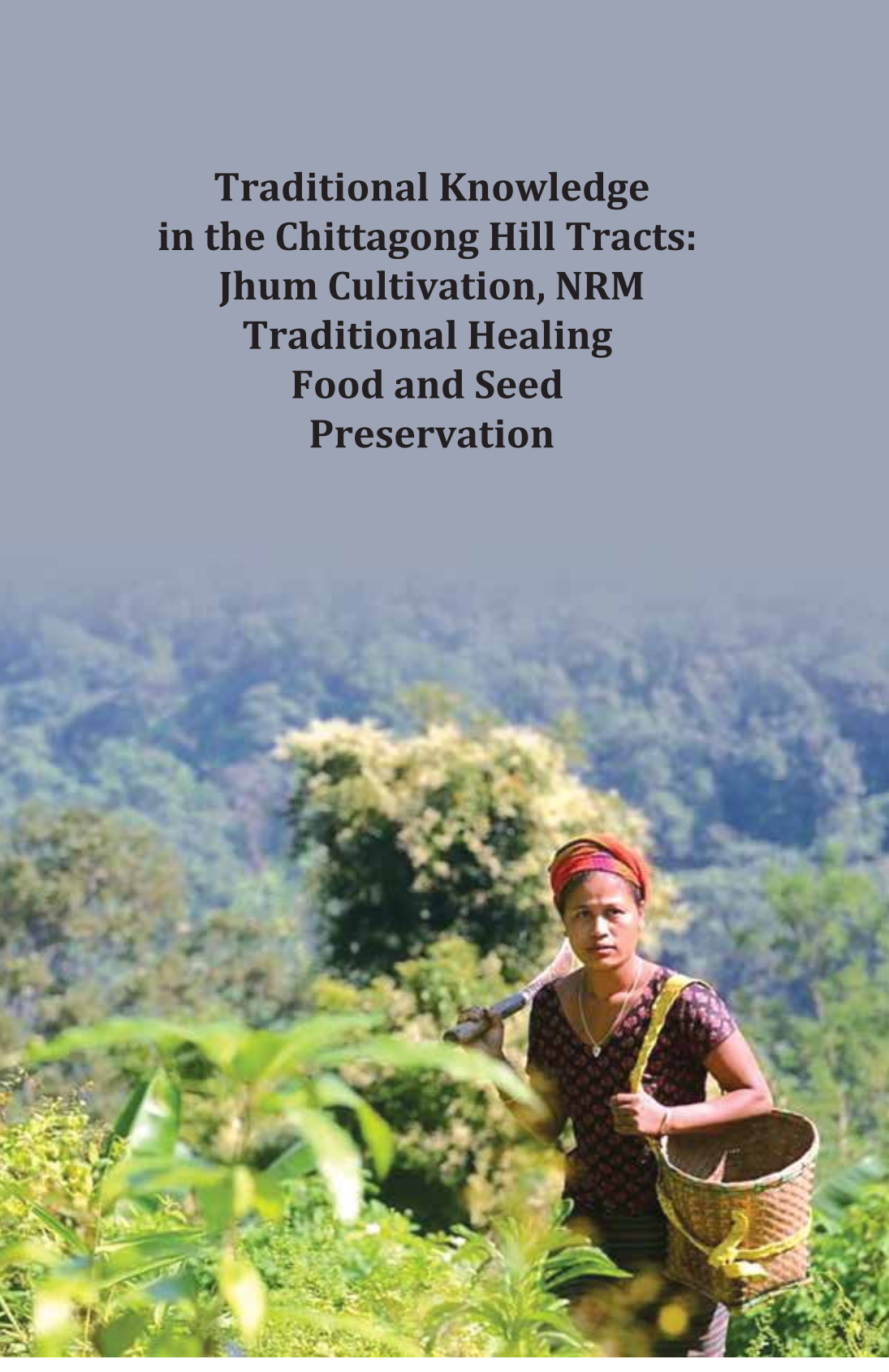
Traditional Knowledge in the Chittagong Hill Tracts: Jhum Cultivation, NRM Traditional Healing Food and Seed Preservation



Traditional Knowledge in the Chittagong Hill Tracts: Jhum Cultivation, NRM, Traditional Healing, Food and Seed Preservation

Trinamul Unnayan Sangstha

Traditional Knowledge in the Chittagong Hill Tracts: Jhum Cultivation, NRM, Traditional Healing, Food and Seed Preservation

Published
December 2017

Editors
Ripan Chakma
Sujash Chakma

Associates
Sukiran Chakma, Rumen Chakma
Reshmee Chakma, Kapiri Chakma, Satish Chakma

Graphics and Design
Tangsree Color System

Cover Photo
Sanchoy Chakma

Photographs
Sanchoy Chakma , Ripan Chakma
Sujash Chakma , Evesh Chakma , Prasun Chakma

ISBN 978-984-34-4705-0

Courtesy by
Enhancing Climate Resiliency and Strengthening Food Security through Traditional Knowledge Project

Published by
Trinamul Unnayan Sangstha

Table of Contents

Acronyms

AIPP	:	Asia Indigenous Peoples Pack
CHT	:	Chittagong Hill Tracts
CHTRC	:	Chittagong Hill Tracts Regional Council
CHTDF	:	Chittagong Hill Tracts Development Facility
EC	:	Executive Council
GoB	:	Government of Bangladesh
HDC	:	Hill District Council
NGO	:	Non-government Organization
NRM	:	Natural Resoure Management
PDC	:	Para Development Committee
TK	:	Traditional Knowledge
TUS	:	Trinamul Unnayan Sangstha
UNO	:	Upazila Nirbahi Officer
UP	:	Union Parishad
UNDP	:	United Nations Development Program
UzP	:	Upazila Parishad
VCF	:	Village Common Forest

Message from the Chairperson

I am so happy that Trinamul Unnayan Sangstha is going to publish a book *'Traditional Knowledge in the Chittagong Hill Tracts: Jhum Cultivation, NRM, Traditional healing, Food and Seed Preservation'* under *'Enhancing climate resiliency and strengthening food security through traditional knowledge project'* supported by AIPP and the Indigenous Ways of Knowing and Learning Fund.

Chittagong Hill Tracts is hilly and mountainous but culturaly diversified region of the country. There are 13 ethnic communities have been living in harmony with nature for centuries. Their livelihood, tradition, culture, knowleddge, values, norms and believes is very closely related to nature. The ethnic communities of CHT have enriched traditional knowledge on jhum cultivation, sustainable hill farming and forest management, collecting water, house desinging, traditional healing, seeds and food preservation and been practicing since times of immemorial.

Nowadays, the traditional knowledges are loosing due to technological advancement and comercial completion in the modern era.

In this circumstance, TUS have taken initiative to promote and restore traditional knowledges through documentation in Chittagong Hill Tracts. I think this initiative will be contributed to the society and future researchers.

Shyamali Chakma

Acknowledgement from the Executive Director

Promoting the practices of traditional knowledge in Chittagong Hill Tracts (CHT), TUS are going to publish a publication *'Traditional Knowledge in the Chittagong Hill Tracts: Jhum Cultivation, NRM, Traditional healing, Food and Seed Preservation'*. In this journey TUS conducted series of workshops on diversified crop production & harvesting technology using traditional method and knowledge with jhumia farmers, on food & seed preservation techniques with elders, youth and women and on traditional healing practices with traditional healers. During the workshops we had find out many data regarding practices of traditional knowledge on jhum cultivation, natural resource management, village common forest, traditional healing practices, seed and food preseravation in CHT. We tried to document all findings or data of workshops and also secondary data which we had used during the workshops as referece materials for better understanding. So that I would like to acknowledge Mr. Sujash Chakma, Program Manager, TUS for his arcticle *'Jhum cultivation: connection with chakma culture and traditions',* Mr. Prakash BG, Department of Biotechnology & Crop Improvemet, College of Horticulture, Mysore, India, Mr. Raghavendra KV, College of Sericulture, University of Agricultural Sciences, Bangalore, India and Mr. Gowthami R and Mr. Shashank R, department of biotechnology, Government Science College, India for their reaserch article *'Indigenous Practices for Eco-friendly Storage of Food Grains and Seeds'*, Mr. Anupam Guha and Ms.

Daina Chakma, department of Botany, Women's College, Agartala, Tripura, India for their reaserch article *"Traditional Usage of Ethno-Medicinal Plants among the Chakma Community of Tripura, India"* and Mohammed Mohiuddin and M. Kairul Alam, Bangladesh Forest Research Institute for their reaserch article *'Opportunities of Traditional Knowledge in Natural resource management experiences from the Chittagong Hill Tracts, Bangladesh'*.

Hence, I would like to thank Mr. Sanchoy Chakma for his nice photographs and participants for their endeavour and effective participation. I would like to express my gratitude to donors, local administration, government line departments and stakeholders for their heartfelt cooperation. All credit goes to my colleagues for their hard work and efforts to bringing out the success of the publication.

Ripan Chakma

Executive Summary

Chittagong Hill Tracts is located in the South Eastern part of Bangladesh that comprises of the three Hill Districts of Bandarban, Rangamati and Khagrachari. It shares common international border with Myanmar and India i.e. the states of Mizoram and Tripura. The region is largely hilly and mountainous which made the region different from other parts of the country. There are 13 ethnic communities have been living with their rich cultural practices and heritage for centuries. They have been practicing their traditional knowledge of natural resource management, sustainable forest management, traditional livelihood, traditional healing system, diversified crops and food preservation since time immemorial for their sustenance and livelihood. The general assumptions are many of the knowledge have lost relevance in modern era and not significantly able to contribute for sustainable livelihood, while some others stand strong with proven adaptability and high degree of relevance and comercial acceptability and demand.

On the contrary, many of the neo-agro practices of the modern times, which are not indigenous knowledge based, poses threat for public health, as most of the crops are highly dependent on toxic chemicals and costly fertilizers. Most of the yield calls for excessive use of ground water and indirectly harms forest and natural resources, which is unsustainable and hazardous for health.

In this regard, TUS has taken initiative to implement *'Enhancing climate resiliency and strengthening food security through traditional knowledge'* supported by AIPP and the Indigenous Ways of Knowing and Learning Fund. The main objectives of the project were: (1) to identify and document relevant traditional knowledge for climate resilient sustainable livelihood to support food security; and (2) to increase climate change resilience of indigenous communities through exchange and publication and dissemination of sustainable practices and traditional knowledge including on food production and preservation and on medicinal plants for the health and well-being of indigenous communities.

To achieve the project objectives TUS conducted series of workshop with Jumia farmers on diversified crop production & extraction or harvesting technology using traditional methods and knowledge, with women and youths, elderly on food & seed preservation techniques, with women and youths, elderly on village common forest and natural resource management techniques and with traditional healers on traditional healing practices as follows;

Jhum Cultivation: Jhum cultivation is related to traditional livelihood and culture of ethnic community peoples of Chittagong Hill Tracts which have been practicing generation to generation for decades. We discussed during the workshop regarding the process of jhum cultivation i.e. Jhum Dhora (site selection), Jhum Kata (cutting), Jhum pura (burning the Jhum field), Tongghar banana (building Tong house), Bijbijidi huja (Sowing Seed), Arahara (cleaning Jhum), Jhumot udana (living in tongghar), Dhan fung gorana (launching harvesting crops), Dhanhaba (harvesting crops), Maleya dena (cropping festival) and Returning crops from Jhum field to village house. We dissuced also the production mechanism (sowing seeds, spreading seeds, cultivating stems and saplings), Traditional Harvesting techniques (paddy and vegetable harvesting) and Traditional Jhum Seed preservation techniques (sand filled, dry earthen house,

preserving in utto-bamboo fram and maja-bamboo shed, planting in cold dry soil, preserving in bamboo container or pot, supporting seed crop with bamboo frame, sun drying etc.).

NRM and VCF: We discussed on Traditional Water management, Water life management, Forest management (village common forest management system, techniques, etc.), and Wildlife management (birds, amphibians, animals).

Traditional Healing Practices: We discussed on types and causes of the origin of diseases as per traditional system i.e. Contaminated foods, Transmission, Contaminated place, Chalan, Bhan and Tona (a typical incantation conducted by the traditional healer) and Ajhor (Goblin's effect), method of diagnosing diseases i.e. Determined by the physical significant, Gona (prediction) and Chalan (incantation), Vain test and Navel test, methods of the treatment i.e. Montro, Jhar, Fook (incantation method), Dali-baja (animal offering), Jagamarana (get pure), Puja (worship), Gona (prediction), Hang and Snan(bath) and the methods of Talik (treatment formula of deases), uses of the medicines i.e. Buri (pills), Darubana (ointment), Majana (massage) and Suddosongo(steam bathe).

Seed Preservation Systems: We discussed seed preservation systems i.e. Bamboo pot/internode, Cloth, Hole, Dry and Cool place, Bottle, Smoke, Hutti (one kind of earthen pot), Basket (made of bamboo), Bamboo shed (macha), Ludung (bottle gourd), Leafy granary (Lau-Kudugulo) and Curved Bamboo stick and also we discussed the rituals, beliefs and customs related to seed preservation (i.e. Ghile, Hojoy, Turmeric and Mustard seed is used for holy spirit to get rid of evil spirits, Kumra (ash gourd) seed and corn is used during earthen dam construction, Cucumber seed, Tamarind seed, Bitter gourd seed is used to get rid of various diseases and popcorn made with sticky rice is used during the funeral and pre funeral ceremony). In addition, we discussed the materials are used for seed preservation i.e. Hutti (earthen pot),

Ludung (made of bottle gourd), Hallong (made of bamboo), Habang (made of bamboo), Hurung (made of bamboo), Hajjeng (made of bamboo), Bamboo shed/internode (made of bamboo), Bee wax (bee hive) and clean cloth piece (cloth).

Food Preservation System: We discussed the method of food preservation system i.e. Sun drying (radish, bean, cabbage, bottle gourd, plum and fruits), Smoke drying (corn, jhinge, fish, edible flowers and vegetables), Barbeque (pork, deer meat, buffalo meat and fish), Oiled and canned in earthen pot (berma/small fish), Fermentation (milk, bamboo shoot and dochoani-rice wine), Rice powder (rice cake), Boiling and Sun drying (ginger and turmeric), Salting (tamarind and ulu), Boiling and Drying (molasses-sugar cane and date juice), Boiling and Bottling (honey) and Storing in cool place (potato, arum, pumpkin, and ash gourd).

It is mentionable that all findings and information of above mention subjects are well documented in this publication. We hope, this publication will contribute for protecting and promoting traditional knowledge in CHT and future researchers.

Chapter-1:
Jhum Cultivation

Part-A

Jhum cultivation: Connection with Chakma culture and traditions

Sujash Chakma

Abstract

Jhum has been part and parcel of the local livelihood of CHT hillmen, who were termed in the Act. 1900[1] as 'indigenous hillmen'. It is the only means of traditional livelihood of a big portion of the Jumma people. But, even the literate jumma[2] portion who got detached from Jhumming do not have explicit knowledge about Jhum system, letting aside the mainstream people who stay far from the system by default. At the national arena of Bangladesh, jhum has been introduced as a general cultivation which has been harming the CHT environment through 'burning' the hills. This discourteous practice of presenting Jhum in mass media bring confusing picture of Jhuming as a whole.

This article attempts to unfold, along with presenting the key focus on the research works on Jhum and asking for a holistic viewpoint while working on it, how life calendar of Chakma community whirled around Jhum cultivation showing how most of the key pillars of their material and non-material culture are built around Jhum cultivation that impelled to keep the natural watersheds and ecosystem alive for ages, which, in turn, enriched their livelihood.

1 Popularly known as "CHT regulation 1900''.

2 People practising Jhumming are popularly termed as "Jumma"

Figure 1: Jhum field in CHT ***PC: Sanchoy Chakma***

Objective of the study

To introduce the academic community and general readers with the significance of Jhum Cultivation in relation to the culture and livelihood of hill people living in the Chittagong Hill Tracts of Bangladesh and presenting a holistic viewpoint for use in future works in this regard.

Research Methodology

The research is qualitative, in specific a grounded theory type of research for which forms its base on observations of data derived from a variety of data sources including quantitative data, review of records and books, internet resources, interviews as well as observation.

About Jhum cultivation

Indigenous peoples[3] are regarded as the son of soil (Weiner : 2015).[i] They maintained close relationship and interaction from the very early period of time with the nature. They have been intimate with the hilly areas or forest to find out the sustainable livelihoods. It is accepted as the essential system of production

3 Throughout the article, the term 'indigenous peoples' is used synonymously with 'Small Ethnic groups' and 'tribes' as termed in Bangladeshi policy documents.

practiced by indigenous community without harming and exploiting the hilly regions in an unfriendly manner, but producing a big number of crops in one field (Chhauchhuak: 2004).[ii] This cultivation method have been practiced in Chittagong Hill Tracts of Bangladesh, Assam, Meghalaya, Arunachal, Nagaland, Manipur and Tripura state of India. Presently, this is also practiced at huge rate in some other Asian countries including- Philippine, Malaysia, Thailand and Cambodia.

Figure 2: A Chakma woman harvesting vegetable from jhum ***PC: Sanchoy Chakma***

One of the distinctive characteristics of Jhum cultivation is, 5-12 years of recycling period after farming for the first time. This is why the hilly indigenous people lead the life of transformative manner from one place to another (Nath ·Inoue ·Myant: 2005)[iii]. Jhum being the major or crucial way of cultivation method basically centralized with different materialistic or un-materialistic consciousness and elements have been created which are the very important cultural parts of the Chakma community as well as other indigenous people. In this article, there is short discussion about the development of cultural roles of Chakma and the reflection of thinking of novelists, poets and artists. In this article there has been discussed only the very special points of the Jhum cultivation which are expected to provoke different thoughts.

Chakma culture and Jhum

'Malaya dagana' is one of the most fundamental pillars of the Chakma culture. In the village, people want to get help from the neighbours in cases when their work is not completed in respect of cutting jungle, plantation, cutting and trashing paddy during jhum cultivation. A single individual from each family has been called to help him/her to successfully accomplish the work jointly. This type of assistance is called 'Malaya Dagana' in Chakma dialect (Sugata: 2011)[iv]. This method of assistance is admirable in terms of jhum cultivation. It is tough for a family to accomplish the tasks in short time when Jhum cultivation tasks have been carried out. It is very hard to get the labour assistance in the hilly regions. This is why the Jhumia cultural customs have been developed through the reciprocal assistance. 'Bala dena or bala darana' (exchange of assistance) is an essential element of survival of the indigenous jhumia people. It also played strong role in creation of social bondage and making the society stronger. It can be undoubtedly said that, the blooming up and acceptance of 'Malaya' would not took place without the evolution of the Jhum cultivation.

'Ubogit' is a special sect of the Chakma song. Two singers, most of the time one male and one female, participate in these types of

Figure 3: A Chakma aged woman is playing Hengorong ***PC: Sanchoy Chakma***

songs by turn. The main spirit of these songs is 'love' and 'nature'. At times, these types of songs have been created instantly, while singing, keeping simultaneous connection with the main topic or flow of the theme as well as adding in many examples and citations. It is a famous way for the young generation as a means of expressing emotion. The lyric of these type of songs are full with love and emotion. So it is generally prohibited to sing these types of songs in the village of the Chakma community (Sugata: 2011). But in the leisure time of the jhum work suddenly when a young man intend to sing 'uboghit' then the mates of the young man enjoy with the applause of 'A, Ho, Ho, Ho, Ho' to encourage the singer and they used to shouting 'Raeing' to appreciate the guy. It can be assumed that, 'jhum' created such an environment where Uboghit has been sung and practiced openly when no restriction have been faced. Besides these, the peace of the jhum environment, fascinating nature and after the hard working this type of function has been arranged for making rejoice and in this way, different components of the nature and social life could be internalized in the mind-set of the young generation.

Banshi (flute) is one of the most essential musical instruments of Chakma community. Bashi is importantly included in the historical ballad-opera (palagan) "Radamon- Dhonpodi"and it also hold its stand in the classical Chakma songs. Among the total historical musical instruments 4 (four) have been playing major role they since earlier time -Dhuduk, Bashi, Shinga and Hengorang. Flute (Banshi) is the top of the most important musical instruments among all of the musical instruments[4]. Bashi is found particularly in the waist of the young Jhum cultivators. The tune of the flute is more important to overcome the tiredness during lags of Jhum activities. The arts of the customary tune of flute would not be completed or fulfilled without the inspiration of the Jhum cultivation.

4. Banlapedia, `Instruments',
http://en.banglapedia.org/index.php?title=Musical_Instruments

Figure 4: A Chakma aged woman is playing Shingya ***PC: Sanchoy Chakma***

The 'respect for nature and the management of the customary natural resource' are the important parts of the indigenous culture and value system. The concept of traditional knowledge and dignity of the nature are nurtured for decades, and it is assumed that these are as eminent and contemporary as the Jhum. Out of these knowledge, some can be termed as traditional knowledge related to Jhum. The traditional rules or customs developed cantering Jhum cultivation may include: setting fire in the opposite side of airflow so that fire cannot catch the Jhum resources and other natural resources unnecessarily, keeping the big trees unharmed, setting fire carefully only to a selected area as needed, keeping an avenue for the wild animal to flee while jhum field burns, keeping 20-40 feet stream side area unshaved in cases of presence of streams in the jhum field[5].

Some of the 'special cooking methods' belong to the Chakma community, are part of the Chakma culture. These can be distinguished from the general method of cooking. The

5 Interview: Ripan Chakma, Traditional Knowledge Researcher, Date: 10 April 2013

mentionable method of Chakma cooking is Chumo Gowrang and Pada Kebang. The specification of these types of foods is that these are cooked almost without extra oil and very little species used while cooking and being processed by bamboo or banana leaves. These types of foods are totally different in terms of smell and delicious than many other foods. The advantage of these foods is that these are cooked in bamboo pots or banana leaves which are collected fresh from surrounding forest, which saves the workload of carrying the cooking pots from far away homes.

It is not possible to make delicious Kolapitha (Banana-rice cakes), Sannaypita (Rice cakes), Dhungipitha and Binihoga etc without Jhum sticky rice. One of the famous deserts or sweet rice is made by the Konchol, a small grained jhum rice. Rice wine (Dochoani) is produced by jhum sticky rice by which guests are entertained during Bizu festivals[6]. Thus the connection of jhum is inevitable for the evolution of the traditional cooking methods and use of cooking materials.

Material cultural elements associated with Jhum

Traditionally, some Jhum cultivators used to make a hut or jhum ghor at the jhum area usually considering security and healthy circumstances .This jhum ghor or mono ghor is the inseparable part of the customary materialistic culture. Generally it is a bamboo hut that contains two or three rooms. In a traditional jhumghar, a terrace (Ejor/khola machang), a guest room, a residential room or sleeping room, a makeup space (saj ghor or ojoleng) and a kitchen or pijor have been seen. The hut is made in such a way so that it can stand a medium range cyclone. It is basically set up in a place where the jhum crops can be observed from and made relatively high to prevent themselves from the attack of wild animals. A tree/bamboo ladder is made for entering the jhum house, which is mainly for getting rid of animals and lifted up at the high ejor of the jhum ghar at night.

6 For details: http://www.everyculture.com/wc/Afghanistan-to-Bosnia-Herzegovina/Chakmas.html

Figure 5: A traditional Jhum ghar ***PC: Sanchoy Chakma***

The walls of the Jhumghar are made of bamboo- weaved using two methods namely- uju jhu and dha dhara jhu. If there is a new born, a bamboo cradle is kept in the jhumghar, which is weaved using a method called ``Kaereng jhu''. In the Pijor or kitchen room, the traditional elements found are: ulonechal or earthly stove, a basket (pakkon) for stocking ashes, earthen or aluminium pot or utensil, a bamboo post or internode (bash chumo) for keeping salt and species. A dwa or pot (made by bamboo post), is used for measuring rice or pulses. Dulo, a bamboo made basket with small wholes at the bottom is put up the oven used for storing dry fish or meat. Bamboo shade is installed above the stove to dry out different baskets which are usually made by bamboo. Ludung is one of the traditional essential kitchen storage materials made of the skull of Kudugullo (bottle gourd).

Khutti (earthen pot shaped as the cattle) in fact has been used for storing drinking water for long. Bamboo Daba (water filtered bamboo pipe) is the indigenous own innovation for filtering smoke into the water and it has been seen as inevitable goods of Jhum Ghor since guest is entertained by Daba as part of traditional

greetings. One type of mat has been also made by bamboo cane (toloi) is used to dry out paddy; for preserving the paddy a big size of basket or gola has been made with bamboo cane. Weaving equipment (Sozpodor)[7] has been kept in the corner of Ejor or corner of hut (jhum ghor). Among them Tatchi cham generally made by the leather of deer, biyong, bohadi, thurchumo (made by bamboo post), khuduk kadak (porcupine quills) and tram etc. Presence of these weaving equipment are essential, specially with the families with young ladies. The traditional ornaments like kharu, bangori, pijuchora, ajuli, tengachora, kajful and chilchora etc. can be found in the dressing room. Balcony of the Jhum ghor has been covered by sun grass (shown) and by bamboo leaves in some rare cases, which are known traditionally for limited fire repelling properties. Bamboo are seen to be hanged crosswise to dry out clothes and hangorong, banshi and duduk are seen to be hanged on the fence or wall of the jhum ghor when jhumias are young in age. A vast sound maker made by the bamboo to chase away the animals are seen to be kept at the corner of the kitchen.

Figure 6: A woman drinking water from hutti ***PC: Sanchoy Chakma***

7 For details: https://cadc.gov.in/culture-tradition/

Beside that, badol (a type of bow made by the elastic materials-bamboo or cane) is seen to be used to chase away or killing birds. Bolter or winnowing fan (Kulo and Chalon) is used to thresh paddy, paddy screening from rice, which are preserved at kitchen or paddy store. Paddy measuring basket (Ari) is used to measure paddy which is made by the stem of stalk and bamboo cane to be used making box are also preserved by jhumias. Hoe (sussang tagol) and turung (busket) are the most essential equipment except which jhum cultivation is not possible (Chakma, L.B.: 2014). Most of the equipment which are depicted or cited above are made by themselves. The self dependency of traditional life of Chakma jhumias can be realized by internalizing the scenario of jhum cultivation.

The influence of Jhum on Chakma's traditional dance

Recently Jhum dance has been playing synonymous character of Chakma dance. It can be undoubtedly said that, jhum dance is the one among the two major Chakma traditional dances. It represents the several tasks, scope and joint participation on jhum cultivation. Different artists and choreographers have been

Figure 7: Chakma traditional jhum dance ***PC: Ripan Chakma***

working on it and new thinking and ideas have been applied. In the first, poet Sugota Chakma Nonadhon 'hillo milabou jhumot jaiday' and 'hoi hoi jhumot jabong' sung by Ranjit Dewan have been loaded in the basket of jhum dance. These two songs have been directed by Ranjit Dewan. Sahana Dewan the then Tribal Cultural Institute (TCI) cultural officer played the pioneer role for coming up with a modern jhum dance. Different tests have been done on Jhum dance along with these songs. It is highlighted more after Bangladesh Television telecast of the dance choreographed by Susmita Chakma which reflect on fetching water in the jhum area has added a new dimension on jhum dance. The jhumia women regularly collect water from the downhill wells and streams which is very difficult and industrious work. This choreography can be treated as an aesthetic initiative to recognize the contribution of Jhumia women. In the dance, 'mon muro sora gang falay jangolloi' played in harmonica by Devashis Roy-King of the Chakma Circle. Many choreographers afterwards have worked newly along with other music. Jhum dance has been given much priority to signify the jhum cultivation of Chakma culture. Many of the components of Chakma culture which have been more appreciated and well-practiced are traditional jhum culture focused. This is why; it can be undoubtedly said that Chakma dance and culture would not be developed enough letting apart connectedness with jhum.

Traditional worship, incantation and customs related to Jhum

'Dojjay lagara' is the ordinary sign which represent the ownership of land used after selection of jhum. A clod of soil has been put on the top of bamboo stick kept crosswise. It indicates the other jhumias that this place has been chosen and advised to choose other place.

'Ahl-paloni' is one of the most excellent festivals of Jhumis. It expresses the high dependency on nature and pays gratitude to the natural elements and tools used for jhum cultivation. On that day all the activities of jhum have been remained closed. This day is

Figure 8: Chakma traditional rice bank (dul) ***PC: Sanchoy Chakma***

regarded as the menstrual time of mother earth 'Bashampudi' or 'Bashumuti' (Sugata: 2011)). On this day different types of fruits and vegetables have been collected and cooked which are dedicated and worshiped mother Bashumoti, mother Gongi (water), mother Laksmi (nature and good luck), Deva (sky-weather). Also, Dhingi (rice grinding machine made of wood) along with the all other equipment like hoe (chussang tagol), scythe and axes etc. used in Jhum cultivation are washed or cleaned and put in a clean dry place.

'Aang' is the most powerful drawing and script which prevents from the evil spirit and incantation done by the bad people to others. "Jhum mara ang" is used to drive away the evil spirit from the contradictory place. This "Aang" has been written on stone and put on the affected place along with the monkey skin, horse excrement, monchatta and luri mada kher etc. (Surendra: 1994[vi]). On the contrary 'Jhum mara ban' is used to destroy the fertility of jhum land possession of which has been taken illegally. A special ang written/drawn on slate stone is kept on the middle place of jhum land. Four corners and mid point of the jhum are secured

through putting five bamboo poles topped with five rice refined with special uttrings (Montra). It is used to keep away the evil spirit from the jhumfield.

The influence of Jhum on Chakma traditional handicraft:

The reputation of cotton produced in Jhum is age old. It is told that, famous 'Muslin' cloth was woven with the threads made of the jhum cotton produced in the Chittagong Hill Tracts. Among the main dress of Chakma's - pinon, hadi, habong, silum and kahni are mentionable. Once upon a time these dresses had been produced by the Jhum cotton. Different colours had been applied which were mostly produced from different fruits and roots of the threes and creepy plants. Inside the dense Jhum forest the jhumias hunted essential animals, among them, one is the porcupine. 'Huduk-hadak' produced by porcupine quill has been recognized as an essential equipment since long for making of Chakma handicraft. 'Rishi' is one kind of wild pine nut like fruit found beside the jhum , it is used to brush out of bobbins and threads. The mature Rishi fruit is dried and cut into long pieces, each piece contain brush ended edges and nice holding grip. On the occasion

Figure 9: Chakma girls with traditional costume Pinon and Hadi ***PC: Ripan Chakma***

of ‘khatina chibara dana’ many types of weaving equipments taken by the Chakma weaver like- chorga, chorgi and chajpoder ete. by which thread bobbin has been produced from cotton usually taken from jhum and similarly ‘chivor’ the clothes of Buddhist monk weaved by that bobbins. The blanket weaved by the jhum cotton has been recognized as the traditional cloth. ‘Alam’ is regarded as the mother of handicraft of Chakma and possessed its glory and importance since inception. in the handicraft of Chakma’s the skits (design) have been arranged reciprocally . Different animals, creepy plants and flowers etc. have been sketched out on the blanket and woven in geometric and general shapes. These plants, flowers and leaves are seen on the new or old jhum land (Rainnya). It can be imagined that, some Chakma artisan has got definitely inspired much by the extraordinary environment of jhum, and while weaving, started bring in the sketches and designs in the clothes, sitting on the balcony of a jhum ghor or hut. Thus many skits have made their place on Chakma design cloth (alaam) which are still contributing to the Chakma weaving craftsmanship.

Composition and research on Jhum

Many articles and research work have been carried out on Jhum.The contribution of researcher Amarendra lal Khisa, Prasanta Tripura, Abanti Harun, Goutam Kumar Chakma and Tanoy Dewan are specially deserve to be mentioned. The institutional research has been conducted by the indigenous agricultural centers (Rashid, Paban: 2011[vii]). The research of Tanoy Dewan has marked different advantages of jhum. Goutam Kumar Chakma has shown how jhum played an important role to increase the wild animals and to access their foods. He discussed and focused on the positive relation between the declination of Jhumland and the interruption on the insecurity of food in the hilly region (Goutam: 2010[viii]). Hill agro-research centres and the hill district council mainly emphasize on how to increase the jhum production of agro-scientific research. The whole process of Jhum cultivation and different Jhum related food and social-cultural

rules have not been reflected. Considering the covered dimensions and the depth of subjective work, Prasanta Tripura and Abanti Harun, have contributed much. He discussed very carefully about the hackneyed presentation of information along with the politics and economics of jhum cultivation (Roy, R .D.: 2003)[ix]. Various malingers against Jhum have been fed in the media which have been following a method. It affects the general people negatively. Moreover, professor Prasanta has shown that the educated young generation has been grown up without the relation of Jhum cultivation. As a result they suffer from the lack of knowledge about Jhum cultivation and generally they get trapped by the various malingers.

It has been shown on the various illustrations of researchers that, valuable woods and the customary ownership of Jhumias land have been tried to grab illegally from indigenous people of Chittagong Hill Tracts by the influential groups. Sometimes they are doing this in the name of the reserve forest or environment and sometimes in the name of modern agriculture and promote agricultural production. They show some laws by which they try to ignore hundreds of year's ownership on ancestral lands of Jhumias, which has been covered with dense forest; they shave the virgin forest and come up with mono plantation of environmentally harmful species. Thousands of Jhumias have no land registration but hundreds of acres land are told to be allotted to the influential individuals and groups.

After raising huge teak plantations shaving out the natural forests, the wood lots are carried crossing big number of check posts. The wood is used for furnishing buildings in big cities, but on the other hand the blame has been fallen in respect of declination of environment or destroying forest only on Jhumias whose livelihoods mainly depend on Jhum cultivation. As appeared in national dailies, the mattress, quilt and pillows of corrupted forest department officers have been made with money through illegal trafficking of woods from Chittagong Hill Tracts (Newspaper reports), but the marginal Jhumias strive hard to provide food and

education for their children, yet they bear the blame of harming environment and destroying forests. The culture of Jhum is being destroyed or eloped mainly due to cutting down forest in the name of development and take control the ancestral land in the name of "Reserve forest" or tourist spots.

Paddy is the common crop among the produces of Jhum cultivation. Many researchers think that jhum in not regarded as jhum where paddy cultivation is not done (Prashanta: 2003). Some of the major paddy crops jhum are-Malay dhan, Kuki dhan, Kamarang dhan, Torgi dhan, Kaborak dhan, Baddhai, lenghdhan chagone, Gallong, Pattaggey, Ghuri chinnel, bini, kobabini, lobabini, louka pora bini , banarong bini, paddatora, ahamay, kala kaborak and song gallong etc. and the other crops like-maize, jobs, seasame, sweet pumpkin, pumpkin, cucumber, cotton, been, chindra, chilli, bringal, juro alu, maraze, sabarang, fuji, amilay, alu, baztara, adotang, rangapilay, dhup pilay, ulkasu, summo kasu, narikal kasu, bini kasu, bada kasu, jadona bigi, mugli, kuki, dumor sumi, ladies finger, rang and maya shak etc. (Zahed: 2010[x]) The real crop diversity is observed in jhum cultivation.

Among the food grains the coarse varieties of rice, followed by maize, millet and small millets are the principal crops. Cotton, ginger, linseed, sesame, pineapple and jute are the important cash crops grown in Jhum fields. Among the vegetables, bean, potato, pumpkins, cucumbers, yams, tapioca, chilies, beans, onion, arum is cultivated. By and large, the cash crops are sold in the neighbouring markets or to the middleman who are generally Marwaris. In the mixed cropping, soil exhausting crops, e.g. rice, maize, millets, cotton etc. and soil enriching crops, e.g., legumes are grown together. This practice has many direct and indirect advantages. These crops harvest at different periods, thereby providing the indigenous with varied food for nearly six to nine months in a year. The same jhum land is cropped by the community for two or three years, thereafter, the land is abandoned to recuperate. Occasionally, some residual crops are collected from the abandoned fields.

The seeds of these crops are being preserved by the farmers since these are regarded as the local crops. This is why they are not bound to pay extra payment for crops seeds. There is need for use of very little fertilizer and pesticide on Jhum. This additional cost is saved by the farmers. By motivating for huge crop production, herbicides, pesticide, hybrid seeds and chemical fertilizer are currently being used in jhum cultivation. This is why Jhumias are suffering from health hazards and leading distressed life. Jhumias used to take organic food which helped to prevent several diseases. The observation of the present situation shows that, the expense of disease treatment is being out of capability to Jhumias. The delicious fish and crabs found in hilly stream and small river almost been extinct that is why the access of malnutrition of jhumias have been increased. As per the observation of Khagrachari medical officer Dr. Shahid Talukder, it was shown that, malnutrition and blood related disease has been increased two fold within one decade. Most of the patients suffered from breathing related disease in 2013[8]. The huge amount of pesticide and herbicide used presently during jhum cultivation, along with other reasons, are suspected to enhance the rate of infection.

Conclusion

The life calendar of Chakma community whirled around Jhum cultivation since time immemorial. Most of the key pillars of their culture are build around Jhum. On the way of managing jhum cultivation, they put their attempts to conserve the natural forest and bio diversity, managed to keep the natural watersheds alive for ages. As a consequence of multi-fold changes which took place in last 7 decades, specially the construction of Kaptai Dam, compelled the hill people opt for jhum cultivation, which was the only means of livelihood familiar to them in the face of submersion of most arable lands under the Kaptai lake. In a research conducted in 2003, around 40000 indigenous HHs are dependent on Jhum cultivation, a big portion of which belong to

8 Interview: Dr. Shahid Talukder, then Upzaila Health Officer, Upazila health complex, Date: 19 January 2014

Chakma community (Prashanta: 2003)[xi]. A number of hearts touching literary works have been created on Jhum, many dance and songs were composed, which are representing the Chakma culture. But the marginality of Jhum farmers is increasing with time as the right of jhumia on the jhum land has always been denied. Jhumias being trapped in the commercial market system, monoculture is an increasing reality in jhum fields. The natural environment of jhum was threatened by the introduction of jhum farming dependent on chemical fertilizer and pesticide (Sujash: 2013[xii]). The opportunistic individuals and institutions made huge money and took full privilege of the propaganda that jhumia are 'villains', jhum farming is 'destructive to environment' as well as through introducing 'jhum control division' and declaring the jhum lands as 'reserved'.

If jhum is considered merely as a general agricultural method, if the socio cultural and traditional value is denied and if the systematic process of neglecting their rights is continued, the dignity and rights of the jhumia will be demolished. It will not be irrational to assume that the jhum culture and jhum centred livelihood will be confined into the cultural programs or will be treated as a show piece item before the new generation steps into a set of decent new livelihood options. This will worryingly threaten the lives of jhumia. So, if someone wants to work on jhum, it has to be considered from the viewpoints of the life system of jhumia, historical context, and cultural traditional connection i.e. from a holistic viewpoint.

Bibliography

i 1978. Weiner, Myron
'Son of Soil
Migration and Ethnic conflict in India',
Princeton Legacy Library

ii 2004 Chhauchhuak, Linda
'Jum Works'
DOWN TO EARTH , P.1

iii 2005 Nath Tapan K. · Inoue, Makoto · Myant, Hla
'Small-scale agroforestry for upland community development: a case study from Chittagong Hill Tracts, Bangladesh'
The Japanese Forest Society and Springer-Verlag Tokyo p-443

iv 2011 Chakma, Sugata
Social customs and rules of Ethnic Groups
Khudro Nrigosthir Sanskritik Institute.
Rangamati.

v 2014 Chakma, L.B
THE CHAKMAS: AN INTRODUCTION,
Bizu Nejeni
Tripura, India.

vi 1994 Tripura, Surendra. Lal
Parbartay Chattagramer ProkritiebongSangskriti.
Rangamati: Tribal Cultural Institute, Rangamati.

vii 2011 Harunor Rashid Dr. A. S. M, Mr. Paban Kumar Chakma
Suitability of rice varieties with other crops and exploration of better management practices in jum field1

viii 2010 Chakma, Goutam Kumar
'Traditional livelihoods and indigenous peoples',
Asia Indigenous Peoples Pact Foundation

ix 2002 Roy, R.D.
Sustainable and equitable resource management in the Chittagong Hill Tracts. In: Farming Practices and Sustainable Development in the Chittagong Hill Tracts, ed. N.A. Khan, M.K. Alam, S.K. Khisa. & M. Millat e Mustafa,

x 2010 Zahed Hassan, Md.
Jum Poster
Manusher Jonno Foundation

xi 2003 Tripura, P, and A. Harun
Parbattya Chotogra Jhum Chash [Swidden Agriculture in the Chittagong Hill Tracts].
Dhaka: SEHD.

xii 2013 Chakma, Sujash
Module on Natural Resource Management for Traditional leaders
Circle Chief's Office,
Mong Circle

Part-B
Workshop Findings on Jhum Cultivation

Introduction:
Trinamul Unnayan Sangstha conducted couple of workshops with Jumia farmers on diversified crop production and extraction or harvesting technologies using traditional methods and knowledge. The workshops were held on 12 January 2017 and 11 September 2017 accordingly at Ashish Hall Room of TUS office premises. Around 50 Jumia farmers including women participated from Dighinala, Matiranga and Khagrachari Sadar Upazila in the workshop. Discussions and group works took place on Jum crops and diversity, cropping season and harvesting season, production technology of the crops against main categories, traditional harvesting techniques, crop storing and preservation techniques, traditional seed preservation techniques and contribution of women in upholding the traditions during the workshops.

Jhumia farmers, despite learning the cultivation systems from their predicessors, rarely come in touch of most of the seeds cultivated in jhum fields across CHT at a time, as they cultivate some selected crops in a jhum season. Some farmers do not know the cultivation techniques of some rare crops if that is not cultivated in a particular area.

Cropping season; harvesting season of the crops; associated traditional knowledge, beliefs and customs

The cropping and harvesting seasons were documented against the crop names. The list of the crops is presented below:

Sl no	Name of the crop (Chakma)	Sowing season	Harvesting season
1)	Bottle gourd (Kudugulo)	April/Arshin-Kartik Vadra	Poush-Magh (2m)
2)	Winter bean (Jarkalle Sumi)	April/Ashin-Kartik	Magh-Falgoon
3)	Brinjal (Jhummo Begun)	April/Ashin-Kartik	Vadra
4)	Ladies finger (Verogulo)	April/Ashin-Kartik	Vadra
5)	Spice leaves (Phuji)	April/Ashin-Kartik	Agrahahayan-Posh
6)	Spice leaves (Sabarang)	April/Ashin-Kartik	Magh-Falgoon
7)	Sweet Pumkin (Suorigulo)	April-May	Vadra
8)	Amila	April-May	Posh-Magh
9)	Bean (Motor)	April/Ashin-Kartik	Posh-Magh
10)	Bean (Narakaba Sumi)	Boishak -Jostha	Posh-Magh
11)	Puishak(Pujok)	April/Ashin-Kartik	July-Agust
12)	Pumkin (Suorigulo)	Ashin-Kartik	Posh-Magh
13)	Green Chilli (Marich)	April/Ashin-Kartik	Posh-Magh
14)	Sesame (Vado masse gosse)	April	Vadra
15)	Sesame (Till/gosse)	April/Ashin-Kartik	Vadra-Ashin
16)	Nagagosse	April/Ashin-Kartik	Agrahayan
17)	Jhum cucumber (Chidira)	April/Ashin-Kartik	Asha-Josta
18)	Raishak	April, Ashin-Kartik	Sraban
19)	Lalshak	Ashin-Kartik	Sraban
20)	Misti Alu (Suori alu)	April/Ashin-Kartik	Posh-Magh
21)	Zinge	April/Ashin-Kartik	Sraban
22)	Chichinga (Porol)	April/Ashin-Kartik	Posh Magh
23)	Miye shak	Boishak -Jostha	Jostwa-Asharh
24)	Joroalu	April/Ashin-Kartik	Posh
25)	Naris shak (Naresh shak)	April/Ashin-Kartik	Kartik agrahayan
26)	Bean (Karanga sumi)	Kartik	Ashini-Kartik
27)	Mustard (Sarisha)	April/Ashin-Kartik	Posh-Magh

Sl no	Name of the crop (Chakma)	Sowing season	Harvesting season
28)	Tettolgulo	April/Ashin-Kartik	Asharh-Sraban
29)	Gourd (Jhummo Kumoro)	April/ Ashin-Kartik	Shraban-Vadra
30)	Maize (Mukke)	Apil	Sraban
31)	Cucumber (Fal)	April/Ashin-Kartik	Do
32)	Ausee amila	Arahayan-Posh	Vadra
33)	Ladies finger (Ausse verogulo)	Apil	Falgoon
34)	Bean (Sarapya sumi)	Kartik	Posh
35)	Bean (Felon)	April/Ashin-Kartik	Falgoon
36)	Pettunggulo	April/Ashin-Kartik	May
37)	Mu-alu	April	Vadra
38)	Maresh shak	All season	
39)	Mattyo shak	April/Ashin-Kartik	Agrahayan- Poush
40)	Dimmetide	Apil-August	Asharh-Sraban
41)	Dhan sabarang	Apri	All season
42)	Arhohor (Domorsumi)	April	Agun
43)	Kasaba (Seme alu)	April	Vadra
44)	Chili (Serebu Marich)	April	
45)	Kakorol (Kangaragulo)	Kartik	Asharh-Sraban
46)	Tantuni Pata (Minmini)	April	Kartik agrahayan
47)	Kalami shak (Harmos shak)	April	Sraban
48)	Betfal (Betgulo)	April	Posh
49)	Lumboi	April	Ashini-Kartik
50)	Hugi Brinjol (Hugi Begol)	April	Ashini-Kartik
51)	Bitter Brinjol (Tide Begol)	April	Sraban-Vadra
52)	Kapibegun	April	Vadra
53)	Sarbo tide	April	Vadra
54)	Tumbaj porol	April	Kartik agrahayan
55)	Cerepuk Marich		
56)	Kakrol	April	Asharh-Sraban
57)	Tantuni Pata	Kartik	Posh

Sl no	Name of the crop (Chakma)	Sowing season	Harvesting season
58)	Betfal	Boishak	Boishak
59)	Lambul bij	Boishak	Boishak
60)	Hugi Begol	Boishakh	Boishakh
61)	Tide Begol	Boishakh	Posh
62)	Sweet pumkin (Suorigulo adotheng jat)	Boishakh	Vadra
63)	Paddy (Ausse Bini)	Boishakh	Ashin
64)	Paddy (Ranga Gelong)	Boishakh	Ashin
65)	Paddy (Bandar Nakh Bini)	Boishakh	Ashin
66)	Paddy (Song Gelong)	Boishakh	Ashin
67)	Paddy (Bor Badhai Dhan	Boishakh	Ashin
68)	Paddy (Gu-Hala Bini)	Boishakh	Ashin
69)	Paddy (Kamrang Dhan)	Boishakh	Ashin
70)	Paddy (Renggui Dhan)	Boishakh	Ashin
71)	Paddy (One two Bini)	Boishakh	Ashin
72)	Paddy (Uttosse Bini)	Boishakh	Ashin
73)	Paddy (Kamrang Dhan)	Boishakh	Ashin
74)	Paddy (Pattiyee Dhan)	Boishakh	Ashin
75)	Paddy (Badhiyee Dhan)	Boishakh	Ashin
76)	Paddy (Company Dhan)	Boishakh	Ashin
77)	Paddy (Madhumalati Dhan)	Boishakh	Ashin
78)	Paddy (Dhahary Bini Dhan)	Boishakh	Ashin
79)	Paddy (Ranga Mani Dhan)	Boishakh	Ashin
80)	Paddy (Husseri Bini Dhan	Boishakh	Ashin
81)	Paddy (Chine iri Dhan)	Boishakh	Ashin
82)	Paddy (Hari Dhan)	Boishakh	Ashin
83)	Paddy (Kallezire Dhan)	Boishakh	Ashin
84)	Paddy (Chakka Pijam Dhan)	Boishakh	Ashin
85)	Paddy (Chitto Pijam Dhan)	Boishakh	Ashin
86)	Paddy (Tumbaj Bini Dhan)	Boishakh	Ashin
87)	Paddy (Ranga Pattiyee Dhan)	Boishakh	Ashin
88)	Paddy (Haba Bini Dhan)	Boishakh	Ashin
89)	Kalozira Dhan	Boishakh	Ashin

Associated traditional knowledge, beliefs and customs

Jhum is a high hill cultivation method which calls for a number of traditional knowledge, customs and beliefs. Following list will provide a glimpse of the knowledge and practices:

1. *Jhum Dhora:* Jhum dhora means starting of a Jhum cultivation process. The process dosen't readily starts without doing the following rituals or steps:
    - Selection of a hill in a suitable area
    - Collection of a soil rock from the jhum field
    - Cleaning hands and feet, putting the soil rock under the pillow while sleeping with a mind of dreaming something good.
    - Monitor dream of that special night.
    - Bad dream (naked person, bad looking person, fire, ferocious animals) indicate that the Jhum field is not suitable. The Jhum is abandoned instantly.
    - Good dream indicate that the jhum field is nice for cultivation and only those fields can be chosen finally. With time, the influence of the custom is faded away due to some practical reasons including shortage of land.
2. *Jhum Kata:* Jhum field is cleaned in Poush and Magh month. Some Jhum fields are cut in Falgun and Choutra also.

    Worship of Gods: Jhum cutting starts with the devoting (boli) of animals chicken, duck, goat to the gods who has potentiality to interfere the Jhuming process and overall yield. The practical reason behind the belief could be to get some valuable protein before starting a heavy and industrious work.
3. *Burning the Jhum field:* Jhum field is set on fire in late Choitro. It is traditionally believed that, burning the jhum field makes it more suitable for growing the diversified vegetables as the burning works against weeds. It gives

ashes and some other nutrients to the jhum plants, which help get high yield and make the crops more tasty.

4. *Building Tong house in Jhum:* Tong house is constructed in Jhum area in early Boishak. As Jhum fields are usually chosen in the high hills far from the main village, separate house called Tong is built in Jhum for temporary living.

5. *Sowing Seeds:* In Boishak, seeds of vegetables are sowed in Jhum field. Then the Jhum field is cleaned and paddy seeds are sown using special tools to do less harm to the top soil and reduce erosion. Turmeric seeds are shown at the beginning of the cultivation process. Paddy seeds are sown during the period of 20 Boishak- 15 Joistho, as it is believed that the paddy sown after this period will not yield good crop. Along with the general crops, some special flower seeds (hill marigold is common) are spread in the Jhum Linings to attract the insects and fixing nitrogen, producing urea.

6. *Cleaning Jhum:* Jhum weeding takes place in the period from 15 Joistho to 15 Asar.

7. *Harvesting from Jhum:* Jhum harvesting takes place in the period of 1st week of Shrabon–end of Bhadro. The first crops include Fuji, mamra, cinal, lau, cucumber.

8. *Living in Jhum Tong ghar:* Jhumia people set for the jhum area in 15 Shrabon – 4-5 Bhadhro, who stay there for 4-5 months up to 15 Kartik.

9. *Cropping festival:* Collection of paddy from Jhum and storing in Dhangola. A mini festival is organized in some Jhumfields during paddy harvesting. As members of a single family cannot harvest the paddy from the field comfortably, they call other Jumia for help, which is called Maleya in popular term. After long, if the Gola is opened, a worship festival is arranged for Goddes Laxmi, who is believed to be linked with mother earth and worshiped for high yield.

10. *Returning from Jhum field to village house:* 1st week of Arshin-15 Kartik is the period when the Jhumias return home.

Production technology of the crops against main categories (sowing seeds, spreading seeds, cultivating stems, saplings):

Production technologies in hilly areas are different than plainland agriculture. The varieties grown in Jhum are usually epidemic resistant varieties, which can live using minimum water and obviously without irrigation. The machines and tools used in Jhum are also different than those of the plains. Mainly 3 methods are used for cropping-sowing, spreading and planting, which are briefly described below:

Sowing technology:

1. Cleaning forest in Poush
2. Setting fire to Jhum field and cleaning burnt branches in late Choitra
3. Seed sowing in Boishak with small sharp edged da/knife
4. With paddy, the seeds of cotton, cucumber-marfa, kumra, cucumber, ladies finger, maize, beans, dumor sumi, cinel-cindire are also sown.
5. Weeding take place after 15 -20 days of sowing the seeds.

Sowing vegetable seeds:

Following crops are cultivated sowing seeds: Jhinge, porol, koida, thanda alu, korenga sim, tettolgullo, mouma, mu alu, tumbaz porol, Reng, Pile alu, kakrol.

Spreading method:

For the following crops, seeds are spread to the field: Amile, Maiye Shak, Nariz shak, chille, til, naga ghochche, Ketrang shak, cerepuk morich, Lumbui, hugi bigol, tide begol biji.

Planting seedlings:

Following crops are cultivated through planting seedlings: Cassava, lemon grass, thankuni pata.

Traditional Harvesting techniques

Paddy

For harvesting paddy, the following steps are generally followed:

1. Cutting with shickels
2. Drying for 5 days
3. Binding in bunches
4. Crushing the bunches to get paddy grains
5. Airing the paddy with bamboo kula/round hand fan
6. Storing in big store houses made of bamboo

Vegetable harvesting

1. Most of the vegetables are collecting in Kallong
2. Rapping is usually done using banana leafs or `Pitthe' leafs
3. 6-8 inches of jhum potato (Juro alu, hoyeng alu, pan alu, ram alu) are left in natural setting for future growing/ regeneration.

Traditional Jhum Seed preservation techniques

For selecting the right crops for seed collection, the following features are observed in crops:

1. Big size
2. No infection
3. Huge number of beads in case of ginger, turmeric
4. Well matured

Following methods were mentioned and written down by the participants as examples of seed preservation techniques:

Sand filled, dry earthen house

Ginger, turmeric, potato, arum are preserved in this kind of house. Firstly, a compartment is dug in a sunny place, it is left for drying for some days, than dry sand is filled in the compartment before the seeds are put layer by layer. In some cases, a shade is prepared on the top of the earthen compartment.

Preserving in Utoo Maja

Maize, ladies finger, Jhinge, porol, fugi begol, mouma are kept in whole, with natural coverings, on the local stove smoke over the kitchen maja/machang a crushed bamboo made frame containing small wholes all over, and fixed like a false ceiling.

Planting in cold dry soil

Cassava, Ahedo Theng Alu and other roots-potatoes are preserved through planting in cold dry soil.

Preserving in Bamboo container

Paddy, and small seeds of which the crop is highly perishable, are preserved in bamboo part containers.

Supporting seed crop with bamboo frame

Lau, cucumber, marfa, pumpkins which are selected for preserving and heavy enough, are supported with bamboo frame and straw, clothes on the top.

Sun drying

Ghuchche, Amile, Marfa, cucumber, lau/bottle gourd seeds are preserved using sun drying method. Usually they are kept in Kurums-bamboo baskets for seeds and left in sun when necessary.

Contribution of women in Jhum Cultivation

Women take part in every step of Jhum cultivation related activities, decisions and rituals except for some special rituals.

Some of the following activities give a small account of the contribution of women for hill agriculture and upholding customs:

1. Seed collection, sun drying
2. Smoke drying of seed/ crops
3. Collection of the materials for worship
4. Selecting the best crop for seed collection and preservation
5. Discovering the special features of special crops
6. All other Jhum cultivation related tasks
7. Preparation of straw coil_bena.

Conclusion

In agricultural arena, huge researches are going on, but very few focuses on jhum technology and the bondage with traditional knowledge and sustained climate resilient livelihood. There is scope for many agro-ecological research and operation research in this field.

Chapter-2:
Natural Resource Management
and
Village Common Forest

Part-A

Opportunities of Traditional Knowledge in Natural resource management experiences from the Chittagong Hill Tracts, Bangladesh

Mohammed Mohiuddin and M Kairul Alam

Bangladesh Forest Research Institute

Chittagong Hill Tracts (CHT) situated in the Southeast of Bangladesh covering about 10 percent of the total land. It is the native hoe of 13 tribal communities and these communities have their own traditional knowledge for natural resource managements. This paper provides 8 traditional knowledge namely, folk classification of landform, land use zoning, community reserve for common resource management, fuel wood selection for domestic use, water harvesting ditches, tree management in the *jhum* filed by the Murang community, coppice management of *Gmelina arborea* Roxb. *(gamar)* and *Tectona Grandis* L. (teak) by the Bwam community, timber harvesting time, keeping bark in teak logs to protect it from insect and borer attack, and maintenance of vegetation at the catchments areas. The economy, livelihood and culture of the tribal people are closely interlinked with the natural resources. An integrated approach I needed by different institutions for conserving the natural resources in the Chittagong Hill Tracts.

The Chittagong Hill Tracts (CHT) comprises of Bandarban, Rangamati and Khagrachari hill districts and is situated in the Southeast of Bangladesh. It is lies between 21^0 25' and 23^0 45' North latitude and between 90^0 45' and 92^0 50' East longitude. The total area of the CHT is 13,295 sq. km covering about 10% of the total land area of Bangladesh and geographically part of the

Hindu-Kush-Himalayan region[1]. About 80% of the total land is hilly and mountainous and are arranged in North-South direction linked with the Hindu-Kush-Himalayan region. Thirteen tribal communities of Bangladesh are living in this area for centuries[2]. They have their own traditional knowledge for natural resource management and to cope with their own agro-ecological and socioeconomic environments. This knowledge is generated or developed and transmitted by the communities over time. It is mentioned that traditional knowledge is generated and transferred by a systematic process of observations, experimenting with solutions, and readapting previously identified solutions to modified environment, socioeconomic and technological situations[3]. Traditional knowledge is vital because of its ecological rationality its inspiration being the sustainable use of ecosystem[4]. Traditional knowledge is location and sometimes community specific and it obviously has to be starting point if peoples' involvement to be ensured and development has to be sustainable.

Soil, water and vegetation are considered as the three basic natural resources. Human beings are managing the natural resources to meet their requirement from the pre-Vedic era. The natural resources management systems are localized systems that form a basis in rural people's decision making and traditional natural resource management system is found to be functioning and proved to be economically, socially and ecologically sound[5]. The local people of the CHT have a long heritage of practicing natural resource management. The history of traditional knowledge of natural resource management in CHT is very primitive but the report on it is very recent[6-14]. It is reported that production of hydro-electricity, increase of population, and commercial and industrial plantations are the main cause of deforestation and deterioration of soil condition of CHT[15]. This paper discusses traditional knowledge for the management of natural resource practiced by the different tribal communities in the different hilly regions of Chittagong Hill Tracts.

Methodology

Participatory rural appraisals (PRA) method is considered as an important tool for documenting plant based traditional knowledge[16-18]. PRA was applied to document plant based traditional knowledge existing among the different tribal groups of Bandarban. An open ended questionnaire was followed to get the real information. In some cases, group meetings were conducted to collect the information on traditional knowledge that provides effective information for new topics like cultural knowledge. The prior consent of the knowledge providers were taken for documentation.

Following section presents some example of tradtional knowldege practies by hill communities of the Chittagong Hill Tracts for natural resources management.

Folk classification of landform

The tribal people of Bandarban have their own classification system for landform and site selection. Different tribles call hills in different words. Hill is called as *Moan* by the *Chakma*, *Muya* by the *Tanchangya*, *Tang* by the *Marma*, *Hung* by the *Murang* and *Talong* by the *Bwam*. Folk classification for landform used by the *Chakma*, the *Tangchangya*, the *Marma*, *Murang* and the *Bwam* is given in Table 1. The farmers of Amazon also use this type land use classification on the basis of soil type, fertility and natural vegetation[19].

Land use zoning

Generally hill people of Bandarban hill district consider landscape of the hills in land use plannning. This is local, specific and ecologically sound. They follow some sorts of zoning for land use planning. The land use planning is broadly classified into three categories as given in Table 2. In addition to these, they also use the streams and water courses *(jhuris and charas)* for multiple purposes (Fig.1).

It is also reported that the classification of ecological zones on the basis of land use capability apprears to be widespread among the traditional agriculturalist of Amazon[20]. Land use classification is made on the basis of the characteristics of soil texture, colour, hydrological pattern and the plant community they support [19-23].

Community reserve for common resource management

Conservation and management of natural resources as a common resource is a tradition of manay tribal communities in the CHT. It is generally called *Para reseve* or *Mouza reserve* (Fig.2). This is a common property of the villagers. Generally, they do not extract any timber from this natural forest. Sometimes, they extract time for some community purposes like construction of school, church. However, some member of the community can extract limited amount of timber only for home consumption with prior permission of the village community. Other than this primary forest, there is some bamboo patch under community management. Like timber, community members can extract bamboo only for domestic use. None of them are allowed to extract timber or bamboo for selling purpose. During the field trips in the CHT some remnant of the community reserves were observed in different places (Table 3).

There was a Government order to maintain 40 h of *Mouza* (revenue circle) reserve by the *Headman* (community head) or *Karbaries* (Village head) under each Mouza in the CHT to meet people's requirement other than timbers[24]. It is also reported local people protect biological communities in the vicinity of their homes and elders based managed them for religious and traditional beliefs[25]. This type of habitat conservation exists in different parts of the world for conserving different species[26] and maintained under collective ownership by indigenous people group [27,28].

Fuel wood selection for domestic use

Bandarban Hill District has diverse fuel wood species. The tribal people collect the fuel wood in January to February from the

surrounding forest for the whole year and preserve under machang type house. Generally they prefer white coloured straight grained wood as fuel wood. Common fuel wood species are; *kom (Nauclea sessilifolia Roxb.) dharmara (stereospermum personatum* (Hassk.) Chatterjee), *rong kat (Mitragyna parviflora (Roxb.) Korth.), bura (Macaranga denticulata* (Bl.) Muell. Arg.), barmala (Callicarpa tomentosa (L.) Murr.), *goda (Vitex* sp.*)*, and *itchri (Anogeissus acuminata* (Roxb.) Wall.ex Bedd.), etc (Fig. 3). These are considered as good fuel wood as they burn well and slowly. *Gamar (Gmelina arborea* Roxb.) is a dominant plantation species in the CHT and easily available in the forest areas. But, the tribal people do

Table 1- Folk classification of landform used by five tribal communities of Bandarban

Position of hills	*Chakma*	*Tanchangya*	*Marma*	*Murang*	*Bwam*	*Land use*
Hilltop or peak	*Toogon*	*Thoap*	*Tang dak*	*Hung*	*Talong Sa*	*Keep the vegetation intact.*
Depressed flat basin between two hills	*Koolog*	*Tal*	*Tang rah*	*Sung Hee*	*Talong*	*No jhum, root andtuber crops are cultivated.*
Hill slope	*Daab*	*Daap*	*Tang sang*	*Nai*	*Dung*	*Preferred to use for jhum cultivation*
Eroded slopes with broken landslides	*Kama*	*Kama*	*Tang Proja*	*Chan*	*Tang Lai*	*No activities*
Very narrow ravines of two hills	*Kizzing*	*Kissing*	*Marong Say*	*Oh*	*Thiba*	*Use as footway, place for bird and animal trap*
The foot trail along the hill crests	*Langel*	*Sowa*	*Tang Craw line*	*Rasa*	*Talong Lam*	*Walking path*
Narrow, marshy strips of plain land between two hills	*Doona*	*Ghonna*	*Tang Ba*	*Khoyi*	*Talong Fi*	*Used for paddy cultivation through plough*

Table 2- Land use classification practices by the tribal communities of CHT

Zoning	Marma	Murang	Tanchangya	Bwam	Characteristics
Villages or Para	Rowa	Kowa	Aram	Kuwa	Villages comprise cluster of houses
Farming sites or *Jhum*	Yah	Yowa	Jhum Ja	Laow	Main cutivation on the hill slopes
Fallow *jhums* or *Raiyna*	Ran Min song, Wang Mi Wah	Rainya Ja, Ja Bhui, Tarong	Reserve or Kowa reserve	Reserve	Kept undistured after jhum and again used for jhum after few years

Table 3- List of the community reserve visited during study period

Community	Locality of the reserve	Area of the reserve
Marma	Paglachara Para, Rwangchari	80 h of land
Bwam	Swan Lu Para, Rwangchari	20 h
Bwam	Sharon Para, Bandarban	2 h bamboo brakes
Murang	Empu Para, Bandarban	8 h
Murang	Jamini para, Chimbuk, Bandarban	20 h
Murang	Kaparu para, Chimbuk, Bandarban	100 h

Not prefer *gamar* as it makes sound, smoke and splits during burning. Generally whitish and straight grained wood produces less smoke during burning. It is reported that wood having fast drying, easy splitting and cutting, efficient burning, burns easily, produce less smoke, good storage characteristics and high heat intensity is suitable for fuel wood[29]. Wood having higher concentration of resin in wood produces toxic fumes on burning [30,31].

Water harvesting ditches: Establishment and lasting of tribal people in an area depend on the availability of water in that area. The tribal farmers of the hilly areas have traditional knowledge of harvesting seepage water at the base of the hills. The seepage

water of hills moves downwards through small water channels *(jhiri)*. The tribal people who are at the upper altitude dug out small rectangular shaped ditches at the base of the hills for reserving seepage water of the hills. The water comes through the streams are reserved in the ditches and the excess water are out let through a small hole *(Fig. 4)*. The tribal people used this water for domestic, drinking and other purposes. For steady supply of seepage water in the streams the tribal people keep the vegetation at the top of the hill. The vegetation of this area is kept intact and nobody is allowed to harvest any timbers and fuel wood form the area.

Tree management in the *jhum* field by the *Murang* community

During *jhum* preparation farmers clear all vegetation from the field. But, keep some important trees like *Albizia* spp., *Derris robusta* and other members of Leguminosae and Ficus spp. Kept trees are cut at about 1m height above the ground. Browsing animals can not reach coppiced shoot at this height. Thus protect from animals. Tree cutting at 1m height or above is not always scientifically sound. The newly produced shoots become susceptible to wind break. Many *Murang jhumias* of Empu para do not remove the large trees from their *jhum* field (Fif. 5). They lop the branches of trees for easily light penetration in the ground. It seems to be more scientific than the previous one. The coppices of elder (*Alnus nepalensis)* are carefully pollarded against the main trunk in fallow management in traditional *jhum* practices by the Angami Nagas[32].

Coppice management of gamar and teak by the Bawam community

Gamar (Gmelina arborea) and teak *(Tectona grandis)* are two important fast growing forest timber species. *Gamar* is planted both in public and private forestlaznd, and harvested at 10-12 yrs cycle. Teak is harvested in 20 yrs rotation. The *Bwam* community of Sharon Para has their own technology for harvesting the *Gamar* tree. It is cut at above 15 cm above the ground label using

handsaw in the month of February (before spring). The stumps of the felled (harvested) trees are kept in the field in the field undisturbed. Profuse copies sprout from the stump within 15-30 days. These attain about 1m height within 2-3 months (Fig. 6). The coppices-shoots are allowed grow till mid-July without any management. After mid-July, farmers manage the *gamar* coppices, keeping 2-3 healthy coppice shoots for the first time. Finally, the best coppices shoot is kept to get a healthy tree. This clearly indicates farmers' perception of periodicity about coppice crop of *gamar* had better growth performance than the seedlings crop and thus the coppices shoots produce merchantable boles within 6-7 yrs. In Rwangchari, the *Tanchangya* tribe practices the coppice management of teak, which is almost similar to gamar. This type of management could be incorporated in raising sustainable tree farming system.

Timber harvesting time

Generally, the foresters and timber traders harvest timbers from the forest mostly throughout the year. The traditional people apply their own tree harvesting technology and time, when they harvest for their own use. The tribal people mostly harvest trees before the spring, during dry months of January-February. During dry months, due to low moisture content in the soil, growth of the tree is comparatively slower than the monsoon. So, there is less starch content in the trunk, which makes the wood less susceptible to insect attack. The *Murang* farmers first girdle in the trunk by removing bark and sapwood of the tree at about 60 cm above the ground. After one or two months of girdling the tree is harvested (Fig. 7). This method reduces the starch content of the sapwood portion due to reduce content of starch materials and effective to hilly areas. This also helps to prevent the insect attack with any extract cost.

Keeping bark in teak logs to protect it from insect and borer attack

Teak is an important timber species having good value in Bangladesh and widely planted by the local people and forest

department. The upland people use it as house pots, rafters, doors and windows. The sapwood of teak is susceptible to insect and borer attack. Generally people debark most of the trees before using as house pots. But it was observed that some members of the *Marma* community of Rwangchari do not de-bark the lower portion of teak pots, which is used for house construction. The users reported that teak bark protects the susceptible sapwood from insect and borer attack. It may be due to large number chemicals such as resin, tannin and secondary metabolites in the bark, which may acts as preservatives. It is reported that bark contain a large variety of complex aromatic extractives which acts against fungi and microbiological attack[33].

Maintenance of vegetation at the catchments areas

The hills receive rainwater in the rainy season and release it in the form of seepage water through out the year. This water goes downwards through the streams. During dry season the tribal people of Chittagong Hill Tracts make earthen cross dam for reserving water out along the streams, which is locally called Goda (Fig. 8). The tribal people use this water for irrigation and domestic purpose. The tribal people maintain vegetation cover at the upper catchments without any disturbance of the vegetation. At the catchments area ensures continuous flow of water.

Refinement of Traditional Knowledge with modern Knowledge

All traditional knowledge based local practices are not always sustainable from the scientific point of view. But this practice is easily adaptive and diffusible among the different community members, as the local people have developed it. There is a need to subject traditional knowledge to rigorous scientific testing to render their value to the world[16]. The knowledge is dynamic, evolving to suit changing circumstances and remaining relevant to the groups' socio-cultural make up. Thus refinement of traditional knowledge with modern scientific knowledge is necessary to solve the problems towards sustainable management and development.

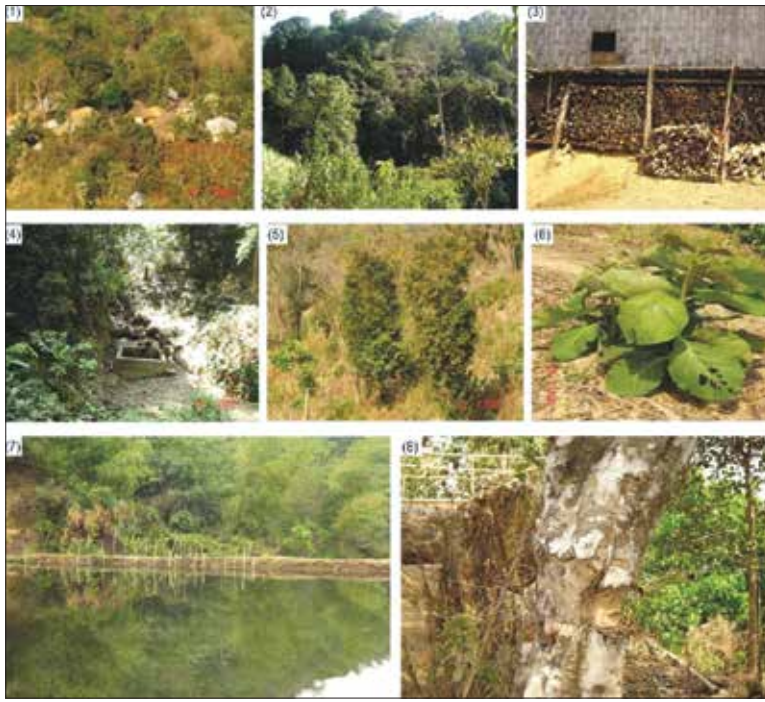


Fig. 1-A tribal village; Fig. 2-A community reserve; Fig. 3- Fuel wood harvesting, Fig. 4- Water harvesting dishes; Fig. 5-Tree keeping in Jhum, Fig. 6-Coppice of teak; Fig. 7- Traditional dam and Fig. 8-Tree girdling

Conclusion

The economy, livelihood and culture of the tribal people of the CHT are closely interlinked and natural resource based. Traditional knowledge is well proven, practiced and accepted to the local people. So the local people would more easily adopt technology based on traditional knowledge. Most of the traditional conservation systems have been broken down as cash economics have developed among the tribal people. People are now frequently selling natural resources in town markets for money. So, awareness should be developed among the young generation about the importance of natural resources conservation. Therefore, the different institutions may develop an

integrated approach for conserving the natural resources in the Chittagong Hill tracts.

References

1 Khan MFA, Mantel S & Chowdhury E H, State of the Environment of the Chittagong Hill Tracts, Charm Project Report 2, (Pro.no. BD/Asia-pro Eco/12/103-584), 2007.

2 Roy D R, Land and Forest Rights in the Chittagong Hill Tracts, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal, (2002) 44.

3 Fernandez M E, Gender and Indigenous Knowledge, Indigenous Knowledge and Development Monitor, 2(3) (1994) 6-7.

4 Agarwal A & Narain S, Traditional system of water harvesting and agroforestry, In: Indigenous Vision, Peoples of India, Attitude to the Environment, India International Center Quarterly, 19(1&2) (1992) 215-220.

5 ADB (Asian Development Bank), Agricultural Aspects of the Upland and Forest Settlement, Component of the Chittagong Hill Tracts Development Projects, Report of the Consultant Agronomist/ Horticulturist, ADB, Manila, 1984.

6 Khan M S, Hassan M A & Uddin M Z, Ethnobotanical Survey in Rema-Kalenga Wildlife Sanctuary (Habiganj) in Bangladesh, Bangladesh J Plant Taxon, 9(1) (2002) 51-60.

7 ADB (Asian Development Bank) Chittagong Hill Tracts Regional Development Plan (ADB TA#3328-BAN), Final Report No. 4, Natural Resources and Forestry. Rangamati, Bangladesh, 2001.

8 Chowdhury J K, Participatory Forest Management – Implications for policy and Human Resource Development: A Case Study of the Chittagong Hill Tracts, 1998.

9 Khisa S K, Ethnobotanical and Cultural Background of the Ethnic Communities in Forest Resource Management in the Chittagong Hill Tracts, Paper presented at the Ethnobotanical Seminar held at Bangladesh Forest Research Institute, Chittagong, 1997a.

10 Khisa S K, Indigenous Technology/ Knowledge of Watershed Management in the culture of ethnic Communities of the Chittagong Hill Tracts, paper presented in the National Workshop on 'Application of Indigenous Technology/ Knowledge in Watershed Management', held on November 30 December 03, Bangladesh Forest Academy, Chittagong, 1997.

11 Hoque M, Indigenous Knowledge and Practices of the People of the Chittagong Hill Tracts in Bangladesh, In: Of Popular Wisdom: Indigenous Knowledge and Practices in Bangladesh, BARCIK, Dhaka, Bangladesh, (2000) 129-134.

12 Khisa S K, Agriculture and Development in the CHT, paper presented at the conference on 'Development in the CHT' organized by the Forum for Environment and Sustainable Development in the CHT, held at Rajbari, Rangamati, 1998.

13 Millat-e-Mustafa M, The Ecology and Management of Marma Home-gardens of Rangamati, paper submitted to ICIMOD, Nepal, 1998.

14 Alam M K & Mohiuddin M, Indigenous Land Use Planning in Chittagong Hill Tracts, In: Forest History of Mountains of the World. Proceedings of the International Seminar on the Forest History of the Mountain Regions of the World, edited by Rawat AS, 9-16 October 2001, Nainital, India, 2001, 35-42.

15 Gain P, The Chittagong Hill Tracts: Life and Nature at Risk, Society for Environment and Human Development (SEHD), Bangladesh, 2000.

16 Gurung J D, Indigenous Knowledge System and Biodiversity Management, ICIMOD, 1994, 58.

17 Martin G J, Ethnobotany; A Conservation Manual, (Chapman & Hall, London), 1995, 268.

18 Horowitz M M, The Management of Semiarid Rangelands: Cultural Experiences of Knowledge of Asian and African Hedgers, Links Between Cultures and Biodiversity, Proceedings of the Cultures and biodiversity Congress 2000, 20-30 July, Yunnan, RP, China, 2000.

19 Salick J, Ecological basis of Amuesha agriculture, Peruvian upper Amazon, In: Resource Management in Amazonia: Indigenous and Folk Strategies (Advances in Economic Botany 7), edited by Posy D A & Balee W, (New York Botanical Garden, New York), 1989, 189-212.

20 Cotton C M, Ethnobotany- Principles and Applications, (John Wiley & Sons Ltd, Baffins Lane, Chichester, Wext Sussex P019 IUD, England), 1996, 424.

21 Box L, Virgilios's theorem: a method of adoptive agricultural research, In: Farmer First: Farmer Innovation and Agricultural Research, edited by Chambers R, Pecey A & Thrupp, LA, (ntermediate Technology Publications Ltd. London), 1989, 61-68.

22 Hecht S B & Posy D A, Preliminary results on soil management techniques of the Kayapo Indians, In : Resource Management in Amazonia: Indigenous and Folk Strategies (Advances in Economic

Botany 7), Posy DA & Balee W, (New York Botanical Garden, New York), 1989, 174-188.

23 Dialla B E, The Mossi indigenous soil classification in Burkina Faso, Indigenous Knowledge & Development Monitor, 2(1) (1993) 10-12.

24 Anon, Government of East Pakistan, Office of the Deputy Commissioner, Chittagong Hill Tracts, Memo No. 2384 (40 dt. Rangamati, the 3rd August), 1965.

25 Primack B R, Essentials of Conservation Biology, 2nd edn, Sinauer Associates, 23 Plumtree Road, Sunderland, MA 01375 USA, 1998, 659.

26 Horwich R H & Lyon J, Community based development as a conservation tool: The Community Baboon Sanctuary and The Gales Point Manatee Reserve, In: Timber Tourists and Temples: Conservation and Development in the Maya Forest of Belize, Guatemala, and Maxico, edited by RB Primack, D Bray, H A Gallettiand & I. Ponciano, (Island Press, Washington, DC), 1998, 343-364.

27 Cox PA & Elmqvist T, Indigenous Control of tropical rainforest reserves: An alternative strategy for conservation, Ambio, 20 (1991) 317-321.

28 Cox P A, Nafanua: Saving the Samoan Rain Forest, (W.H. Freeman, New York), 1997.

29 Balla M K, Chowdhury S & Karkee B T, Wood Energy Management and Knowledge in Pokhara Area, Western Nepal, In: Pei Shengji, Su Yong-ge, Long Chun-Lin, Ken Marr, and Darrell A. Possy (edited): The Challenges of the Second International Congress of Ethnobotany, Yunnan Science and Technology press, China, 1990, 33-47.

30 Felger R S & Moser M B, People of the desert and Sea: Ethnobotany of the Seri Indians. University of Arizona Press, Tuscon., 1985.

31 Milliken W, Milleer R P, Polland S R & Vandelli E V, Ethnobotany of the Waimiri Atroari Indians of Brazil, (Royal Botanical Gardens, Kew), 1992.

32 Godbole A, Angami Home Garden, In: Applied Ethnobotany in Natural Resource Management Traditional Haome Gardens, (Highlight of a training Workshop held at Kohima, Nagaland India, 18-23 June 1997), (International Center for Integrated mountain Development, Kathmandu, Nepal), 1998, 65-70.

33 Sjöström E, Wood Chemistry, Fundamentals and Applications, 2nd edn, (Academic Press limited, 24-28 Oval Road, London NW1 7DX), 1993.

Part-B

Workshop Findings on Natural Resource Management and Village Common Forest

Introduction: Trinamul Unnayan Sangshta conducted couples of workshops with Elders, youth and women on Natural Resource Management (NRM) and Village Common Forest (VCF). The workshops were held on 18 October 2017 and 30 October 2017 accordingly at Ashish hall room of TUS office premises. Around 50 participants participated from Dighinala and Khagrachari Sadar Upazila, including women members of the VCF committees and NRM related project areas. The first workshop

Figure 10: Bandarsing Village Common Forest ***PC: Ripan Chakma***

mainly focused on drawing a list of the TK related with VCF and NRM, which took in the organizing systems of VCF and NRM, resource management techniques, associated beliefs, customs and rituals and second workshop focused and placed on the methodologies and techniques of identifying useful natural resources, methods of using those and techniques of collection. The sessions addressed the different components of NRMs and associated techniques and systems. Open discussions produced ideas and knowledge on VCF idea, need and practices behind raising and sustaining VCFs and biodiversity. Prices of the regularly collected natural resources and contribution towards the livelihood of the forest communities were also discussed in the workshop.

Basic concepts of Village Common Forest and Natural Resource Mangement system in CHT on the background of traditional knowledge

VCF: This is a traditional practice of forest management by the indigenous communities of CHT. One of the most important things about VCF is that it is a natural process or practice without planting any kind of tree. The community through a management committee headed by karbari(village head). The community never uses VCF for jhum. Generally the community does not extract any timbers from this natural forest. If required they only extract timber or bamboo for some community uses like construction of school, temple or any other community purposes. None of them are allowed to extract timber or bamboo for selling purpose for individual cash earning. Very poor villagers, who can't afford to buy, can harvest necessary house construction materials like wood, bamboo etc. with the permission of the VCF management committee. The villagers use resources of VCF at the time of communities need. The villagers equally share any income, if any, earned from the VCF. Forest resources are open for all the households of the community but they require permission from the community chief.

Figure 11: An edible natural mushroom, ***PC: Sanchoy Chakma***

NRM: Natural resource management is a process of managing natural resources in a traditional way which includes multiple aspects of natural resource use as well as goals of the wider community. It focuses on sustainability of natural resources. It involves putting resources to their best use for human purpose in addition to preserving natural system. People will conserve a resource that is linked directly to their quality of life.When a local people's quality of life is enhanced, their efforts and commitment to ensure the future well-being of the resource are also enhanced. Natural resource management specifically focuses on traditional method understanding of resources and ecology and the life-supporting capacity of those resources.

VCF as a system: techniques used for maintaining VCFs

VCF resources management system: *VCF members use resources from forest but they maintain forest by good practices/traditional way. Vigilance man or karbari or*

headmen create awareness to the villagers to keep the forest unharmed. Women also get sensitized about forest resources. Villagers conserve an area covering 5 acres to hundreds or thousands acres of forest. They extract natural resources by using traditional methods without deforestation.

They extract fish, crab, snail, bird, pig, bamboo shoot, bamboo, timber, different kind of vegetable's, firewood etc. all natural resources from forest in their daily life. They use trap to hunting birds, animals but they follow some ritual. They use steam water but they plant bamboo and broom tree to protect from erosion.

List of rituals, beliefs, customs and livelihood actions connected with VCF:

Figure 12: A women collecting vegetable ***PC: Sanchoy Chakma***

Nature and Indigenous people both are connected with one another. Indigenous people in CHT also dependent on forest and nature. In their daily life they collect their essential elements from forest. They extract forest product since thousand years by using

traditional methods. Their beliefs, rituals, customs and livelihood everything is interlinked with forest.

Worship/Puja:

SL.	Worship/Puja parbon	Links with VCF- NRM
1)	Thanmana	Most of the indigenous people are farmer and jumia. Whole year they cultivate paddy and different kind of vegetables. During Falgun-Choitra, when droughts come out, they do thanmana puja for rain water.
2)	Longtre	Beliefs of Tripura community- the worship to Longtre god before hunting to protect from wild animals attack.
3)	Bizu	Bizu, social festival of three indigenous communities (Chakma, Marma, Tripura,Tanchangya) in CHT. Ful bizu, mul bizu and gujjjepujje are the three days celebration of bizu. Wild flowers and lots of wild vegetable are used in bizu.
4)	Shajonney puja	Three types of shajonney puja- 1. Healing disease- the worship was givenhealing from all kind of disease of family members, at down stairs of main door at house. 2. Debohorom- to release all kind of spiritual effect. 3. Gonga horom- Gonga is mother and Togolok is daughter. Sacrifice hen and cock to Gonga and tagolok to release from Gongahorom.
5)	Ful bizu	Ful bizu is the first day of bizu. In the morning of ful bizu childrens collect wild flower and float that flower in the river.
6)	Subolong puja- A worship to God Maletra during marriage ceremony	For the worship, some materials are required which include: Muli, rice wine, wild flowers, head of a wild animal/bird. Most of the materials are collected by the local experts from the VCF areas or from other forests. For preparation of rice wine, some bamboo pipes and other earthen materials are used, which are also collected from wild settings.

Customs/ rituals:

Custom/ritual	Links with VCF-NRM
Bishud vanga- related to forest Rangda- related to forest	Bishud vanga is one kind of legal way of marriage ceremony. Next day morning after marriage bride and groom go to the non-deciduous shade tree. Rangda is upper part of Marma women's attire. When Rangda woven in handloom, it's required jungle element as like bamboo, cotton etc.
Aag bara poi-related to livelihood	There are many rituals after death. Aag bara poi offered to death spirit. Some materials are required such as banana leaf, rice, fruits, local wine, rice cake, dogan chara pide, mema michri, egg, meat, water, fish, earthen pot etc.
Bou sa, bou hoja, beranne- related to livelihood	It's a whole processing of Chakma marriage system. **Bou** sa- At first groom's parents with their relative goes to the bride home. They take with coconut, sugar cane, rice cake, betel leaf, betel nut etc. Then both family member give their opinion and fixed marriage date. **Bou Hoja**- on marriage day groom's relatives goes to the bride home and come back with bride at groom's house. **Beranne-** after marriage bride and groom with their few relatives and friends go to the bride's home. Bride and groom, they took local wine with them.

Beliefs:

Beliefs	Links with VCF- NRM
Ahl faloni-peddy land	Al faloni celebrate on 7th, Ashar(3rd week of June). A full plate of foods offer to "Ma Laksmi" to satisfy her and pray for good & huge crops.
Banyan tree-	Banyan tree, specially the aged ones are believed traditionally as the ones with spirit, which can react to the harming of the tree.
Ghila & Hojoy-	Ghila & Hojoy are non-eatable fruits, available in jungle. To get refried both are used in water with turmeric.
Madha dhona	According to believers- There are many good and bad spirits around us. Bad spirits always try to harm us. If anybody harmed, must require madha dhona in river/steam to get rid of bad affect.

NRM as a set of systems: interlink with all component

Water management:

Figure 13: A girl following her mother to collect food ***PC: Sanchoy Chakma***

- It's told that, don't urinate in the water, otherwise Ma Gonga will be dissatisfied.
- The approach is traditional and demand-driven in order to harvest rainwater by building a goda (small earthen dam) for multipurpose use as like irrigation, fish and duck farming.
- To use waterfall water by bamboo pots traditionally called Tagolok (Chakma)/Tung khong ung (Marma). Bamboo pots used like a pipe.
- Stop pick off stone.
- To save the bank of river/steam from erosion plant bamboo, broom and dumur tree.

Water life management:

- Fishing in deep water/dhuduk (where fishes are available) or

in bound water by using poison/mel.

- In snail breeding season, it's told not to eat snail. If anybody eat snail she/he will be sick.

Forest management:

- Without permission no one can use timber.
- Use forest resources for need purpose not for cash earning purpose.
- No jhum cultivation in forest area.

Wildlife management: birds, amphibians, animals

- Chakma community's belief, in rainy season (religious purpose) not to kill any living being.
- In Vadro-Ashin-Kartik pig is strictly prohibited to hunt.
- Doe (Vola horin) is prohibited to hunt.
- Raj shikar- to hunt more than one is strictly prohibited in a group of deer. During hunting they have to obey some rules. If they break any rules, it brings bad luck to them.
- Hunting materials or trap- Idhi, fal, habuk, herap, dub, chey, lui, podang, glue etc.
- They keep trap at whole night not all day long.
- Vuo tree/ sonattali tree/ hlangkuoey is barred to cut.

NRM traditional good practices

1. **Water management:** Mr. Sunity Bikash Chakma at Nutunpara, Bengmara constructed a goda (small earthen dam) at the suitable side in the foothills for rain water storage for multipurpose use. The dam was compacted manually and both sides of the dam were reinforced with bamboo pots and mats so that the earthen dam did not collapse or slide down. Seepage water and rainwater were accumulated above the dam. Accumulated water was mainly used for domestic use, fish and duck farming and sometimes irrigation of paddy fields down the dam during dry season.

2. **Soil management:** Mr. Nirodh Ranjan Chakma at Dane dhan pata, he planted bamboo at the bank of stream. That way he protected the stream from erosion. After his death his children did not take any protection and now the bank of stream is breaking.

3. **Wildlife management:** Indigenous community used trap to hunt. But they obey some rules. They use trap whole night and remove trap next day morning.

4. **Tree and forest management:** There is a tradition in CHT of keeping a forest reserve which is used for forest dependent HHs and managed by communities under supervision of traditional leaders. Huge number of timber and non timber forest products are extracted from those reserve forests. Some of the rituals also are connected with the forest resources, as some materials used for spiritual customary arrangement are collected from the natural forest only. So, for keeping up the traditions, reserving community forest is very important practice.

Traditional NTFP extraction methods:
The methods of extraction were listed along with the time of collection and the main purpose of using the NTFPs.

Group-1 (Flower):

SL	Method of collection	Time of collection	Purpose
1	Gamari flower-collect fallen flower	Boishakh- Joistho	Food
2	Ulu flower- fallen flower	Choitro- Boishakh	Medicine
3	Boragulo flower- fallen flower	Choitro- Boishakh	Medicine
4	Ahgaja flower-pick from tree	Choitro	Food
5	Edible Root (Kochu ponga)-pick from tree	Ashar	Food
6	Shan flower-pick from tree	Ashar	Food
7	Chenge flower-pick from tree	Falgun-Choitro	Food
8	Termaric flower- pick from tree	Srabon-vadro	Food
9	Ginger flower-pick from tree	Srabon-vadro	Food

Group-1 (Roots/Potato):

SL	Method of collection	Time of collection	Purpose
1	Pan alu	October-March	Food
2	Ram alu	October-March	Food
3	Koeyng alu	October-March	Food
4	Tat alu	October-March	Food
5	Mun alu	October-March	Food
6	Sweet alu	Falgun-Jyostha	Food
7	Muo alu	Kartik-Choitra	Food
8	Pile alu	Kartik-Choitra	Food
9	Cassava	Kartik-Choitra	Food
10	Juro alu	Kartik-Choitra	Food
11	Shammyo Kochu	Kartik-Choitra	Food
12	Edho theng alu	Kartik-Choitra	Food
13	Fira alu	Kartik-Choitra	Food
14	Narikel kochu	Kartik-Choitra	Food
15	Bini kochu	Kartik-Choitra	Food
16	Hugi kochu	Kartik-Choitra	Food
17	Ol kochu	Ashar-Falgun	Food
18	Thenga kochu	Kartik-Choitra	Food
19	Ghuri kochu	Srabon-Choitra	Food
20	Chagol dudh kochu	Kartik-Choitra	Food
21	Lalit alu	Magh-choitra	Food
22	Ranga pile alu	Kartik-Choitra	Food
23	Egarut alu	Whole year	Food

Group-1 (Kora/Aga):

Sl#	Particular	Sl#	Particular
1	Pumpkin Shak	20	Hattol dhingi aga
2	Dhingi shak	21	Red leaf
3	Mormojjya shak	22	Thankuni
4	Paranga shak	23	Abbush shak
5	Lelon Pata	24	Ujan shak
6	Ujan sina shak	25	Pagujja aga
7	Jangal shak		

Sl#	Particular	Sl#	Particular
8	Ichadar shak		
9	Edible root shak		
10	Kochoi shak		
11	khona shak		
12	Khirija shak		
13	Bottle Gourd shak		
14	Bitter gourd shak		
15	Sumi shak		
16	Bamboo shoot		
17	Sion shak		
18	Bedagi aga		
19	Rani shiyen aga		

Group-2 (Creepy plant/Leaf):

SL	Method of collection	Time of collection	Purpose
1	Edible root	Any time	Food
2	Pata baj loti	Any time	Harbal
3	Sharbo amila	Boishak- kartik	Harbal
4	Jiot loti	Any time	Harbal
5	Kireja loti	Boishak- Joystho	Food
6	Thanda manik	Any time	Harbal
7	Lelom pata	Any time	Food
8	Dheki shak	Any time	Food
9	Edible root leaf	Any time	Food
10	Titrang shak	Boishak- Kartik	Food & Harbal
11	Ichadar shak	Any time	Food & Harbal
12	Pran shak	Boishak-Kartik	Food
13	Thankuni	Any time	Food
14	Guava leaf/aga	Any time	Food & Harbal
15	Daolong aga	Any time	Harbal
16	Ojon sina shak	Any time	Food
17	Songra sing aga	Any time	Food

Group-2 (Bark/Kondo/Kando):

Sl#	Method of collection	Time of collection	Purpose
Bark-1	Mango Tree-	Any time	Harbal
Bark-2	Guava tree-	Any time	Harbal
Bark-3	Lotkon tree-	Any time	Harbal
Bark-4	Bohera tree-	Any time	Harbal
Bark-5	Honagulo tree	Any time	Harbal
Bark-6	Jarul tree-	Any time	Harbal
Bark-7	Maner moto tree-	Any time	Harbal
Kondo/Kando-1	Chenge tara	Falgun-Boishak	Food
Kondo/Kando-2	Tara	Any time	Food & Harbal
Kondo/Kando-3	Bamboo shoot	Boishak-Vadro	Food
Kondo/Kando-4	Banana Tree	Any time	Food
Kondo/Kando-5	Rani sior	Any time	Food
Kondo/Kando-6	Gola (bet) & moricha	Falgun-Choitro	Food & Harbal
Kondo/Kando-7	Tita kochu	Boishak-Vadro	Food
Kondo/Kando-8	Sion shak	Any time	Food & Harbal
Kondo/Kando-9	Ekdajje kochu	Any time	Food
Kondo/Kando-10	Ol kochu	Boishak-Srabon	Food

Group-3 (fruits):

SL	Method of collection	Time of collection	Purpose
1	Botta gulo-	Ashar	Food
2	Chapalishgulo-	Ashar	Food
3	Lotcon	Srabon	Food
4	Sorbek gulo	Choitro-Vadro	Food
5	Berry	Joistho	Food
6	Ho-gulo	Ashar	Food
7	Amloki	Ashin-Choitro	Food
8	Horitoki	Kartik	Food & Harbal
9	Bohera	Kartik-Choitro	Harbal
10	Pok gulo	Vadro-Ashin	Harbal
11	Pittung gulo	Joistho-Ashar	Food
12	Perejam gulo-	Joistho	Food
13	Mogo pittung gulo-	Ashar	Food
14	Jhogona gulo	Ashar-Vadro	Food
15	Keg gulo	Joistho	Food
16	Nol Mango	Joistho	Food

SL	Method of collection	Time of collection	Purpose
17	Grey Mango	Joistho	Food
18	Rosko	Choitro-Joistho	Food
19	Bandor Marfa	Ashin-Kartik	Food
20	Gorgotta	Ashar-Srabon	Food
21	Pannemala	Ashar-Srabon	Food
22	Kudungsa Gulo	Joistho	Food
23	Gorek coconut	Joistho	Food
24	Heda fal	Srabon	Food
25	Rebek gulo	Srabon	Herbal
26	Forest Banana	Any time	Food
27	Chenge gulo	Choitro	Food
28	Chalta	Ashar-Magh	Food

Group-3 (Seed):

SL	Method of collection	Time of collection	Purpose
1	Keg gulo	Joistho	Taken as alternative of Betel Nut
2	Gola/Bet	Choitro	Taken as alternative of Betel Nut
3	Rani sieyng	Choitro	Taken as alternative of Betel Nut
4	Kuradi Pata	Choitro	Taken as alternative of Betel Nut
5	Chaa Seed	Kartik	Taken as alternative of Betel Nut
6	Amloki seed	Vadro	Food
7	Jhar Nut		
8	Tara seed	Ashar	Spicy/Harbal
9	Pobang seed	Ashar	Food
10	Palong moma	Ashar	
11	Tita biol	Any time	Food
12	Midhe biol	Any time	Food
13	Tettol gulo	Ashar-Srabon	Food
14	sorbo tita	Ashar-Srabon	Food
15	Boro tita biol	Ashar-Srabon	Harbal/Food

Conclusion:

In CHT, all indigenous communities are linked with nature and forest. Their culture, food habit, livelihood, rituals, beliefs everything is connected with forest. They know how to extract forest resources and also know how to keep forest by using traditional knowledge. They maintain forest by traditional way. That is one point of forest sustainability.

Chapter-3:
Traditional Healing Practices

Part-A

Traditional Usage of Ethno-Medicinal Plants among the Chakma Community of Tripura, India

Anupam Guha and Daina Chakma
Department of Botany, Women's College,
Agartala-799001, Tripura, India

Abstract: An ethno-botanical study focused on medicinal value of plants was carried out among the Chakma community of Tripura, India with aims to document the traditional knowledge of the medicinal plants used in various ailments. The information was based on normal interview, discussion and conversation with local herbal practitioners, elderly people of Chakma community. In this study, a total of 59 plant species in 55 genera belonging to 41 families were described which have been used in the treatment of around 33 different diseases. Apocynaceae is the most frequently used family in context to the number of species used by the Chakma Community. The other important families used for medicinal plants are Caesalpiniaceae, Amaranthaceae, Rutaceae, Araceae, Zingiberaceae, Asteraceae, Liliaceae and Combretaceae respectively. Mostly leaves are used for the formulation of folk medicine. An attempted has been made to document the ethnophy to therapeutics and the folk claims of the plant parts used along with their medicinal uses. Most frequently medicated claims were Diarrhoea, Dysentery, Toothache, Jaundice, Bone fracture, Cough and cold. All these claims need to be subjected to previous established literature to validate the potentiality of these plants and plant parts as drugs.

Introduction

Ethnobotany is the study of the correlation between plants and people: from 'ethno' - study of people and 'botany' - study of

plants. Ethnobotany is considered a branch of ethnobiology. Ethnobotanical studies are the complex interaction between (uses of) plants and cultures. The focal point of ethnobotany is on how plants have been or are used, supervised and recognized in human societies. Tribal people are the ecosystem people who live in harmony with the nature and maintain a close relationship between man and environment [1]. All cultures have traditions of folkloric medicine that include the use of plants and other ethno pharmacological products [2]. Ancient tribal people have used plants to cure a variety of ailments but they keep no records and the information is mainly passed on verbally from generation to generation [3]. Traditional healers employ methods based on the ecological, socio-cultural and religious background of their people to provide health care. Plant derived medicines are widely used because they are relatively safer than the synthetic alternatives and are easily available, cheaper also. The biological evaluation of plant products on the basis of their use in the traditional herbal system of medicine develops a basic platform for the recent and newer drug discovery methods, development of new drugs from different plant sources [4-6]. Tripura is India's third smallest hilly state in the North-eastern part of the country (Figure 1). Tripura state lies between 22°56' to 24° 32'N latitude and between 90°09'to 92° 20'E longitudes covering an area of 10, 491 sq.km. In Tripura, 19 different tribal communities are found to dwell, viz. Tripura, Shantal, koki, Noatia, Lusai, Halam, Jamatia, Chakma Mog, Riang and others. The climate of Tripura is characterized by intermediate temperature and highly humid atmosphere. During summer (April-May), maximum temperature reaches 38°C. In summer relative humidity ranges 50-75% while during monsoon it remains over 85%. The present study was carried out in Tripura, India. Several ethno-botanical studies [7-10] in the state have documented various healing plants with folk recipes.

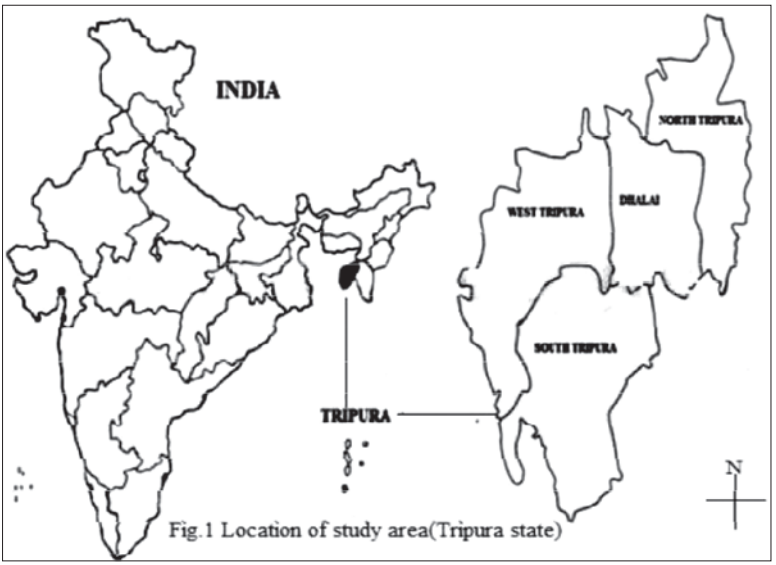


Fig. 1: Location of study area (Tripura state)

However, an extensive attempt is made to report on ethnomedicinal plants used by Chakma community people of Tripura, India.

MATERIALS AND METHODS

Exhaustive field survey has been undertaken covering all the seasons for gathering information on each and every species useful in herbal medicine among the Chakma. Survey conducted in different villages of Tripura state. The present research study was undertaken to document the plants solely used by the Chakma tribe of Tripura state for the treatment of various diseases. The information's on medico-botanical aspects was collected by questionnaires to the traditional practioners. This being a descriptive research, survey method involving collection of data through questionnaire was adopted. The plants were collected from the study area, dried, preserved and identified with the help of available literature [11-13]. Voucher specimens were deposited in the Herbarium of Department of Botany, Women's College, Agartala.

RESULTS AND DISCUSSION

About the Community Chakma: The Chakma population is estimated to be around 64, 293 (Population census of Tripura, 2001). Chakma is one of the prominent Tripura tribes. The people belonging to Chakma tribe believe in the sermons of Lord Buddha. Kailsahahar, Kanchanpur, Udaipur, Amarpur, Belonia and Sabroom sub-divisions of Tripura are the prime locations where *Chakma* tribe live. Their language is grouped under Tibeto-Chainese family. Chakma are dependent on Jhum cultivation [14-15].

By nature they are not so much active for advancement of life and entirely depend on surrounding environment for livelihood. They also rely on forest products and medicinal plants for sustaining their life.

Taxonomic Enumeration: The reported plants were arranged according to their scientific name, family, vernacular names (as recorded during the field work), parts used and therapeutic uses. Plant species belonging to 55 genera and 59 species in 41 families are being used by the Chakma people for the treatment of common diseases [16]. The dose is prepared by using juice, leaf, bark extracts and other parts of the plant. Scientific names arranged alphabetically, followed by family, local names/ habit, Chakma names, plant part and medicinal uses are listed in Table 1 & Fig. 2.

From ancient period people made use of plants for their livelihood and medicare. Some plants they used are cultivated while others grow in wild conditions. The Chakma people depend predominantly on plants for food, medicine, agricultural implements, art and crafts and for other requirements [17-21]. Plant species were also used

Table 1: List of plants used in folk medicine by Chakma communities

Scientific name	Family	Local name/ Habit	Chakma name	Parts used	Ethno-medicinal use
A. Dicotyledons					
Acmella paniculata (Wall. Ex DC.) R.K. Jansen	Asteraceae	Marhatitiga/Herb	Osonshak	Flower	Crushed flower is applied to treat Toothache
Achyranthes aspera L	Amaranthaceae	Apang / Herb	Uvalayara	Leaf	Leaf extract is taken for treat Cough, fever
Adhatoda vasica Roxb.	Acanthaceae	Basak/ Shrub	Basak pada	Leaf	Leaf extract use to treat Cough
Aegle marmelos (L.) Corr.	Rutaceae	Bel/ Tree	Belgulu	Fruit	Fruits are directly taken to treat Diarrhoea, dysentery
Alstonia scholaris (L.) R.Br.	Apocynaceae	Chatim/Tree	Jarbo sesna	Leaf	Mother sits on the leaf of Jarbo sesna to romote milk production.
Amaranthus spinosus L.	Amaranthaceae	Katanotey/ Herb	Hadamarej	Root	Juice prepared from root is taken to treat Pregnancy problem
Artocarpus heterophyllus Lam.	Moraceae	Kathal/ Tree	Hattol	Latex	Latex is used to treat Skin disease
Azadiracta indica A. Juss.	Meliaceae	Neem/ Tree	Neem gach	Leaf	Leaf used to treat Skin disease and stem used for Toothache
Boerhavia diffusa L.	Nyctaginaceae	Punarnava/Herb	Purnadalak	Leaf	Leaf used to treat anemia and edema
Cardiospermum halicacabum L.	Sapindaceae	Lataphatkari/ Climber	Hedaboksa shak	Whole Plant	Hot water extract of the plant is taken to treat Chiken-fox. Leaf is taken for fever and root is used to treat mumps
Cajanus cajan (L.)	Fabaceae	Arhar/ Shrub	Dumursumi	Leaf	Paste prepared from leaf is taken in Jaundice, Cough and gastritis. Seeds are used to treat Snake bite
Carica papaya L.	Caricaceae	Pepe/ Tree	Hogoya	Latex	Latex of green fruit is used to induce abortion

Scientific name	Family	Local name/ Habit	Chakma name	Parts used	Ethno-medicinal use
Cassia alata L.	Caesalpiniaceae	Dadmardan/ Shrub	Dattalong pada	Leaf	Leaf Paste of leaf is applied in eczema and ringworm
Cassia sophera L.	Caesalpiniaceae	Kalkasunde/ Shrub	Ijji gach	Seed	Paste of seed is applied in eczema and ringworm
Cassia tora L	Caesalpinaceae	Chakunda	Latha	Seed	Seeds are useful in obdurate skin diseases, ring worm, itching
Catharanthus roseus L. G. Don	Apocynaceae	Nayantara/ Herb	Chokful	Leaf	Leaf juice is taken to treat Gastritis, Abdominal pain
Centella asiatica (L.) Urban	Apiaceae	Thankuni/ Herb	Menmini	Leaf	Leaf juice is taken in Digestive, Dysentery, Gastritis
Cissus quadrangularis L.	Vitaceae	Harjora/ Climber	Harvan-gadaru	Leaf	Paste of leaf is used to plaster the fractured area. Stem is used to treat Cancer
Citrus lemon (Christ.) SW.	Rutaceae	Kagogi lebu/Tree	Hagugi	Fruit	Juice from fruit is taken to treat Jaundice
Dillenia indica L.	Dilleniaceae	Chalta/ Tree	Ulugach	Flower	Flower prepared pills and taken in Weakness, Low pressure after delivery
Eupatorium odoratum L.	Asteraceae	Assam lata/ Shrub	Mugujuher	Leaf	Crushed leafs are applied in Cuts and wounds
Ficus hispida L.f.	Moraceae	Dumur/ Tree	Dumur gulu	Fruit	Fruits are directly taken in Dysentery and Diarrhoea
Gmelina arborea L.	Verbenaceae	Gamari/Tree	Gamari gach	Seed	Paste of seeds are spread affected area to treat Itching
Grewia microcosm L.	Tiliaceae	Patka/ Tree	Assarbiji gach	Leaf	Juice from leaf is taken to treat Jaundice

Scientific name	Family	Local name/ Habit	Chakma name	Parts used	Ethno-medicinal use
Hibiscus macrophyllus Roxb.	Malvaceae	Udal/Tree	Lambak	Bark	Fresh juice of bark is used in blood dysentery, painfill micturation
Holarrhena pubescence (Buch. Ham.) Wall.	Apocynaceae	Kurchi/ Tree	Huruk gach	Bark	Juicefrom bark is taken with sugar for Jaundice
Hyptis suaveolens (L.) Poit	Lamiaceae	Tokma/ Shrub	Chongadana gach	Root	Paste of root is taken with sugar for the treatment of High blood pressure
Jatropha curcas L	Euphorbiaceae	Keron	Keran	Stem	Fresh juice of the stem used in blood dysentery, tender stem in pyorrhoea as tooth bruah
Lawsonia inermis L.	Lythraceae	Mehedi/ Shrub	Minti pada	Leaf	Paste from leafs is used for Hair Falling and to remove dandraft
Mangifera indica L.	Anacardiaceae	Am/ Tree	Amm gach	Bark	Juice prepared from bark is taken with sugar to treat bleeding piles
Melastoma melabatricum L.	Melasomaceae	Datranga/Shrub	Maga pittungulu	Leaf	Paste prepared from leafs are useful to treat toothache
Mimosa pudica L.	Mimosaceae	Lajjaboti/ Herb	Lajuriher	Fruit	Fruits are used for Dysentery, Diarrhoea, emetic. Stem extract are Used to treat Bone fracture
Moringa oleifera Lamk	Moringaceae	Sajina/ Tree	Sesna shak	Bark	Juice prepared from bark is taken with sugar for Jaundice
Ocimum sanctum L.	Lamiaceae	Tulsi/ Herb	Tulusi pada	Leaf	Extract of leaf is used to treat Cough
Oroxylum indicum (L.) Kurz	Bignoniaceae	Khona/ Tree	Honagulu	Bark Leaf	Juice prepared from bark is mixed with sugar and taken to treat Jaundice

Scientific name	Family	Local name/ Habit	Chakma name	Parts used	Ethno-medicinal use
Peaderia foetida L	Rubiaceae	Gandha bhadali/ Climber	Dukhupui	Leaf	Extract of leaves are used in Diarrhoea, indigestion
Phyllanthus emblica L.	Euphorbiaceae	Amloki / Tree	Hadamala	Fruit	Fruits are used for Dysentery and Diarrhoea
Physalis micrantha Link.	Solanaceae	Phutka/ Herb	Pittungulu	Root	Root extract mixed with sugar taken to treat Dysentery
Piper betel L.	Piperaceae	Pan / Climber	Pan	Leaf	Crushed leafs are applied in wounded area and toothache
Psidium guajava (L.)	Myrtaceae	Piyara/Tree	Guyam	Leaf	Young leaf is taken directly in Diarrhoea
Sesamum inducum L	Pedaliaceae	Til/ Herb	Shiping	Leaf	Juice of leaves are used externally as hair shampoo for dandruff.
Tabernaemontana divaricate (L.) R. Br.	Apocynaceae	Tagar/ Shrub	Hastadangar	Root	Extract prepared from root is taken with sugar to treat the Children in fever.
Tamarindus indica L.	Caesalpiniaceae	Tetul/ Tree	Tedoy	Fruit	Ripe fruit are directly taken for Headache, High pressure
Terminalia chebula Retz	Combretaceae	Haritaki/ Tree	Oithal	Fruit	Ripen/ green fruits are taken directly to treat Gastritis and Abdominal pain
Terminalia belerica (Gaert) Roxb	Combretaceae	Bahera/Tree	Boragulu	Fruit	Fruit is taken directly to treat cough and Diarrhoea
Thevetia peruviana (Pres.) Merr.	Apocynaceae	Kolkiphul/ Shrub	Goiphul	Seed	Latex of seeds are used to treat Boils.
Tinospora cordifolia (wild) Hook. F. & Th.	Menisper-miaceae	Gulanch/ Climber	Duksa sungsari	Whole plant	Watery extract of stem is used in loose motion, Diabetes

Scientific name	Family	Local name/ Habit	Chakma name	Parts used	Ethno-medicinal use
Vitex negundo L.	Verbenaceae	Nishinda/ Shrub	Nishinda	Leaf	Juice of the leaves are used in arthritis
B. Mon ocotyledons					
Acorus calamus L	Araceae	Bardai/Herb	Lang Hing	Rhizome	Sundried rhizomes along with mustard oil are applied locally for curing arthritis
Allium cepa L.	Liliaceae	Piaj/ Herb	Peaj	Bulb	Juice prepared from bulb is taken to Cough, asthma
Allium sativum L.	Liliaceae	Rasun/Herb	Ron	Bulb	Bulb is directly taken to treat Boils, gastritis
Ananas sativus Schult. F.	Bromeliaceae	Anaras/ Shrub	Anas	Fruit	Fruit Unripe fruit is directly taken to treat Abortifacient
Areca catechu L.	Arecaceae	Supari/ Tree	Subari	Fruit	Fruit is directly taken to treat Cough
Colocasia esculenta (L.) Schott	Araceae	Kachu/ Herb	Araceae	Latex	Latex of Stem is used to treat Bee or ant bite
Costus specious (Koen ex Retz.) Sm.	Zingiberaceae	Keo/Herb	Mailuma kathama	Rhizome	Juice of rhizome used in cold and cough, asthma, dyspepsia
Crinum asiaticum (L.)	Amaryllidaceae	Sukdarshan/ Herb	Koba ron	Root	Paste prepared from root is applied in Boils
Curcuma longa L.	Zingiberaceae	Halud/Herb	Olod	Rhizome	Paste prepared is taken in Cough and treated on head of frightened child.
Musa sapientum L.	Musaceae	Bangla kala/ Herb	Hattuli hala	Fruit	Fruits boiled in hot water is taken to treat Diarrhoea
Zingiber officinale Roxc.	Zingiberaceae	Ada/ Herb	Ada	Rhizome	Juice prepared from Zinger is taken to treat Diarrhoea and Cough

Fig. 2: Photographs of some recorded ethnomedicinal plants: A. Boerhavia diffusa L. B. Cissus quadrangularis L. C. Tinospora cordifolia (wild) Hook. F. & Th. D. Holarrhena pubescence (Buck. Ham.) Wall E. Alstonia scholaris (L.) R.Br. F. Moringa oleifera Lamk

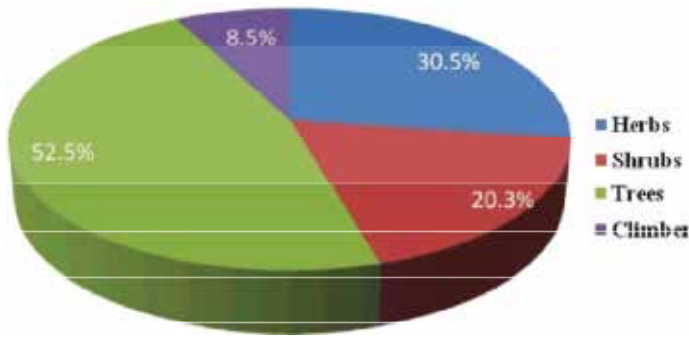


Fig. 3: Percentage of life Plant habit used by the Chakma community of Tripura

to prevent abortion, achieve easy delivery, gastric and respiratory problems, fever, antidote for snake and scorpion bites, arthritis, toothache, cough, dysentery, Jaundice and sexual power [22-28]. The Majority of plant species belong to families Apocynaceae, Caesalpiniaceae, Amaranthaceae, Rutaceae, Araceae, Zingiberaceae, Asteraceae, Liliaceae and Combretaceae. Among these 59 plant species belong to 34 dicots and 7 to monocots. According to plant habit the numbers of plant species (Life forms) have been used by the Chakma community are 30.5% herbs,

20.3% shrubs, 52.5% trees and 8.5% climbers respectively (Figure 3).

The majority utilized plant parts for the preparation of folk medicine is leaf which is 33.8%, then fruit 18.6%, root 8.5%, stem 1.7%, seed 6.8%,bark 8.5%, rhizome 6.8%, bulb3.4%, latex 5.08% and whole plant 3.4% respectively (Figure 4). The study showed that bulb, rhizome, root and the whole plant have been used in formulation of folk medicine is 22.12% for the cure of diseases. These are the unfriendly way of using plants because it needs to eradicate or abolish the whole plant. Moreover the aerial parts of the plant (leaf, flower, fruit and seed) can be used without eradicating the plant. For this, it is an outstanding way to conserve them. The studied ethno-medicinal plant species have been used to treat various diseases which are illustrated in Figure 5. The various diseases such as Diarrhoea, Dysentery, Diabetes, Cough, Jaundice, Skin diseases, Boils, Gastritis, Toothache, Abortion, Fever, Bone fracture, High blood pressure, Asthma, Itching, Abdominal pain and Ring warm were found to be 16.9%,15.3 %, 3.4% 16.9%, 8.5%, 5.08%, 8.5%, 8.5%, 10.2%,5.08 %, 5.08%, 3.4%, 3.4%, 3.4%, 3.4%, 3.4%, 5.08% plant species used respectively whereas Anaemia, Antiseptic, Edema, Bee and ant bite, Bleeding, Cancer, Chicken fox, Dandruff, Hair falling, Headache, Low pressure, Mumps, Snake bite, Pregnancy problem, Arthritis and Weakness each one was found to be 1.70% plant used. The most commonly used methods of folk-medicine are juice, extract, paste, pills etc. Both external and internal methods of practice of folk-medicine have been recommended.

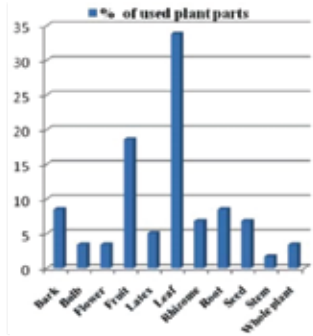


Fig. 4: Percent of used plant parts as folk medicinein in the chakma C community of Tripura

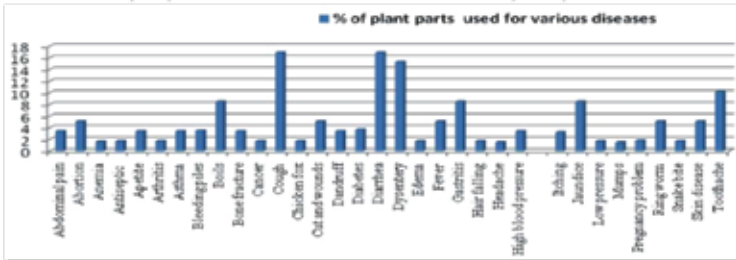


Fig. 5: Percentage of plant species used for various diseases in the Chakma community of Tripura

The internal use of folk-medicine is 68.79% whereas the external use is 31.21%.The time of taking, dose and duration of practice of these folk-medicines are varied from traditional healers to healers and on the basis of disease. The establishment of community.

Clinic is in many rural areas and that may change gradually the existing pattern of indigenous knowledge based system of healthcare. Recently, they are losing their precious heritage of plant use indigenous knowledge because of, industrialization and urbanization. At present younger generation lost the interest to continue their parental tradition because it does not provide them proper financial support for their livelihood [29-31]. If these conditions continue; their traditional plant use knowledge will be loose rapidly. Now, it is a burning necessity to document their ethno-medicinal use information to protect them from disappearing. This information can be the source and help the modern researchers in the discovery of new drugs.

Conclusion

The present study adds to the earlier knowledge regarding the use of plants in the treatment of common diseases. The increasing demand of medicinal flora has resulted in the rapid dwindling of these natural resources. There is an urgent need of systematic conservation and sustainable production of medicinal plants involving local communities, researchers and departmental field group with stronger linkage for collaborative work to meet future demand on a sustained manner.

Acknowldegements

Authors are greatly thankful to Professor B. K. Datta, Dept. of Botany, Tripura University for identification and authentication of the plant materials and valuable suggestions during the preparation of the manuscripts. Special thanks are also extended to all the traditional informants of Chakma community peoples for their active participation and knowledge sharing during the field investigation.

References

1. Shah, N.C. and M.C. Joshi, 1971. An ethnobotanical study of Kumaon region of India. Economic Botany, 35: 414-422.
2. Schultes, R.E., 1941. Lethobotanica on alcancoy Sus objects, Caldesia, 3: 7-12.
3. Bodding, P.O., 1927. Studies in Santal Medicine and Enacted Folklore. Part I and II. Memoirs of the Asiatic dosages and their applications. Society of Bengal, 10: 1-427.
4. Anonymous, 1994. Ethnobiology in India-A Status Report, (Ministry of Environment and Forest, a Govt. of India).
5. Pal, D.C. and S.K. Jain, 1998. Tribal Medicine, Nayaprakash Publisher, Kolkata.
6. Jain, S.K., Ethnopharmacology and drug development, in Ethnobotany and search for new drugs, by D.J. Chadwick and U. March, (Ciba Foundation Symposium 183, Willey, pp:153.

7. Deb, D.B., 1981 and 1983. The Flora of Tripura State, Vols. 1 and 2, Today and Tomorrows' Printers and Publishers, New Delhi.

8. Deb, D.B., 1968. Medicinal Plants of Tripura State, Indian Forester, 94(10): 753-765.

9. Barman, D.D.P., 1983. Treatise Traditional Social Institutions of the Tripuri Community, Directorate of Tribal Research, Government of Tripura.

10. Majhumdar, K., B.K. Datta and Uma Shanka, 2012..Ten new additions of tree species to the Tripura, state, North East India: Distribution of extension and geographic map. Nebio, 3(1): 17-24.

11. Singh, H.B., T.M. Hynniewta and P.J. Bora, 1997. Ethno-Medico-Botanical Studies in Tripura, India, Ethnobotany, 9: 56-58.

12. Jain, S.K. and R.R. Rao, 1977. A handbook of field and herbarium methods. Today and Tomorrow printers and publishers, New Delhi.

13. Majhumdar, K. and B.K. Datta, 2007. Ethno-botanical Observation on the Traditional Usage of Medicinal Plants among the Tribes of Tripura, (P C Trivedi ed.), 'Ethno medicinal Plants of India'. Aavishkar Publishers, Distributors, Jaipur, pp: 136-161.

14. Majhumdar, K., B.K. Datta and D. Roy, 2009 Inventory and Status of Medicinal Trees of Tripura (P C Trivedi ed.), 'Indian Medicinal Plants'. Aaviskar Publishers and Distributors, Jaipur, pp: 93-123.

15. Jain, S.K., 1989. Methods and Approaches in Ethnobotany, National Botanical Research Institute, Lucknow.

16. Kanjilal, U.N., P.C. Kanjilal, A. Das, R.N. De and N.L. Bor, 1934-1940. Flora of Assam, Vols. I-IV, Government Press, Shillong.

17. Prain, D., 1903. Bengal Plants. Vols-I and II, Repd. ed. (1963) , BSI., Calcutta.

18. Hooker, J.D., 1872-1897. The Flora of British India, Vols. I-VII, -VIII., L. Reeve and Co., London.

19. Arunachalam, K. and T. Parimelazhagan, 2011. Ethnomedicinal observation among Hooralis Tribes in Kadambur Hills, (Kalkadambur) Erode District, Tamil Nadu. Global Journal of Pharmacology, 5(3): 117-121.

20. Bhaskar, A. and L.R. Samant, 2012. Traditional Medication of Pachamalai Hills, Tamilnadu, India. Global Journal of Pharmacology, 6(1): 47-51.

21. Sebastian, M.K. and M.M. Bhandari, 1990. Edible wild plants of the forest areas of Rajasthan. J. Econ Tax. Bot., 14(3): 689-694.

22. Majhumdar, K., R. Saha, B.K. Datta and T. Bhakta, 2006. Medicinal plants prescribe by different tribal and non-tribal medicine men of Tripura state, Indian J. Traditional Knowledge, 5(4): 559-562.

23. Das, S. and M. Dutta Choudhury, 2010. Plants used against gastro-intestinal disorders and as anti hemorrhagic by three tribes of North Tripura District, Tripura, India. Ethnobot. Leaflets, 14: 467-478.

24. Majhumder, K. and B.K. Datta, 2009. Traditional Wild Edible Fruits for Forest Dwellers of Tripura, India, Pleione, 3(2): 167-178.

25. Deb, D., L. Darlong, A. Sarkar, M. Roy and B.K. Datta, 2012. Traditional ethno-medicinal plants use by the Darlong tribes in Tripura, Northeast India. Int. J. Ayurved. Herb. Med., 2(6): 954-966.

26. Kremen, C., I. Raymond and K. Lance, 1998. An interdisciplinary tool for conservation impacts in Madagascar. Conserv. Biol., 12: 549-563.

27. Kshirsagar, R. and S. Upadhyay, 2009. Free radical scavenging activity screening of medicinal plants from Tripura. Nat. Prod. Radiance, 8(2): 117-122.

28. Kshisha, T., K. Reatul, R.S. Chowdhury and R. Banoo, 2012. Ethnomedicinal studies of chakma communities of Chitagong hill tracts, Bangladesh. Bangladesh Pharm. J., 15(1): 59-69.

29. Sen, S., R. Chakraborty, B. De and N. Devanna, 2011. An ethnobotanical survey of medicinal plants used by ethnic people in West and South district of Tripura. J. Forestry Res., 22(3): 417-426.

30. Faruque, O. and S. Bokhtear Uddin, 2011. Ethnodiversity of medicinal plants used by Tripura community of hazarikhil in Chitagong district of Bangladesh. J. Taxon. Biodiv. Res, 5:27-32.

31. Charkraborty, R.,B. De, N. Devanna and S. Sen, 2012. North east India an ethnic storehouse of medicinal plants. J.Nat. Prod. Plant Resour., 2(1): 143-152.

Part- B
Workshop Findings on Traditional Healing Practices

Figure 14: Workshop on Traditional Healing Practices ***PC: Prasun Chakma***

Introduction: Trinamul Unnayan Sangshta conducted couple of workshops with the traditional healers on traditional healing practices in CHT. The workshops were held on 17 July 2017 and 18 September 2017 accordingly at Ashish hall room of TUS office premises. Around 44 traditional healers participated from different upazilas in Khagrachari District. It created a rare opportunity for the traditional healers to meet and share their knowledge on the traditional healing practices and medicines.

During the workshops group works produced a list of common diseases treated by the healers, spiritual healing system, wild materials and other ingredients needed for healing. Some of the discussion also took place on the wild material collection and preservation methods. Wild materials found in the British era, Pakistani period and Bangladesh period. It was found that, many of the wild materials were lost from the usage list due mainly to extinction. Many methods and muntra-spiritual healing tools and systems were lost with time. The linkage of the beliefs and customs with the healing system were also noted down out of the discussion. The local names of the materials were listed in local languages, as the special words used for marking the wild trees and herbs are also considered as traditional knowledge.

Traditional healing methods in CHT

The indigenous physician (boddyo) has been giving treatment to the patients with herbals medicines–leaves, seeds and the root of trees since time immemorial. The Chakma and other indigenous physicians (Boddyos) are the pioneer for this healing system (Talik).

The indigenous people in the Chittagong Hill Tracts were mainly dependent on the traditional method till the beginning of the the last century when there was very limited connection with the modern world and moreover, had not been appointed separate civil surgeon in the Chittagong Hill Tracts. Deputy Commissioner was in charge of the Public Health till 1940.

For the first time in Rangamati and Bandorban districts hospitals have been constructed in 1902 and later in Mahalchari, Manikchari, Lama and Chandraghona charitable hospitals have been constructed in Chittagong Hill Tracts. There have limited medical facilities in Chittagong Hill Tracts till 1907 though several hospitals like Chandraghona Mission Hospital has constructed and before that time. Indigenous people of Chittagong Hill Tracts were dependent on the traditional treatment till to 1950

with herbals, leaves and shrubs. It is said that, all the indigenous people of Chittagong Hill Tracts developed their production system by 'shifting cultivation', construction of houses (tong ghor), cooking, worship method, dresses, rituals and religious customs; these are all included in traditional knowledge, indigenous knowledge and local folks etc.

Cause of the origin of diseases as per traditional system:

Figure 15: Open discussion session ***PC: Evesh Chakma***

The traditional healer (Boddyo) starts diagnosing the disease by asking some question to the patient of external and internal health problems, history, ate something new, visited new places, scared to something, foes with someone etc. The indigenous people were mainly dependent on the nature and its resources since long. They used to enjoy the freedom of choice and cultivate the land independently without any intervention of anyone and moreover, for surviving themselves they gathered all the sustainable goods such as foods, clothes and domestic materials from the natural resources. According to the traditional healer, the disease may originate either by the effect of the nature (ghost) or may be artificial (men created) are caused by the human being such as–the behavioral change and physical problems have been affected by the evil spirit that is called " bhudo karma". On the other hand, the

black majic (jadu), tona, bhan and chalan operated by the enemies which played a major role of the origin of disease created by the human beings. The main causes of the origin of the diseases are as follows:

a) ***Contaminated foods:*** according to the traditional healer blood nausea, several griping, artery affliction etc. have been originated by consuming contaminated foods and consuming alcohol, smoking and poisonous fishes like swamp barb(puti mas), wallago attu (boyal mas), puti sutki(made by the swamp barb) are strictly prohibited during the treatment time. It is known that, contaminated foods are the major sources of the origin of different diseases like cancer etc.

b) ***Transmission (sajurana):*** According to the traditional healer some of the disease transmitted directly or indirectly by touching with men or animals such as smallpox, malignant boil, leprosy etc. That is why the traditional healer advised that not to be seated instantly on the seat until it became cold after left by others, not to be eaten the waste foods, not to be used the dresses of others and not to be stay close with patients.

Figure 16: Two aged traditional healers putting their opinion ***PC: Ripan Chakma***

c) ***Contaminated place:*** It is obvious that, the scratched, ring worm (daud), eczema and fungus etc. are originated by the polluted water or places which are regarded as the main sources of the origin of transmittable diseases. In the forest, there are many contaminated places where various species and animals intake soil and water and that are christened as elephant (hathi), dear (horin), snail (samuk) and boar(sukor) aja or wandering places etc. These are termed as "Aja" in chakma language where soil and water is consumed by the elephant, dear, cow and buffalo etc and boar enjoy on the mud and snails are gathered. Men affected by the different diseases like akzima, daud, leprosy etc. if someone walk, drink water, spit or left blood on the places. Similarly if there is found caves, animals and birds dead body and Khung tree (a type of tree) in shifting cultivation land is usually regarded as impure, unholy land and by sacrificing chickens, boars, goats etc. it became pure or cultivable land, otherwise any member of the family might be subjected with incurable disease or even die. By Hung and animal scarification, it is believed that (a special worship for the betterment of disease) land became pure.

d) ***Chalan, Bhan and Tona (a typical incantation conducted by the traditional healer):*** Different types of diseases or domestic misfortune came into effect by the enemies incantation (chalan, bhan and tona). The tyranny at any house or individual is created (the evil sound, spread sands or wastages at the home and slap etc.) by the traditional healer's incantation. Similarly when a man became sick by the Bhan and Tona then the health of the patient became thick bang tona (frog) which leads to swallows the health of the patient when the frog put into the water and patient died out when put it into the fire, by the bhan, chalan and tona blood vomiting is to be occurred . The ailments (bhan, tona and chalan) are cured by the application of herbals and moreover evil torture can

be prevented by the worship, animal offering and using armlet (tabij).

Goblin's effect (ajhor):

Figure 17: ED, TUS delivering speech ***PC: Prasun Chakma***

According to the traditional healer by the effect of the goblin, evil spirit or ghost different types of diseases such as demonized, puri pagol(madness of angel), sleeplessness are occurred and hear different sounds, speak blither, behave like mad by the subjection of Rongiya Bhoot, keep finding something when subjected by the yajna's, keep laughing when subjected by the phantasm, talk and sings, shake hands and head when subjected by the Sijiya bhut , can't sleep, cry, bone , joint of the body in pains, hands and legs became senseless and thicken when patient subjected by devil sprit . According to the traditional healer the initial stage of the treatment patient has to be protected from the evil spirit and the treatment has to be started after making satisfaction by worship, offering animals to the ghost. Therefore, such types of traditional worship are conducted at dusk (boar), stream devotion, Dapda sukor etc.

Methods of diagnosing diseases:

The traditional healer used different methods to ascertain the diseases are as follows:

1. ***Determined by the physical significant:*** The diseases of the patient like–navel movement, behavior, outlook, speech, eyes and colors of the urine and excrement etc. are the major aspects to identify diseases. Here it is explicitly narrated that the symptom and the origin of diseases in a chart of traditional healer. In the modern time, the traditional healer able to develop their treatment method along with the development of modern technological (treatment) system.

2. **Prediction (ganona):** First of all traditional healers prefer to predict the effect either it be occurred by the devil, misfortune or made by men. Besides that healers predicted about the domestic goods which have been lost from their own house to find out and used a typical method to justify the good or bad of life it is called as 'Aak Pata'.

3. ***Incantation (chalan):*** The incantation (chalan) is usually conducted like khori chalan, ban tola, marola bas chalan etc, to identify the disease originated from the hidden cave, unholy place etc. and person of Libra (tula rashi) origin is essential during the chalan or ban are conducted. The Libra (tula rashi) identify the unholy land and put down armlet (ang) to make pure by offering animals to the devil.

4. ***Vain test:*** Traditional healer used to test vain to identify the disease and they called it "Bayubedh". The best healer is admired most in this method.

5. ***Navel test:*** The traditional healer believes that navel is inter-connected with all the vain which is called 'Takket' by them. The Takkat became unstable and slower due to various types of illnesses. The medicines and treatments

are given to the patient according to the Takket Talik (the catalogue of the takket).

Methods of the treatment

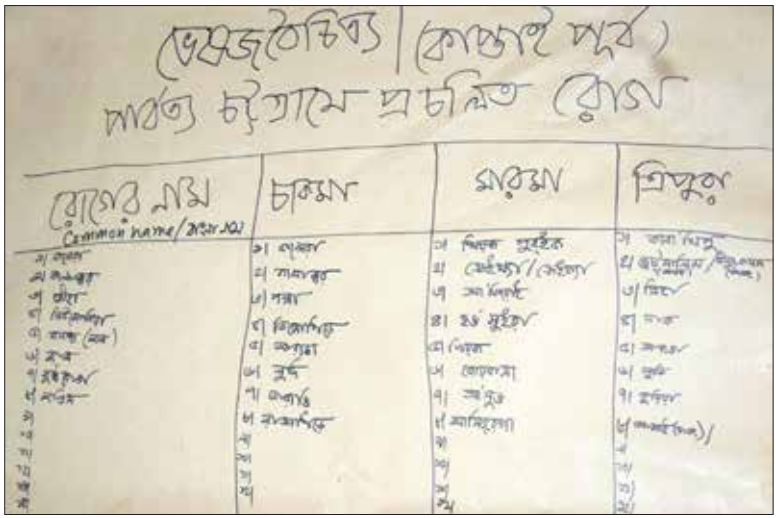


Figure 18: A list of disease ***PC: Sujash Chakma***

The physician (traditional healer) usually arrange for a bath for the patient so that the herbals medicines which leads to determine the origin of the disease work best. The Chakma boiddyo (traditional healer's) treatment is mainly conducted in two major ways:-1) incantation method and 2) prescribed method (traditional method). The treatment, for most of the healer, is conducted with both of methods they are incantation method and prescribed methods since they believe that every type of illness are created by the interference of evil spirit which are eliminated by the scarification of animals, use the effective amulet etc. and illness can be cured by the use of herbals medicines. According to the traditional healer incantation and prescribed method of treatment as follows:

a) Incantation method: The incantation method was the major, quick and effective treatment method in ancient

time. The healer who are credited more respect and honored as to be expert in the treatment and different types of chalan are conducted to prevent the enemies, violence creator, destroy and even gonga chalan , bhut chalan, sukor halan and bottles chalan etc. have been conducted, besides that bhan and tona (incantation) is also included in this method. The healer's power is examined through the reciting mantra (traditional healer used it). Tomru khela (a traditional game was played to test the healer's power) was played to prove the superiority by defeating the foes through the baan and chalan in ancient time. In modern time, these methods are more prominent, esteemed and available in the hilly region(rural areas) in Chittagong Hill Tracts but it is unavailable in urban areas and further more it may be used in different ways as follows:

1) ***Incantation (jhar, fook):*** Incantation (jhar, fook) is recited to alleviate the different types of diseases and indeed it is an easy method of treatment. It basically alleviates the headache, fever, tummy ache, pain and torture of evil spirit by the recitation of the incantation. Similarly Pani Pora and Tel Pora are also adopted to alleviate the diseases.

2) ***Armlet:*** the armlet is being hanged up in front of the door to get rid from the ghost made by the different copper, soil plate, palm leaf and white papers etc. with different design of drawings (ang) and the patient keep the armlet tie on the arm, neck and waist. Some of the rules and restrictions, such as avoid to participate in cremation ceremony, house with death person present and houses with newly born baby etc, are strongly avoided to keep alive the armlet for long time. The armlet can be effective again to recite the incantation (mantras) if the rules and restriction are broken up.

3) ***Animal offering (dali baja):*** To remain safe from the ghost effects-chickens, goats and boars etc. are offered to them. (sajunnya kura, bhut kura and gonga pujo etc.) and when they became satisfied the patient then get cured.

4) ***Get pure (marana):*** according to the traditional healer it may be created many problems during setting house if there is the separate clans house between the two houses of the same clans, the minors house below the older house and the bamboos used opposite one by another during the construction of the house -which are usually thought to bring the misfortune to the family. Similarly in the shifting cultivation where have been found the caves which thought as the ghost house which affect seriously when take bath, wash hand and mouth, left sweat and spit on the place, are the cause of the origin disease and that places are make pure by sacrificing animals such as Jhum Mara, Aja Mara and Ghat Mara etc. The incurable diseases have been seen for the cause of those caves and holes as an effect when a single member of the family may fall in incurable disease and even death might be occurred. Such type of the problem may be mitigated only by the animal's scarification.

5) ***Puja (worship):*** The initial stage of the treatment ghosts are usually given worship when the healer thought that diseases are generated by the effect of them. Types of worship may be different according to the evil spirits. Some of the traditional healer worship only with flowers but the incantation (tantric) healer make happy to the evil spirit sacrificing animals such as chickens, goats and boars etc. namely Sajunnay kura(dawn), Bhut kura (ghost) and immolation on the stream.

6) ***Prediction (Ghanana):*** The traditional healer tries to find out the origin of the disease by prediction. They predict it in different ways either the disease created by the effect of ghost or the others conspiracy (chalan, ban and tona). It is better to predict on Saturday and Wednesday in a week according to the traditional healer.

7) ***Hang:*** it is one type of treatment. Generally it is believed that, diseases are generated by the contaminated place and disease which get not cured until the place make pure (hang) and the contaminated place is made pure by hang devotion. The hang has been accomplished by the different mantras (incantation) and goods like boiled eggs. The bak pata, pattya pata and new earthen pot are used to successfully perform Hang devotion.

8) ***Bath:*** An arrangement is made for a bath for the patient so as to get rid from the authority of the evil. In the morning time the vessel with full of fresh water mantras have been recited on it and the patient is taken bath with it.

b) The methods of Talik

Figure 19: Chakma Talik ***PC: Sujash Chakma***

To mitigate the disease the patient is given treatment according to the herbals medicines catalogue (talik). In this method the medicines are made with the roots, flowers, leaves, fruits and other herbal plants which are massage on the external parts of the body, feeds making liquids and stream bath also given to the patients. It is used as wide range of prescription in the traditional treatment method with varieties herbals products. In this catalogue (talik) the sign, essential description of the medicines, dose and the usages are narrated elaborately in this prescription. This is called Talik by the chakma traditional healer and they have been preserving this method since immemorial with their own distinct dialect or alphabet. The catalogue is not same and varied according to the different traditional healer. The talik may not be similar with other traditional healers and they prepare the different taliks.

Usages of Talik

Four types of Taliks are used by the traditional healer are as follows:

Herbals: the herbals, leaves and shrubs are the major components of the traditional healer's medicines. The roots, cortex (bakol), leaves, flowers, fruits, sap and creepy plants are used as medicines. There are about 700 types of herbals, creepy plants and shrubs in Chittagong Hill Tracts. There are similarities between kabiraji and unani treatment with the chakma traditional healer in terms of herbals use. Similarities have been found between the kabiraj and Unani treatment method with chakma traditional healers treatment on the Traditional Uses of Ethno medicinal Plants of the Chittagong Hill Tracts. It is known by the different names of different castes basis in terms of their owned dialect. There are the integration between Kabiraji and Unani treatment method regarding the quality and uses of the herbals. These herbals are collected by the different individuals .Most to the traditional healer can't collect the herbals but some collect those themselves.

Animals: The bones, horns, brains and urine-excrements of the animals are the valuable components on the catalogue (talik) of traditional healer. These are generally collected and preserved by the older people of any family to be used as the medicines. In the traditional treatment found that python and bear's gall bladder, horns and bloods of rhinoceros are very essential elements in traditional treatment and these are also very rear to be found .

Minerals: in the herbals treatment method verities chemicals like Rashamanikko, Rash kanchan, Sunjuk laban, Fitkiri, Sindur and different metals like gold, bronze etc. are used as the major elements of herbals treatment. Generally traditional healers collected these goods from herbals stores (kobiragi) and these are available in these stores.

Uses of the medicines:

After identified the diseases, traditional healer used and gathered the medicines (herbals) according to the catalogue and they are as follows:

Pills: According to the traditional healers pills are made with herbals grinds with a limited quantity. These pills have been eaten with honey, liquor (wine) and hot water etc. and the leaves and creepy plants are eaten make them juice by rubbing on the stone. It is troublesome to make pills every day. At the present time, many traditional healer have been giving treatment to the patient with such ready-made pills. It makes easier to access the treatment and to use.

Ointment (prolep): the medicines (herbals) are being covered over the infected parts of the body with the endurable hot and cold and this method is not easily accessible. This method is mainly applied on the tumor, swallows and mostly infected parts.

Massage (malish): In the traditional treatment liniment or massage is vastly useable methods and is made by the different types of herbals especially it is more valuable and useful for the arthritis (bat).

Steam bathe (bhanp): The different types of herbals medicines are mixed in a pot and boiled enough which generate the steam or vapors. It is consumed or steam up by the patients on external parts of the body to illuminate the ailment.

The initial treatment of the traditional healers:

The different types of treatment of T.H. are as follows;

1. Tummy ache(pat bhata) :
2. Distaste and flatulence (aruchi and pat fapa)
3. Gripping (pat jala pora) :
4. Dyspeptic (pat sulani)
5. Diarrhea (ahamashoi)
6. Minor diarrhea (sadaron ahamashoi)
7. Dysentery
8. Constipations(kosta katinno)
9. Gastric
10. Kremi/Worm
11. Vomit
12. Madness of child
13. Child sweat
14. Different color of excrements(paikana) of child
15. Vomit and excrements of child
16. Breast pain
17. Fever, tummy ache and bodh hajom during the pregnancy time
18. Fever, head ache and shake during the pregnancy time
19. Fever and head ache of pregnant women
20. Breast pain
21. White urine
22. Bloody urine
23. Minor fever
24. Fever
25. Poisonous fever
26. Urine (problem)related fever
27. Get pain whole body due to the fever
28. Pitto jar (bitter mouth)
29. Sannibatik jor (fever)

30. Snake bite
31. Insect bite
32. Urinal block
33. Prosrab shul/Urinary tract infection
34. Urinal pain
35. Temperament disease (dhatu rog)
36. Diabetic (bahumutra)
37. Head ache
38. Bhaeu chara
39. cough and cold (sordi-khasji)
40. Nak pinak (nak pinak)
41. Teeth ache (dhat bhata)
42. Blooding from the teeth (dath takay rokta poda)
43. Too much thirsty (adik trisna)
44. Heart bits(pran sot pot)
45. Panic (jala pora)
46. Hat pa jala pora
47. Body swallows(sorir fola)
48. Body pain(sorir batha)
49. Baro pleha
50. Dola
51. Blister (foska)
52. Skin disease (harma rog)
53. Boil (foda)
54. Wound (gha)

Herbal elements and plants used and associated ground rules for healing

Cluster 01

Sl no	Diseases name	Herbal	Proportion/ Anupan
1)	Kashi (kough)	Lajuri, Matol shikor, Telechara, Gobre poka, (manusher) Gaddang- Baro mashi begun ful, Tita begol shikor, Marbana	
2)	Ul rog (Bishorpo)/ (Cancer)	Tute, Kobutorer bistha (Pigeon shit), Ajogor saper pitto, Ketuki dhuja, Klaa bujuka mul	
3)	Har vanga(bone fracture)	Shorbo gach, Del ludi pada, Kata annel, ehl ludi, Syal ludi pada, Kata aar sanga	
4)	Gastric	Jiot ludi, Asam lata (500 ml)	Mix with 5 Liter water and 1.5 liter of Jiot ludi/Asam lata
5)	Ma o shishu (mother & child)	Depends on what type of disease	
6)	Arsho rog (Piles)	Kagori vanga hero aga 7 piece, 1 kossa Rasun 7 piece, bangal morich bodhu 7 piece, Trifola gacher chaler 7 piece pill, Avi montro 3, 1no wine	Mixed with Warm water
7)	Typhoid	Cha (6) masshe bete ros khabar Jiot ludir vijano pani	

Cluster 02

Sl no	Diseases name	Herbal	Proportion
1)	Joraiu (uterus)	Komola(orange), Roja manikko, Pibey jotrish, Roja sindur, Long (clove), Gulmorich(black pepper), Thanda manikko	Proportion Mixed with warm water, time- twice a day
2)	Gorvo bish	Boj, Boroy pata, Long (clove), Golmorich (black pepper)	Make a paste and apply on upper forehead Few amount of paste have to feed
3)	Bondhatto	Ponch jira, kalo jira, long(clove), Jaifol, Jotrik, Golmorich(black Pepper), Elach(Cardemom), Jolabini, Shukhbini, Bap bini, Shudh ada, Piloy, Boro fut sunduk noon, Ballo moha, Korpur, Boch	Boiled with peel of lal Kodom then mixed pill (all ingredients) with that boiled water
4)	Malaria	Ada (Ginger), Black pepper, Roshun(garlic)	Same amount of Plum seed paste with warm water three times of a day
5)	Materninity problem		Have to massage patient hands
6)	Jondish	Rong gach, Badi ludi, Charbo ludi	Boiled all ingredients and have to feed with sugar

Cluster 03

Sl no	Diseases name	Herbal	Proportion
1)	Dola	Tali takket patti daru 1. Chidira Bey Shak 2. Kiliga 3. Thanda Shak 4. Ghorbo beshak 5. Jharbo beshak 6. Ranga begol 7. Dhub Mormojji pata	1. Mantra 2. Bandage

Sl no	Diseases name	Herbal	Proportion
2)	Paralysis	1. Chagol Satta 2. Lodi mon Satta 3. Badal satta 4. Chidire beshak 5. Dhamang Ganju 6. Deno Apbo 7. Ajongma 8. El lodi 9. Hadang gach 10. Chigirasik 11. Rada vuta 12. Bar poroma	1. Boiled water with all leaves 2. Make pills with all root 3. Have to take with warm water
3)	Baat (Arthritis)	1. Peel of Bok ful gach 2. Doy murji 3. Black pepper 4. Onion	Make pills then have to take with warm water
4)	Dhonus tonker (Tetanus)	1. Deno thabo 2. Tama Gach 3. Bele Longur 4. Deu sigeri sik 5. Ghorbo uring sing	1. Make pills with root or boiled water with all root 2. Grind leaves then have to Cauterize
5)	Liver problem	1. Jotri (flower of Jaifol) 2. Ros shindu 3. Ros manik 4. Balm 5. Daruchini (Cinnamon) 6. Nuiyekhu 7. Langyng 8. Chelekhu 9. Jaifol	Have to take a pill three times of a day

Common diseases in the Pre-Kaptai Dam (before 1960) in Chittagong hill tracts

Sl no	Diseases name	Chakma	Marma	Tripura
1)	Cholera	Cholera	Puhik	Kaba khipu
2)	Kala-jor	Kalajor	Kraya/kraifa	Jotsalim/ulung basom
3)	pleeha	polla	Aha firoi	Pleeha
4)	pneumonia	tinnepire	Song muira	Dak
5)	Chicken Pox	aranga	Khiyak	Aaranga

Sl no	Diseases name	Chakma	Marma	Tripura
6)	Measles	Ludi	Bayokama	Luti
7)	Leprosy	Farangi	Aanung	kuria
8)	Jaundice	Rangapira	ashiharga	Amai (datong)

The common diseases in chittagiong hill tractes in 1965-1970

Sl no	Diseases name	Chakma	Marma	Tripura
1)	Malaria	malaria		malari
2)	Typhoid	Nanni padik jhor	Noha bhe	Typhoid

Present diseases (2000-2017)

Sl no	Diseases name	Chakma	Marma	Tripura
1)	Polio	Polio		Polio
2)	Tetanus	Kichuni	Hligong	
3)	Dipteral	Dipteral	Dipteral	diptaral
4)	Cancer	Ul	Motna	Cancer
5)	Diabetic		Soborga	Diabetic
6)	Blood pressure	Blood pressure	Suida roga	
7)	Asthmatic	Tuguni	Paongna	Padubo/pusuok
8)	Kidney stone	Kidney pator	Pije thiok	
9)	Stroke	Stroke	Ta alnaroga	Ashira ni thieo

The trees which collected from forest/jungle at present: Names of some of the trees could not be found in all local languages, to keep trace of those trees, the names were catalogued if it is found in just one of the languages.

Sl no	Chakma	Marma	Tripura
1.	Bung gas	Puiching	Biong kumra
2.	Ascchol / goda	Yangchi hrang	Sampari bukut
3.	Jiyot ludi	Nuethubo	Tita bukut
4.	Gondho vadali	Agunsita	Bormymi bukut
5.	Bor sighire sid	Khabru nuye	Jali bukut
6.	Hadong gach	Sorang gree	Yangji bomol

Sl no	Chakma	Marma	Tripura
7.	Deno ahhppo	Rero	Maibana
8.	Hammang ghadu	Falu uba	Both
9.	Mog jangalle	Faluma oeeji	Tulshi kala
10.	Dharalig	Poknuiyu	Angur pata
11.	Utho lengera		Gadang
12.	Shon sabarang		Rupa tala
13.	Shurchan		Sonatala
14	Thanda maneg		Thuri Bukut
15.	Tulo potti		Burbo bukut lola
16.	Chindebaj her		
17.	Khali vomor gach		
18.	Haladar		
19.	Chandra hetu		
20.	Guada		
21.	Mur ada		
22.	Dharagulo		
23.	Pottichara		
24.	Nuli gach		
25.	Bajok pada		
26.	Beley livur		

Diversity of herbal species which are available in CHT

Sl no	Chakma	Marma	Tripura
1	Lal kodom	Thangru	Mahrung bafang
2	Gach Nidhish	Chi roingkhong	Karfo
3		Chi kong iang	Bor maiming
4		Lak peng pru	Burchukupu
5		Khrumjapru	Sada burbo
6		Yochi	Jal bukhu
7		Chi kangmi	Pepumukhroi
8		Nuebthi	Yang ji bosol
9		La ga	Both

Sl no	Chakma	Marma	Tripura
10		Athe kungga	Chetang
11		Mahaga	Khumako
12		Ubsaka	Bosmay
13		Tara tamang	Titagat
14		Samaga	Aarang katro
15		Chi mang	Chalagara
16		guhopru	Rupatala sonatala

The trees and materials which are collected from market

Chakma	Marma	Tripura
Long	Sheto chandan	Setu chandan
Golmorich	Lal chandan	Lata modhu
Jaifol	Jaifol	Rosh manik
Jatrik	Long	Rosh shindhu
Rosh shindhu	Gol morich	Jaifol
Rosh manik	Nuekhu (latamodhu)	Rokto chandan
Poncho Jira		Sundhu lobon
Poncho ada		Tiskari
Loha jaron		
Sona jaron		
Thama Jaron		
Apro Jaron		
Rong Jaron		
Nimai		
Moja kor		

Insects used as medicine

Chakma	Marma	Tripura
Randol	Groing	Bolo poka
Gu o puk	Pang khunh	Telapoka
Jallemora	Tongte	Songba
Shamuk	Khyubo	Horin koboj
Mey hangara	Kuy sobok	Sheara
Panne puk		
Majhina sabo pit		
Juni		
Mujje puk		
Humujje puk		

Animals and birds are used as medicine

Chakma	Marma	Tripura
Gondar shing	Nisshya	Buut
Gonar rokto	Fo oye	Ma sani
Gondo Horin Baccha	Jayng chang sui	Mi proma
Huduk tir	Krang	Makra ojai
Kumirer chamara	Hlang	Alaba chibok
Bora sukor telpit	Kay	Masa
Mulugiye Banor		Matham
Chamra		
Rongrang		
Seddoba		
Malmuro		

Conclusion:

Previously, dependency on traditional healing was huge and only option for the hill people of CHTs. The bio diversity and plant diversity was also mentionable and very rich. At present, the flora and fauna, which are used for traditional healing are getting

scarce. Small number of traditional healers are currently practicing taking it as a profession. It was noticed that young generation is less interested about the knowledge and system mainly due to dependence on modern systems despite that those bear huge re actions. It is very important to revitalize and preserve the knowledge without wasting time, through systematic large scale approaches. Otherwise, traditional healing related knowledge can be extinguished in near future once the current generation of practitioners pass away.

Chapter: 4
Food and Seed Preservation

Part-A

Indigenous Practices for Eco-friendly Storage of Food Grains and Seeds

Prakash BG
Dept. of Biotechnology & Crop Improvement, College of Horti., Mysore, India

Raghavendra KV and **Gowthami R**
College of Sericulture, University of Agricultural Sciences, Bangalore, India

Shashank R
Dept. of Biotechnology, Govt. Science College, India

Abstract

Agriculture is the chief occupation of the people all over the world and in India, of the total population; more than 70% depends on agriculture for their livelihood. Indias grain production has steadly increased due to advances in technology, but pot-harvest loose is constant at 10%. Losses during storage, accounts for around 6% of the total losses at proper storage facilities are not available. Grain storage plays an important role in preventing losses which are costed mainly by insect pests, pathogens and rodents. Even though chemical control of stored product pest in predominant, traditional pest control practices are still continued especially in rural areas. It is estimated that 60-70% of food grain produced in the country is stored at home level in indigenous storage structures. Hence, a study was undertaken to collect and document traditional storage practices followed by the farmers of Thoopalli. Kamatampalli and Segalapalli villages of Srinivaspura taluk, Kolar District in Mylandlahalli, Kuruburu and Kurtahalli villages of Chintamani taluk, Chickballapura, Chickballapura District of Karnataka State. Data were collected from viarious farmer by personnel contact. The twenty four important traditional storage practices followed by the farmers were as

1) Sun drying of grains
2) Use of ash

3) Red soil coating method
4) Plastering of storage bins with clay and cow dung
5) Storage of pulses with common stalt
6) Turmaric application method
7) Use of Garlic cloves
8) Mixing of leaves
9) Stepping method or stamping method
10) Use of salt and chilli powder
11) Use of Neem(Margosa) leaves
12) Use of Neem (Margosa) leaves and dry chillies
13) Use of Neem oil/Margosa oil
14) Use of camphor
15) Use of castor power
16) Sand mixure method
17) Use of dried red chillies
18) Use of lime power
19) Use of matchbox
20) Fumigation of the godown/store room
21) Use of Neem (Morgosa) seed power
22) Use of ginder rhizome
23) Use of custared apple seed power and
24) Use of Tulsi (Basil) seeds.

Introduction

Agriculture is the chief occupation of the people all over the world. and in India, of the total population; more than 70% depends on agriculture for their livelihood. India's grain production has steadily increased due to advances in technology, but potharvest loss is constant at 10%. Losses during storage, accounts for around 6% of the total losses as proper storage facilities are not available [1]. Grain storage plays an important role in preventing losses which are caused mainly due to insect pests, pathogens and rodents.

Though chemical control of stored product pest is predominant, traditional pest control practices are still continued especially in

rural areas. It is estimated that 60-70% of food grain produced in the country is stored at home level in indigenous storage structures and food grains are protected in home level by using indigenous technology (Knowledge) [2]. Indigenous knowledge is the knowledge, skill or technology gathered by local masses during direct interaction of human beings with the environment. Indigenous practices are passed on from generations and are an outcome of elder's wisdom and experience as a result of their close contact and deep knowledge of their environment [3].

During the last few decades, various synthetic pesticides have been applied to protect stored grains and other agricultural products from insect infestation, but their massive use has imposed so many detrimental effects on the environment and cause intoxication of non-targeting organisms [1]. However, these chemicals are declared ecologically unsafe because these persist for longer period in the environment and enter in to the food chain. It has been reported [4] that certain insect pests have acquired resistance against most of the insecticides. To overcome the ill effects of synthetic pesticides, the best alternative is to going back for adopting Indigenous Traditional Knowledge for protecting the food grains and seeds from insect pest attack. Hence the Indigenous Traditional Knowledge should be documented at each and every instance which can be used by the present and next generation.

Methodology

The present study documents the traditional practices of storage of food grains and seeds in Thoopalli, Kamatampalli and Segalapalli villages of Srinivaspura taluk, Kolar District and Mylandlahalli, Kuruburu and Kurtahalli villages of Chintamani taluk, Chickballapura District of Karnataka State. Detailed information given by experienced, practitioner farmers (210 families) were documented. In total, 210 families in different villages of Karnataka, India constituted the population of the study. In view of the small size of the population, a total enumeration method

was adopted. Questionnaires were the main instrument used for data collection. Two hundred seventy eight copies of the questionnaires were administered while 210 copies were completed and found usable, giving a return rate of 75.5%. The questionnaires were complemented with an informal interview with the head librarians of eight of the libraries. The discussion which centred on AIK policy, funding, equipment and technical knowledge was frank and revealing. Data collected with the questionnaire were analysed and interpreted using Statistical Package for the Social Sciences (SPSS) and frequency counts and percentages.

Results and Discussion

India has become self-sufficient in food grains production due to advances in technology, but a pot harvest loss is constant at 10% [3]. Stored grain pests causes heavy losses to stored grains and pulses all over the world [2]. Even though chemical methods of management of storage pests are highly successful, still farmers are using traditional methods of storage. The readily available and low cost items like ash, sand, salt, camphor and plants etc. are being used by the rural peoples for grains/seeds storage because such practices are not only user-friendly but also increases shelf life of food grains and seeds. Traditional practices followed by farmers of Karnataka for storage of food grains and seeds are expressed in percentage (Table 1) Some important traditional practices followed by farmers of Karnataka for storage of food grains and seeds are:

Table 1: Traditional practices followed by farmers of Karnataka for storage of food grains and seeds.

Sl no	Storage Practice	Percent
1	Sun drying of grains	92
2	Use of ash	78
3	Red soil coating method	60

Sl no	Storage Practice	Percent
4	Plastering of storage bins with clay and cow dung	76.67
5	Storage of pulses with common salt	61.33
6	Turmeric application method	50
7	Use of garlic cloves	42
8	Mixing of leaves	50.67
9	Stepping method or Stamping method	34
10	Use of salt and chilli powder	28.67
11	Use of Neem leaves	50
12	Use of Neem leaves and dry chillies	70
13	Use of Neem Oil	58
14	Use of camphor	16
15	Use of castor powder	14
16	Sand mixture method	20
17	Use of dried red chillies	43.33
18	Use of lime powder	15.33
19	Use of matchbox	9.33
20	Fumigation of the godown	10
21	Use of Neem seed powder	7.33
22	Use of ginger rhizome	8.67
23	Use of custard apple seed powder	5.33
24	Use of Tulsi seeds.	2.67

Table 2: Major storage pests attacking storage of food grains and seeds.

Major Storage Pests	Scientific Name	Family	Order	Crop
Rice weevil	*Sitophilus oryzae,*	Curculionidae	Coleoptera	Rice, maize
Lesser grain borer	*Rhyzopertha dominica*	Bostrychidae	Coleoptera	Rice and millets

Major Storage Pests	Scientific Name	Family	Order	Crop
Pulse beetle	*Callosobruchus chinensis, Callosobruchus maculatus*	Bruchidae	Coleoptera	Pulses –Red gram (Cajanus cajan), Bengal gram (Cicer arietinum), Black gram (Vigna mungo), Green gram (Vigna radiata)
Red flour beetle	*Triboliumcastaneum, Triboliumconfusum*	Tenebrionidae	Coleoptera	Wheat flour, pulses
Rice moth	*Corcyracephalonica*	Galleriidae	Lepidoptera	Rice, maize, gram, groundnut
Khapra beetle	*Trogodermagranarium*	Dermestidae	Coleoptera	Wheat, maize, rice, flour

Sun drying of grains

Sun drying is the common traditional practice followed by the farmers (92.00 %) before grains and pulses storage. If moisture content is high, they are dried for longer duration in sun before storing it.

a. **Farmer'sview:** To protect from storage insect pests, easy to follow due to lesser work during summer.

b. **Scientificrationale:** Sun drying destroys existing insect pests and their different stages [5]. Sun drying helps to reduce spoilage and also enhance the dormancy period of grains [5]. Optimum grain moisture (10-12%) is necessary for proper storage of food grains/seeds.

c. **Targetcrops:** Almost all crops which are stored for longer periods.

Use of Ash

Seeds are filled in earthen pots to its 3/4 volume and rest 1/4 volumes filled by wood or cow dung ash. If grains are to be stored for a longer period, then after 6 months the grains and pots are sun-dried and again filled with fresh ash. 78.00 % of the farmers are following this method.

a. Farmer'sview: Wide range of storage pests are controlled for 6-10 months.

b. Scientific rationale

i. Ash contains silica which interferes with insect feeding and also hinders fungal pathogen multiplication.

ii. Ash dust reduces the relative humidity of the storage condition and also dries the seed surface [6].

iii. Egg laying and larval development of the storage pests could be hampered because ash dust covers the grain seeds [6].

iv. Also affect the insect movement to search for mating partners and friction of the dust particles with the insect's cuticle leads to desiccation and hampers the development of the pests [6].

c. Target crops: Pulses

Red Soil Coating Method

Red soil and water are mixed to form a paste in a container. Seeds are transferred into this pot and mixed well so that the soil completely adheres to the seeds. Seeds are dried under shade. Seeds are transferred into a gunny bag and tied tightly and stored in dark.60.00 % of the farmers are following this method.

a. Farmer's view: Wide range of storage pests will be controlled.

b. Scientific rationale:

i. As the red soil covers the grains and seeds the insect could not able to feed, lay eggs as it acts as a barrier [7].

ii. Soil absorbs left out moisture in the seeds and grains and avoids spoilage [7].

iii. Improves germination.

c. Target crops: Pulses, ragi, maize

Plastering of storage bins with clay and cow dung

Storage bins made of bamboo will be plastered with clay and cow dung which prevents insect attack from outside. 76.67 % of the farmers are following this method.

a. Farmer's view: To reduce moisture content.

b. Scientific rationale:

i. Soil absorbs left out moisture in the seeds and grains and avoids spoilage.

ii. Soil and cow dung paste acts as a barrier between seeds, grains and insects.

iii. Cow dung acts as a repellent for storage insect pests.

c. Target crops: Pulses

Storage of pulses with common salt

Common table salt at about 200 grams of salt was mixed manually in one kg of pulse was followed to store pulses for a period of 6-8 months. 61.33 % of the farmers are following this method.

a. Farmer's view: Insects are kept away from the stored grains.

b. Scientific rationale:

i. Salt has an abrasive action on the skin of insects thereby preventing their movement inside the storage containers and as a result their growth in the storage containers/bins/ boxes is inhibited [8]. ii. Salt has a hygroscopic and insecticidal property [6].

iii. Salt helps in keeping the grain dry by absorbing the moisture thus avoiding spoilage and hence aid in safe storage [3].

c. **Targetcrops:** Red gram, Bengal gram, Black gram, Green gram and other pulses and legumes.

Turmeric application method

Turmeric powder is another good alternative method to prevent the grains from insects and pests. Grains and seeds are mixed with turmeric powder before storing them in containers or jute bags. This treatment provides protection for up to 6-8 months and is equally safe for consumption.50 % of the farmers are following this method.

a. Farmer's view: Easy method and kills the storage pests.

b. Scientific rationale:

i. Turmerones and arturmerone are the components which act as insect repellent in turmeric. Its strong smell and insecticidal properties keep the insects away from food grains [9].

c. **Target crops:** Pulses and cereals

Use of Garlic cloves

Garlic cloves are kept in layers in the storage bins filled with seeds. Garlic cloves acts as a repellent for several pests.

a. **Farmer's view:** Easily available and acts as a repellent.

b. **Scientificrationale:** *diallyl di-sulphide, diallyl tri-sulphide and diallyl sulphide are the major compounds present* in Garlic has anti-feedant, bactericidal, fungicidal, insecticidal, nematicidal and repellent properties [10].

c. **Targetcrops:** Pulses, Ragi, Paddy, Maize

Mixing of leaves

Leaves having insecticidal property like Neem/Margosa (Azadirchta indica), Nirgandi/Chinese chaste tree (Vitex nigundo), Madar/Calotropis etc., are collected and dried under shade till it becomes papery. These leaves are mixed with seeds

and fill in the bags or storage bin.

a. **Farmer'sview:** Leaves are readily available at low cost and used for management of wide range of storage pests.
b. **Scientificrationale:** Leaves of Neem/ Margosa (Azadirchta indica), Nirgandi/ Chinese chaste tree Vitex nigundo, Madar/ Calotropis etc., has very good insecticidal properties and also acts as antifeedents, repellents and growth inhibitors of storage pests [11-16].
c. **Targetcrops:** Pulses and cereals

Stepping method or Stamping method

Seeds are filled in the plastic bags and are tied with a thread tightly. Repeated stamping of the bag will avoid pest attack and also destroys the eggs and maggots that are already present in the seeds.

a. **Farmer'sview:** Easy method and does not requires any ingredients.
b. **Scientificrationale:** Stamping helps to disturb insects and kills the immature and adult stages of insects.
c. **Targetcrops:** Pulses

Use of salt and chilli powder

250 grams common salt and 250 grams dry chilli powder are mixed with 20 kg seeds and filled it into a plastic bag or bin.

a. **Farmer'sview:** Insects are kept away from the stored grains and an easy method of storage
b. **Scientificrationale:** The pungent nature of chilli shows repellent effect on insects and salt has a hygroscopic and insecticidal property [9,17].
c. **Targetcrops:** Pulses

Use of Neem/Margosa leaves

Neem/Margosa leaves are collected from the trees and dried in shade and mixed with seeds/grains and stored in gunny bags or bins.

a. **Farmer'sview:** It is safe, cheap and effective method.

b. **Scientific rationale:**

i. Neem/Margosa contains bitter principles called meliacins like azardiracin, nimbin, salannin, meliantriol etc., and acts as anti-feedants against several pests.

ii. The active ingredient azadirachtin, found in neem/Margosa leaves, acts as an insect repellent and insect feeding inhibitor and sterilant, antifungal and nontoxic qualities [12-16].

c. **Targetcrops:** Paddy, pulses ,Ragi

Use of Neem/Margosa leaves and Dry chillies

Neem leaves and driedred chillies are placed in the bins or bags containing seeds.

a. **Farmer'sview:** Seeds and grains can be protected from pests and pathogens.

b. **Scientific rationale:**

i. Neem/Margosa contains bitter principles called meliacins like azardiracin, nimbin, salannin, meliantriol etc., and acts as anti-feedants against several pests [12-16].

ii. Active ingredient azadirachtin, found in Neem leaves, acts as an insect repellent and insect feeding inhibitor and sterilant, antifungal and has nontoxic qualities [12-16].

iii. Pungency of dried red chillies keeps away the insect pests [6].

c. **Targetcrops:** Paddy, little millets, pulses

Use of Neem/Margosa oil

Neem/Margosa oil is manually applied on pulses to coat every grain uniformly.

a. Farmer'sview: The bitter taste of Neem/Margosa gives protection to their seeds and grains against pests and pathogens.

b. Scientific rationale:

i. Neem/Margosa oil acts as repellent to many insects such as beetles, moths and weevils. Neem oil kills insects at the egg stage itself thereby saving the legumes [18].

ii. Neem/Margosa oil has several properties like repellence, feeding, and ovi-positional deterrence, growth inhabitation etc. and it almost kills the insect even at its egg stage, so that infestation stops from the early stage itself [6].

c. Targetcrops: Pulses

Use of Camphor

2 gram of camphor is placed per 5 kg of grain in the jute gunny bag which can be stored up to 3 months. After 3 months again the grains are sun dried and fresh camphor is kept in the bag. Camphor evaporates over time when stored. To prevent this, grains of pepper are placed along with camphor in the container.

a. Farmer's view: Easy method to control storage pests.

   Scientific rationale: Camphor inside the storage bag repels the pests due to the strong odour emanated from camphor.

b. Targetcrops: Cereals and pulses.

Use of Castor powder

Bean seeds are dried in sun for some time. Some small quantities of castor seeds are placed in a bowl, roasted for some time and ground into powder. 1/4 kg Castor powder is mixed with 1 kg beans seeds and stored it in a mud pot. The lid of the pot is closed and sealed it with cow dung to avoid aeration.

a. Farmer'sview: Insects are kept away from the beans.

b. Scientificrationale:

i. The oily nature of castor powder which is coated to the grains will form a slippery surface which avoids the egg laying by female insects upon seeds [19].

ii. It also acts as feeding deterrent and repellent and hence grains are protected from insect pest attack.

c. Targetcrops: Beans, Pigeon pea.

Sand mixture method

A thick layer of sand is added at the base of the mud potand sundried seeds are spread over this sand. Again sand is added over the seeds. The same process of filling sand-seed mixture layer by layer is continued till it reaches up to the brim of the pot. The container is closed with a lid and it is air tightened with cow dung paste.

a. Farmer'sview: Seeds are protected from the pest attack, easy and safe method.

b. Scientificrationale:

i. The sand particles act as an abrasive agent of insect cuticle and hence kill the insect pests.

ii. It also acts as a barrier between seeds and insects and hence protects the seeds from pest attack. iii. Cow dung at the top of the pot acts as a repellent.

c. Targetcrops: Pulses

Use of Dried red chillies

Dried chillies are kept in a container filled with seeds poring bags.

a. Farmer'sview: The seeds are protected from the pest attack.

b. Scientificrationale: Pungency of dried red chillies keeps away the pests [6].

c. Targetcrops: Pulses, paddy

Use of Lime powder

Lime (Calcium carbonate) is powder and mixed uniformly with grains and stored them in gunny bags at dry place. Generally 1015 gms of lime is used for 1 kg of grains.

a. **Farmer'sview:** The rice grains are protected from the pest attack.

   Scientificrationale: The lime has a repellent and antifeedant property and lime also prevents insects to get multiplied [6].

b. **Targetcrops:** Cereals

Use of Matchbox

It is the oldest method generally used by the ladies at houses for storage of food grains. Match boxes are kept in layers.
Generally 8-12 matchboxes kept at the middle, bottom and top of the container and tightly close the lid of the container.

a. **Farmer'sview:** Seeds are protected from the pest attack.
b. **Scientificrationale:** Phosphorous in the matchsticks have strong repellent properties which help to avoid the infestation [6].
c. **Targetcrops:** For almost all types of seeds/grains.

Fumigation of the godown (warehouse)

Before storing the seeds/grains the godowns (warehouses) are fumigated with leaves of Vitex, Neem, Pongamia, etc.,

a. **Farmer'sview:** Preventing the pest attack upon seeds/ grains.
b. **Scientificrationale:** Fumigation helps in killing the hibernating stages of stored insect pests present in cracks and crevices and creates an inoculums free storage facility.
c. **Target crops:** all field crops

Use of Neem/Margosa seed powder

Neem seed powder is mixed at the rate of 1% to the volume of the seed.

a. **Farmer's view:** The bitter taste of Neem/Margosa gives protection to their seeds and grains against pests and pathogens.

b. **Scientificrationale:** Neem has several properties like repellence, feeding, and ovipositional deterrence, growth inhabitation etc [12-16].

c. **Targetcrops:** Pulses

Use of Ginger rhizome

30 grams of Ginger rhizome powder is mixed with 1 kg of pulse

a. **Farmer'sview:** The Pungent taste of ginger gives protection to their seeds and grains against pests and pathogens.

b. **Scientificrationale:** Presence of alkaloids, anthocyanins, flavonoids, tannins in ginger makes ginger to act as anti feedant and repellent against pests [20].

c. **Targetcrops:** Pulses

Use of Custard apple seed powder

50 grams of custard apple seed powder with 1 kg of any of the pulse are mixed to prevent the attack of the pulse beetle.

a. **Farmer'sview:** Seeds are protected from the pest attack.

b. **Scientific rationale:**

i. Repellent and oviposition deterrent property of custard apple seeds protects seeds/grains from bruchid attack [19].

ii. The acetogenins present in custard apple seeds shows insecticidal and vermicidal effects.

c. **Target crops:** Pulses

Use of tulsi/basil seeds

The seeds of Maize are mixed with dried seeds and leaves of tulsi/basil (Ocimum sanctum)

a. **Farmer'sview:** Protects the seeds from the weevil attack during storage.

b. **Scientific rationale:**

i. Tulsi/basil has a very good repellent property [19].

ii. The palmitric acid, linolenic acid, linoleic acid and stearic acid present in tulsi seeds have antifeedant and larvicidal effect [19].

c. Target crops: Maize

Conclusion

Stored grain pests seriously damage food grains during storage. Several synthetic pesticides were used, but they have shown adverse effects on environment and persist for longer period in form of residues and entered in the food chain after utilization of products by organisms. Hence to replace these chemicals, safer eco-friendly and farmers friendly methods were evolved. Most of these practices are indigenous practices enhances utilisations of locally available materials. These methods protect the food grains, do not cause health hazards apart from being eco-friendly, cheaper and locally available materials. This collection of traditional agricultural knowledge/practices is of great significance in conserving and maintaining sustainability of the environment. Further it requires integration with modern scientific knowledge to generate a wide range of new ideas and practices for the betterment of the mankind. Although these all above discussed traditional agricultural knowledge/practices were available in the tribal setting but now not at reducing rate. So there is need to motivate the tribal farmers to use these practices as past to save the agricultural produce. Simultaneously these traditional agricultural knowledge/practices must be generalized among other farming communities of the country as well.

References

1. Dhaliwal R, Gurdeep S (2010) Traditional food grain storage practices of Punjab. Indian J Traditional Knowledge 9(3): 526-530.

2. Karthikeyan C, Veeraragavathatham D, Karpagam D, Firdouse S Ayisha (2009) Traditional storage practices. Indian J Traditional Knowledge 8(4): 564-568.

3. Gupta Manju, Jain Simple, Mandowara (2007) User friendly storage practices followed by rural women of Rajasthan.

4. Kausarmalik, Rizwana Riasat (2014) Study of combined effect of locally isolated Bacillus thuringiensis and Turmeric powder on Red Flour Beetle (Tribalism castaneum). Int J Curr Microbiol App Sci 3(4): 760-773.

5. Kumar S, Singh AK (2013) Traditional Agricultural Knowledge Followed by Tribal Farmers of Uttar Pradesh, India. Search and Research 4(3): 43-47.

6. Rekha BK, Padmakar CK (2014) Indigenous food grain storage Practices followed by tribal farmers of nandurbar district. Golden Research Thoughts. 4(4): 2-4.

7. Rakesh C Mathad, Vasudevan SN, Naveen C Mathad, Patil SB (2003) Traditional Seed Treatment and Storage Methods of Northeastern Region of Karnataka. Asian Agri-History 17(3): 233-239.

8. Manocha A (2013) Indigenous wisdom of farm women in grainstorage. Journal of Environment and Ecology 4(2): 105-112.

9. Chander H, Kulkarni SG, Berry SK (1991) Effectiveness of turmeric powder and mustard oil as protectants in stored milled rice against the rice weevil Sitophilus oryzae. Int Pest Control 33: 94-97.

10. Prowse GM, Galloway TS, Andrew Foggo (2006) Insecticidal activity of garlic juice in two dipteran pests. Agricultural and Forest Entomology 8(1): 1-6.

11. Baby Joseph, Jency George, Jeevitha MV, Sisssy Charles (2013) Pharmacological and biological overview on calotropis gigantean: a comprehensive review. International Research Journal of Pharmaceutical and Applied Sciences 3(5): 219-223.

12. Kwasi Opoku B, Samuel Kofi T, Michael Akrofi A, Jerome Desire K (2011) Production of natural insecticide from Neem leaves (Azadirachta indica). Asian Journal of Plant Science and Research 1(4): 33-38.

13. Misra HP (2014) Role of Botanicals, Biopesticides and Bioagents in Integrated Pest Management. Odisha review p. 62-67.

14. Rohit Sharma, Gulab S Thakur, Bhagwan Sanodiya, Ashish Savita, Mukeshwar Pandey, et al. (2012) Therapeutic Potential of Calotropis procera: A giant milkweed. IOSR Journal of Pharmacyand Biological Sciences 4(2): 42-57.

15. Subbalakshmi L, Muthukrishnan P, Jeyaraman S (2012) Neem products and their agricultural applications. Journal of Biopesticides 5 (Supplementary): 72-76.

16. Suresh Kumar P, Suresh E, Kalavathy S (2013) Review on a potential herb Calotropis gigantea (L.) R. Scholars Academic Journal of Pharmacy 2(2): 135-143.

17. Madhumathy AP, Ali-Ashraf Aivazi, Vijayan VA (2007) Larvicidalefficacy of Capsicum annum against Anopheles stephensi and Culex quinquefasciatus. J Vector Borne Dis 44: 223-226.

18. Kumar J, Parmar BS (1997) Neem oil content and its key chemical constituents in relation to the agro-ecological factors and regions of India. Pesticide Research Journal 9(2): 216-225.

19. Talukder FA (2006) Plant products as potential stored-productinsect management agents- A mini review. Emir J Agric Sci 18(1): 17-32.

20. Chaudhari SV (2013) Herbal control of stored grain pest bruchus chinensis linnaeus (Coleoptera: Bruchidae). International Journal of Innovative Research & Development 2(3): 397-402.

Part-B
Workshop Findings on Food and Seed preservation

Introduction: Trinamul Unnayan Sangshta conducted couple of workshops with with Elders, youth and women on Seed and food preservation were held on 19 October 2017 and 31 October 2017 at Ashish hall room of TUS office premises. Around 48 partcipants participated from different upazilas of Khagrachari District. The workshop sessions addressed existing practices of traditional seed preservation , local ethics and norms followed in the process of exchange of seeds, management of community seed banks, criteria in seed selection, steps involved in improving seed quality, traditional seed storage methods and traditional food preservation methods. Considering the significance of the role of women in seed and food preservation, women's contribution was discussed in a separate session. The second workshop focused on detailed knowledge on the themes discussed in the previous workshop. The result was a detailed list of various steps, methods, management systems and materials used for the preservation system. The weaving and production methods of the baskets and pots were also discussed and noted.

Preserving seed and food were so natural for the IP farmers of remote zones that they even could not separate the knowledge on seed preservation in a systematic manner. The same is true also for food preservation. In all cases, natural elements were used

previously, which were replaced in last decades by easy-to-collect plastic containers and chemical elements. This meant that, the tradition is at stake and wiped out of the minds of even the elders and consequently those of new generation. It produced a clear reason for sharing the knowledge in presence of youth, elders and women.

Seed preservation systems and associated beliefs, rituals and customs

The lists of common systems were listed down in the brown papers.

Major seed preservation systems-

1. ***Bamboo pot/internode-*** There are two way to preserve seed in bamboo pot/internode (two nodes and one internode of Dulu or any big sized bamboo stem). One is- In a bamboo internode, at first make a hole near the upper node. Then put seed into the hole and cover the hole with honey bee wax "machi moom". Another one is- cut one side of bamboo internode at around 45 degree angle and put seed into the bamboo internode. Afterwards, the cut is sealed with bee wax.

Figure 20: Dulo, ***PC: Sujash Chakma***

2. ***Cloth-*** Put seed into a piece of cloth, then tight with thread and hang on the earthen oven maintaining safe distance of around 6 feet.

3. ***Hole-*** Matured and good shaped healthy ginger, at first a hole is dug in a high and dry location near the house/homestead, than the bottom is furnished with big leaves for cushioning and protection. Than the gingers are put in the middle topped up with leaves and sandy soil.

4. ***Dry and cool place-*** Turmeric seed, potato, sweet potato, arum and pumpkin in dry and cool side of the house, which is usually in the East corner of the house.

5. ***Bottle-*** At first, eggplant seeds need to be sundried for around 7/8 days then the seed is preserved in a bottle made of plastic or glass, which is exposed to sunlight at times.

6. ***Smoke- Maize, ridge gourd (jhinga)-*** hang on the earthen oven keeping safe distance enough to keep out moisture.

7. ***Hutti (one kind of earthen pot):*** This is a kettle shaped earthen pot, which has two openings easily closable. The pot is used to preserve the seeds which need cold dry and semi air tight environment for preservation.

Figure 21: Hutti ***PC: Sujash Chakma***

8. ***Basket (made of bamboo)-*** Depending on size, bamboo baskets has different names: hallong, kabang, hurung, hajjeng. Many of these baskets are used to keep dry seeds in those baskets.

9. ***Bamboo shed (macha)-*** Big sized fruits like pumpkin/ chalkumra are preserved in whole on bamboo sheds, out of reach of rodents and insects. Some days before sowing, the fruits are cut to bring out the seeds, which are then dried, mixed with ash for sowing.

Figure 22: Ludung, ***PC: Sujash Chakma***

10. ***Ludung (bottle gourd)-*** keep dry seed in the ludung bottle gourd basket. For making the basket, a well ripe bottle gourd is chosen first, then a square sized or rectangular shaped cutting is made in the upper part to take out the seeds and flesh residue. Than the basket is dried in the sun or smoked on the oven.

11. ***Leafy granary-*** Seeds are stored in the fruits like bottle gourd (Lau-Kudugulo) and also in the leafy granary made from the leaves of Gorjon and bott. In some cases, women

mix domestic ash to the seeds and preserve them in earthen pots. Only during sowing time the seeds are touched and avoid contamination.

12. ***Curved Bamboo stick–*** These barbeque stick type of bamboo sticks/slices are used for piercing edible flowers like honagulo, silk cotton flower, which are lately put in the bamboo walls near the traditional fuel wood oven.

Figure 23: Utto ***PC: Sujash Chakma***

In the session, the time dimension was put into focus for discussion assuming that preservation methods for long time can be different to those applied for shorter periods. Out of the discussion, it was clear which method is suitable for which time period.

The link of seed preservation with rituals, beliefs and customs and livelihood were also discussed primarily. The major output of the session is presented below:

- ***List of seed preservation with rituals, beliefs, customs and livelihood-***

  - *Popcorn:* Popcorn, which is made from sticky paddy/rice & corn is used during the funeral and pre funeral walk to the cremation ground. The popcorns

are taken in a basket and sprinkled on the road while taking the dead body.

- *To get refried (ghile, hojoy, turmeric):* There is a belief that there are many harmful spirits who can bring bad luck and diseases. To get rid of those evil spirits, Ghile (Seed of a bean type big sized fruit of Ghile creeper, which is raised naturally by huge old tree), Kojoi (A tamarind shaped wild fruit)and Turmeric parts are soaked in water, are sprinkled over the heads of the family members.
- *Mustard seed:* to keep away the ghost or bad spirit mustard seeds are purified with holy spirit through uttering muntra-special utterings' and scattered on the heads or packed in pieces of cloths and tied with arm or waist with a small rope or thread.
- *Graveyard:* As per Chakma belief (not widespread) different kind of seeds (minimum 5/6 types) needs to be planted on graveyard after funeral. It's a belief that dead men use those vegetables in need. That custom still practiced in Komolchari area of Khagrachari Sadar. If anyone wants to eat that vegetable, he/she has to need permission from dead man.
- *Kumra (ash gourd) seed and corn:* Kumra seed and corn is needed during earthen dam construction.
- *It's a belief in Tripura community:* Before doing jum, Jumia farmer need to set mind for a nighttime dream, in which the Jumia will get hint on which seeds to sow in jum field. The Jumia tells about his/her dream to traditional healer. Then traditional healer told them which seed they have to cultivate.
- *Sowara:* In Marma community, they do 'Sowara' worship to get rid of disease. In that 'Soowara' worship needed 7 types of seeds of any kind.

- *Bitter gourd seed:* Bitter gourd seed need to heal from tummy ache.

Figure 24: Hulo ***PC: Sujash Chakma***

- *Other seed:* Cucumber seed, tamarind seed, bitter gourd seed need to get rid of various diseases.

Why is good seed important

Alike modern thinking, good seed selection is very important in the traditional systems for the following:

- To produce good quantity of crops
- To get good quality crops
- To produce good seed for next season
- To ensure that the crop quality doesn't get deteriorated or nature of crop changed.

What are the characteristics of good seeds

Characteristics of good seeds as per TK are;

- Mature seed
- Good color
- Healthy seed good in size and shape
- harvested from most strongest and healthy plant

Steps involved in improving seed quality

Figure 25: A woman preserving seed, ***PC: Sanchoy Chakma***

Traditional knowledge is used for sorting out the variety to be selected, identifying good panicles, processing of seeds before storing and techniques to avoid mixing of seeds. Morphological characteristics like plant height, erectness of leaves, tillering ability, panicle size and grain type-size are usually checked by the indigenous farmers to identify which variety to select for seeds. For rice and other grain crops, good panicles are selected which are at least 1 meter away from the borders. As part of processing the seeds, those are threshed, cleaned, sun dried and stored in a new container if available. The container of any available kind is labeled properly to avoid mixing with other varieties.

Traditional seed exchange methods

Mainly two seed exchange methods were identified as prominent. The first method appeared very simple- From general social connections, community and Jumia farmers know who else are engaged with seed collection. They informally request for some seeds and if agreed, he/she can take the seeds on unconditioned basis. This is a common occurrence, which provoke the indigenous farmers collect more seeds than actually needed for household purpose.

The second method is almost similar with the first one except that the seed is given following barter system, i.e. taking a kind of seed in exchange of other seeds depending on farmer's needs. A supplementary system is also practiced traditionally, where the exchange happens followed by a condition to return seeds of same amount and quality.

Seed preservation materials

List of materials used for seed preservation is presented below:

Materials name	Core material
Hutti	Earthen pot
Ludung	Made of Bottle gourd
Hallong	Made of bamboo
Habang	Made of bamboo
Hurung	Made of bamboo
Hajjeng	Made of bamboo
Bamboo shed/internode	Made of bamboo
Bee wax	Bee hive
Clean cloth piece	Cloth

Traditional Food preservation methods

Women are the key persons who take part in food preservation, as women traditionally handle cooking and food processing affairs.

Figure 26: Food preservation ***PC: Sujash Chakma***

Food preservation using natural elements is an ancient traditional practice. There are common methods which are used for food preservation. The following methods are used to preserve food for different time periods.

Method	Food
Sun drying	Radish, bean, cabbage, bottle gourd, plum, fruits
Smoke drying	Corn, jhinge, fish, edible flowers, vegetables
Barbeque	Pork, deer meat, buffalo meat, fish
Oiled and canned in earthen pot	Berma/ Small fish
Fermentation	Milk, bamboo shoot, dochoani (rice wine)
Rice powder	Rice cake
Boiling and sun drying	Ginger, turmeric
Salting	Tamarind, ulu,
Boiling and drying	Sugar cane (midhe) , date juice (midhe)
Boiling and bottling	Honey
Storing in cool place	Potato, arum, Pumpkin, and ash gourd

CONCLUSION:

It is already late enough to get pictures of the materials and methods in community settings. It was also clear that research work is needed to find out the details of the methods which will focus on time, livelihood social and cultural dimension to understand the methods from a holistic viewpoint.

Workshops in Pictures








Workshops in Pictures

Trinamul Unnayan Sangstha

ISBN 978-984-34-4705-0