

**INDIGENOUS KNOWLEDGE OF UPLAND
TREE MANAGEMENT: A CASE STUDY OF THE
KHASI OF NORTHEAST BANGLADESH**

by

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LIST OF ABBREVIATIONS

- BBS- Bangladesh Bureau of Statistics
- CGI- Corrugated Galvanised Iron
- DC- District Commissioner
- FAO- Food and Agricultural Organization
- GOB- Government of Bangladesh
- GD- Group Discussion
- IDI- In-depth Interview
- IK- Indigenous Knowledge
- KI- Key Informant
- KUBRAJ- Kulaura Boromchal Rajnagar and Jure
- MP- Muriate of Potash
- NGO- Non-government Organization
- SK- Scientific Knowledge
- TSP- Triple Super Phosphate

**PENGETAHUAN PRIBUMI (SEDIA ADA) DALAM PENGURUSAN
POKOK KAWASAN TANAH TINGGI: SATU KAJIAN KES DI KHASI,
TIMUR LAUT BANGLADESH**

ABSTRAK

Kajian ini adalah mengenai pengetahuan peribumi (sedia ada) dalam pengurusan pokok di kawasan tanah tinggi oleh komuniti Khasi di Sylhet, Timur Laut Bangladesh. Kajian ini meneroka bagaimana masyarakat Khasi menggunakan pengetahuan sedia ada bagi menguruskan tanaman pokok jenis buah dan bagaimana petani menggunakan kaedah hibrid dengan menggabungkan elemen pertanian tradisional dan moden. Selain itu, kajian ini juga mengkaji pelbagai jenis ancaman pertanian dan cabaran yang dihadapi oleh petani yang terlibat dalam aktiviti pengurusan pokok-pokok ini. Dua buah kampung telah dipilih sebagai lokasi kajian. Pendekatan etnografi telah digunakan dalam penyelidikan kualitatif ini dan jumlah saiz sampel ialah seramai 76 orang. Penyelidik telah menjalankan temu bual secara mendalam dan perbincangan kumpulan dengan 66 orang responden dan menemubual 10 orang informan utama dalam kajian ini. Analisis data dilakukan secara manual dengan berpandukan pendekatan tematik. Melalui analisis yang dibuat, terdapat beberapa tema utama berkenaan amalan pertanian secara hibrid dalam pengurusan pokok jenis buah di Khasi. Pada peringkat tradisional, petani telah menggunakan elemen organik dan bukan organik bagi mempercepatkan pertumbuhan pokok yang lepas kerana mereka menghubungkannya dengan konsep fisiologi dan pengasingan. Bagi teknik moden pula, petani telah menggunakan racun serangga dan baja seperti Urea, MP dan TSP bagi memberikan perlindungan maksimum untuk tujuan pertumbuhan dan penghasilan. Seterusnya, dalam semua

aktiviti pengurusan yang dilakukan, masyarakat Khasi sedar akan kepentingan untuk memulihara persekitaran etno ekologi. Dapatan kajian mendapati terdapat banyak cabaran yang dihadapi oleh masyarakat Khasi dalam pengurusan pokok jenis buah yang merangkumi masalah tempatan dan global. Antara cabaran-cabarannya ialah input pertanian yang sedikit, ketidakselamatan berkenaan isu tanah, konflik kejiwaan, rasa tidak puas hati dalam komuniti yang terlibat, krisis kepimpinan, serta serangga perosak dan jangkitan yang membahayakan persekitaran. Oleh itu, kajian ini mencadangkan pendekatan holistik untuk pengurusan semua cabaran yang memerlukan komitmen kedua-dua pihak berkepentingan baik dalaman ataupun luaran khususnya program pembangunan kapasiti kerajaan dalam menyediakan input apabila diperlukan dan kehabisan, penglibatan dan kerjasama pertubuhan bukan kerajaan (NGO) dan masyarakat setempat untuk menerima ilmu baru dan kefahaman bagimenyelesaikan pertikaian secara baik di semua peringkat. Penyelidik juga mencadangkan untuk dilakukan penyelidikan lanjut dalam bidang ini.

INDIGENOUS KNOWLEDGE OF UPLAND TREE MANAGEMENT: A CASE STUDY OF THE KHASI OF NORTHEAST BANGLADESH

ABSTRACT

This study is on indigenous knowledge of upland tree management of Khasi community in Sylhet, northeast Bangladesh. It explored how Khasi people use indigenous knowledge for the management of fruit-bearing trees and also how the farmers hybridize traditional and modern farming elements in the management of fruit bearing trees, the study also examined the various farming threats and challenges encountered by the farmers in carrying-out the tree management activities. Two villages were selected in this study; qualitative method guided this study with a total sample size of 76 respondents. In-depth interview (IDI) and group discussion 66 farmers are considered as respondents and key informant interview (KII) 10 respondents. Data collected were analyzed manually and was guided by thematic approach. Major themes which emerged from the analysis was that within this hybridized farming practices farmers employ both traditional and modern scientific knowledge in the management of fruit bearing trees. At the traditional level they apply organic and inorganic elements to facilitate past growth of trees as they connect it with physiological concepts and abstractions; for modern technique they apply pesticides and fertilizer such as urea, MP, and TSP to give the trees maximum protection for growth and yield. In all these things the Khasi people are doing they are conscious of conserving the ethnoecology of environment. The study findings revealed that so many challenges embedded the process of fruit bearing trees management in Khasi community which include both local and global problems such as few farming inputs, insecurity of land, neighbours conflict and

internal community grievances and leadership crisis, pest and diseases as well as environmental hazard. The study recommend holistic approached to the management of all the challenges for Khasi people fruit bearing trees growers which require both internal and external stakeholders commitment particularly the government capacity building programmes of providing the needed inputs as at when due, nongovernmental organization (NGO's) and community involvement and cooperation in accepting new knowledge and understanding for amicable dispute resolution at all level. The study also suggests further investigation in that area.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

1.1.1 Background to the Study

This chapter is a complete description of background information to the study. It describes the indigenous knowledge of upland tree management system along with global knowledge on Khasi fruit-bearing tree farming systems, and strategies adopted by them to cope with their diverse challenges. The problem statement, research objectives, research questions, research area and the justifications of the study are subsequently presented.

In this study, Khasi farming and forestry knowledge is illustrated. Indigenous peoples' locally derived knowledge is indigenous knowledge. It is used to explain the knowledge system developed by members of the community, which is opposed to modern knowledge, having the basis for local-level decision-making in many rural of thier communities. Indigenous knowledge is a distinctive to the cultural or society, and the term of indigenous knowledge also known as 'local knowledge', 'people's knowledge', 'traditional wisdom', 'traditional science', or 'folk knowledge'. Their knowledge transferred from generation to generation, usually by the word of mouth and cultural rituals (Ellen, Bicker, & Parkes, 2000). Indiscriminately all over the world, indigenous farmers contain traditional knowledge, expertise, skills and practices connected to natural resource management and food security as well as to agricultural products and variety.

Traditional farming, fishing, collecting and forestry are based on indigenous knowledge systems and practices that help to ensure subsistence and agricultural diversity, rich landscape and livelihoods security. Over hundreds of years, these have supplied rural communities with the essential resilience to face challenges and ensure survival. However, traditional livelihoods, local knowledge and indigenous plant-species are now increasingly threatened by some causes such as large-scale industrialization of agriculture, population dynamics, politico-economic inequity, land-use/cover changes and the impact of climate change (Eisemon, 1989; Thrupp, 1989).

Today, indigenous people are influenced by the global changes with overexploitation of natural resources and conduct their farming system, taking support of modern knowledge with traditional knowledge. At the same time, the FAO's (Food and Agricultural Organization) approach is to manage the threat to farming livelihoods that effect from natural and human-induced disasters, such as climate change and land scarcity. On the other hand, local level, the nation state and other organizations are trying to mitigate the indigenous peoples' farming hazard through diverse support and social services as their capabilities.

Recently, modern agroforestry and agriculture are developing new projects that assist indigenous people and the use of local knowledge to improve rural development, including tree crop farming with conservation of biocultural diversity, and sustainable management of agro-ecosystems. However, indigenous people farming system go together with modern agroforestry. In fact, indigenous peoples play a vital role in the conservation of biodiversity and in the alleviation of climate

change, preserving 80 percent of the world's biodiversity within their landscapes (World Bank, 1997).

Khasi are also one of major ethnic community and they are Mon-Khmer-speaking an indigenous upland people of the north-eastern part of Bangladesh, usually living in areas surrounded by forests. A matrilineal society, Khasi accords high respect to mothers and younger daughters and inheritance of property is transferred from mothers to daughters (Gurdon, 1914). Maternal family name inherits to the siblings and maternal uncle is highly respected in the family. Traditionally, Khasi were hunters, semi-swiddeners, medicine men, folk healers, artisans and craft men.

It was for over a hundred years, they had been practising semi-swidden agriculture¹ (*jhum*), and rains fed cultivation system in which the soil is prepared for cultivation by clearing and then rot out the surface vegetation to release nutrients into the soil. They plant a mixture of crops, such as rice, millet, sesame, maize vegetables and cotton, following a system of inter-cropping and multi-cropping with fallows in the hills and forests surrounding their villages (*punji*).

With population increase and out migration, as well as with changes in their social world, the Khasi's way of life is rapidly changing. Their traditional form of semi-swiddening cultivation became rarer and their land use system was changed and become fixed-field farming. Insecurity of tenure to forest land and governments' fallow land also drives them into horticulture; horticulture is the categorical term for a kind of agriculture that includes tree crops gardening. Homesteading is a way of

¹It was one kind of land use system where Khasi slash the twigs and bushes and then decompose it to release nutrients into the soil. They did not use fire to protect the microorganisms of the soil, but they maintained fallows. They called it *jhum*, still they use the word *jhum* and though have no anymore fallows.

claiming land by planting more forest (as I understand it) and agroforestry includes tree-crop cultivation as well. Homestead forest² and agroforestry are following a pattern seen in other parts of Asia (see Fox et al., 2009; Salam, Noguchi, & Koike, 2000).

The Khasi, in general nowadays without burning, slash and clean the undulating hills and forest land, which is owned by lease from the Government, and cultivate economic tree-crops (betel leaves, nuts and fruits) but not cultivating food-crops for livelihoods and earnings. Food-crops come from lowland areas as well as external markets. They cultivate trees for construction, fruits, shades, and religious ritual. During clearance and cultivation, care is taken to preserve the root and seed stocks to ensure the re-growth of shrubs for usages of organic plant-manure and mulch (Warner, 1991). Along with this system Khasis' ethno-ecological knowledge and way of life are influenced by scientific knowledge and they had been gradually detached from the traditional cultivation to homestead farming and gardening system near their vicinity.

Khasi have been adapting to the influences on their subsistence base by using a combination of traditional and modern scientific practices of farming, which include adopting new techniques and knowledge. The researchers are not undertaken comprehensive study on hybridized farming system. This farming knowledge of upland Khasi how much widely is used and what types of farming concepts and practices are employed in the field not known to us. However, the community is ripe for study, due to the presence of diverse origin knowledge and challenges of natural

²For local people earnings as well as ecological reason with cause of inadequate trees cover, and whose main source of incomes are tree-crops gardening, they plant trees in the homestead and nearest surrounding farm fields to intensify forestry. Forest extension workers very often work closely with the local people due to implement homestead forestry.

hazard such as human-induced environmental crisis, degradation and depletion of natural farming resources. To accelerate the native cultivation practice for sustenance modern knowledge is persuaded.

Brodthorn (1999) found in her studies in Madhya Pradesh, India that the villagers integrate different subsystems of knowledge with their traditional knowledge, using formal and informal concepts of tree-crop farming. For example, villagers use folk science concepts of hot/cold to explain cow dung application in the field as soil nutrients as well as the global scientific practice of urea application. There are other farming elements – oilcake, animal dung, compost manure, plant-manure, plant-mulch, limestone and commercial fertilizers have been prevalent among the Khasi in the field to the concept of farming knowledge in connection of local, global and/or mixed knowledge system.

The preliminary observations suggest that the Khasi similarly, are practicing tree farming knowledge with compilation of different sub-systems of knowledge, such as local, global, informal, and formal with folk tradition which are somewhat similar to Brodthorn's findings (personal communication). Therefore, drawing from Brodthorn's perspectives, I examine the sources of knowledge and farming inputs with integration process, including farming difficulties and coping strategies of the Khasi, focusing on the ways by which their tree organization knowledge, methods, concepts, and practices combine indigenous and scientific knowledge systems.

In this study tree management refers to one kind of organizational strategy, how the Khasi coordinate their efforts to accomplish tree management activities (manuring, planting, and nursing) successfully by using local and global knowledge. It is a system and design of planning, arranging, organizing, directing, and controlling

how to fulfil tree-crops-farming for maximum returns through the optimum integration of skills. It is an organized strategic course which is interlocked with knowledge, experience, creativity, and conceptual understanding to manage the tree resources in the farming system.

Khasi tree planting and organizing strategies are performed the following some aspects such as for maintaining and restoring the physical environment needed in order to maintain crop farming through the restoration of soil nutrients and energy. The other is the rural household economy that generates income and employment of the members (Arnold & Dewees, 1997). This incorporates products used by the household as food, fuel, fodder, mulch and raw materials for making farming implements.

In my primary observation, I found that Khasi's farming strategies, (manuring, tree reproduction, watering and nursing) animal husbandry, and way of life is integrated with local and global knowledge due to household needs and preferences, food culture and local custom, nutritional complementarities, with other major food sources, and ecological and socio-economic factors such as market forces, policies and local development projects.

These factors impose Khasi ethnoecological knowledge with tree-crop farming system in the part of landscapes. They incorporate hybridized farming knowledge in practice and conceptual level, which derives from diverse sources of knowledge – Western science and indigenous knowledge with folk science. However, what extent it uses and what types of threats and challenges arise by using the combined knowledge with farming input and output is not known.

The study explores and analyses how Khasi communities in the northeast region of Sylhet Division combine formal and informal knowledge in their tree management practices. The tree management system practices to investigate include: fruit gardening system with manure usage, the integration level, ways and processes of diverse knowledge and practices, how Khasi plant trees and tend them. The influence of global knowledge and science on indigenous knowledge and how Khasi's tree management knowledge encounters multiple problems have examined.

It highlights the consequence of global science in the tree growing system, how Khasi carry out the managerial, organizational, and strategic activities with conceptual skill to grow healthy trees by fertilizing with manuring, watering, weeding, loping, pruning, bark ringing, thinning, pesticide used, and overall nursing. Specially, the focus is given on fruit-bearing trees, but besides these, Khasi cultivates and tend some specialty tree-species such as, acacia, agar, neem, eucalyptus, ipil-ipil, and bamboo with natural trees for timber and home making materials. Khasi in general nurses all kinds of trees as supporting trees to cultivate betel leaf trees, which is their one of the major economic crop.

The other types of tree-crops also have social, economic and ethnoecological value. This study investigates how effectively Khasi nurtures and manage trees with fruit-bearing trees, namely mango, jackfruit, pineapple, lemon, guava, papaya and areca nut in a natural setting household premise and in the fields coping with global threats and challenges. And also, I attempt to suggest how change is affecting the overall agricultural knowledge of the Khasi.

1.1.2 Problem Statement

The hilly area of Khasi in Sylhet division comprises mostly isolated blocks of land in reserved forest, un-classed State forest and private forest. The Khasi people have been allowed to live there as forest people and cultivate their surrounding land following ethnoecological knowledge (Alam & Mohiuddin, 1995). In the past, the northeast greater Sylhet divisional hill-forest was very rich with flora and fauna. Most of the forests of the region were of evergreen hill types (Rizvi & Ishaq, 1970) and as well as the Khasi cultivate various categories of vegetative plant species in the forest with fallows and homesteads adapting local farming settings. But recently, because of the explosion of population growth and exploitation of natural resources, a lot of tree-species are extinct and eroded with diverse knowledge. Khasi's formal, informal and folk expert knowledge and practice is eroded due to the global changes and scientization (Brodt, 2001). However, Khasi people were verily dependent on hill-farming cultivation called tree-crop gardening system. In this hilly area, they expanded their market-oriented tree crop farming due to household and economic needs (Nath, Makoto, Islam & Kabir. 2003). The emergence of the tree crop farming economy and market system changed the subsistence-based old farming system into income based new tree crop farming, combining scientific knowledge and farming elements.

Among the Khasi, the types of knowledge, source of materials and farming abstraction with piece of knowledge and cognition of objects are hybridized and linked in the tree management methods. It is occurred through framer's agricultural plan, including tree conservation, propagation, shade management, branch-root pruning, pest management, watering, irrigation, plant protection, land potency,

farming-plot management and so on. Khasi farming knowledge continuum need to understand, what processes combine and recombine based on historical, political and socioeconomic factors as well as personal plan, which is intensified as farming knowledge dynamics and employed in tree crop field. This process protects viable farming environment harmonizing the potentiality of diverse knowledge and resources.

Khasi social, cultural and economic lives have been changed due to the global changes, and scientific knowledge invaded indigenous knowledge through different channels and weakens the local tree crop farming knowledge paradigm in terms of development-process and thought (Guha & Gadgil, 1999; Gupta, 1996 & Shiva, 1997). Therefore, it is needed to examine how farming knowledge and tree management system is suppressed and decreased by socioeconomic and political causes. However, many scholars and development workers (Chambers, 1983; Howes & Chambers, 1980 & Agrawal, 1995) observed that the overall forest resources were deteriorated by the pressure of overpopulation, farming and household settlements. The most basic natural resources, namely, soil with fertility, air, and water are degraded by the consequences of excessive exploitation of natural resources. This condition is also observed in Khasi's tree farming system and intensively, hampered their overall farming culture with bio-physical environment. Khasi farming lands are inadequate with fallows to meet their needs. In addition, the farming land is losing its fertility due to frequent cultivation and land erosion. Ultimately, the land becomes barren and farmers' subsistence and income decreases. Hence, Khasi face a lot of natural calamities even in matured-farming seasons, which was very rare in the past. Recently, Khasi cultivate fields, they must grow economic tree crops with subsistence

by taking precaution to protect trees or reduce the severity of tree damage from natural disasters. Therefore, farmers look forwards diverse external and scientific knowledge with traditional concepts.

The Khasi are not well-off because of the insecurity of land ownership and inadequate productivity of land and as a backward community. Most of the Khasi are unable to lease their possessed governments' land in permanent settlement of land tenure system as bureaucratic disparity and the partiality of local administration (Patam, 2005). Land allotment, boundary demarcation with neighbors' lowlanders and tea gardeners are not well managed by the government. Sometimes, mainstream Bengali gets possession of the Khasi land because of monetary and political influences. Besides this, while the agroforestry project has been expanded, the external people have migrated in forested land extensively with encroachment also, due to scarcity of land (Saha, 1998). The inadequacy of farming land with infertility leads Khasi to increase soil fertility by matching local and global knowledge optimally. Khasi understand the bio-physical milieu of the region, and they have started cultivation and protection of native trees by merging modern agroforestry (Saha & Azam, 2004).

Khasi once depended on indigenous knowledge and practices in the very near past, but now they need more production due to growing everyday needs with limited land and shrink existing farming materials. Therefore, they become curious with other potential knowledge and practice, which might help their subsistence. To find out possible solutions of the above mentioned problems, it is necessary to know how Khasi community combines indigenous knowledge with modern scientific knowledge and deal with farming difficulties. Drawing from Brodt's (1999) insights, this study

will investigate the knowledge dynamics of Khasi, focusing on the degree to which their knowledge and methods integrate indigenous and scientific knowledge in tree crop management in the fields.

1.1.3 Research Objectives and Questions

The objectives of this study are:

1. To explore Khasi indigenous knowledge of fruit-bearing tree management and analyse how they combine traditional and modern knowledge in their use of tree-management concepts.
2. To examine threats and challenges encountered by the Khasi people in carrying-out tree management activities.
3. To suggest how change is affecting the overall agricultural knowledge of the Khasi.

This research will begin by exploring and examining the following queries.

1. How do the Khasi combine traditional and modern knowledge and farming elements in growing and managing fruit-bearing trees?
2. How do the combined knowledge practices in management techniques of fruit-bearing trees?
3. What are the threats and challenges that face Khasi farmers today, and how do they adapt their practice to deal with these challenges?

1.1.4 Research Area

The Khasi indigenous people reside mainly at the greater Sylhet Division in the North-eastern region and border of Bangladesh. The study was conducted among them. For the study purpose Kulaura and Rajnagar sub-districts were selected considering Khasis' uphill tree-crops farm field with forest surroundings. The area

remains between latitudes 24° 01' and 25° 15' N and longitudes 91°05' to 92° 15'E. The north-eastern part of Sylhet is a broad, level valley. Indian Khasi and Jaintias' hills to the north form a barrier the base of which builds the district border. The study area was situated in a remote place and far from the district town of Sylhet, surrounded by forest, hill-hillocks, several streams and rivers. The soil, including clayey and sandy loams of hilly ground is especially fertile. There were five villages (punji) in this study area, viz; Singuir Punji, Islachara Punji, Amchari Punji, Aynachara Punji and Indanagar Punji, which have a combined population of about a thousand. Following preliminary surveys, I focused on two villages, Singuir Punji and Amchari Punji. The inhabitants' source of livelihood depends on forest and forest surrounding areas. Their economy is tree crop farming with fruit-bearing trees and mode of farming mainly traditional as well as mixed with external knowledge and agroforestry along with hill-farming system.

Khasi ethnically maintain tree plantation along with various categories of trees and betel leaf cultivation in the fields for their necessities as well as heritage. This practice is prevalent in all Khasi Punjis (villages) in different ways as an adequacy of natural resources and topography with the collaboration of Forest Department or separately in their leased land, which is governments' unclassed forest land. Khasi are allowed to collect forest products like food, fruits, and fodder, fuel and homemaking materials with resin instead of nursing overall forest. They can plant tree-crops for extra income in forest-fallows as Government and Forest Department farming codes.

Selected two main villages – Singuir Punji and Amchari Punji, were interesting site, because of having physical proximity, one is dominated by un-classed

State forest and other one is controlled by a reserve forest of Forest Department. Villagers farming items, system, concept, geographical location and landscape with secondary natural forest are almost similar. However, usage of farming materials, farming-infrastructure, economic and political differences with power exercise of the headman and the role of forest/agricultural officers and inhabitants individual competencies could make a difference in organizing tree management methods. Therefore, for looking similarities and contrast in tree-crop farming system of indigenous knowledge along with modern knowledge as well as authority's domination and policies both villages were selected.

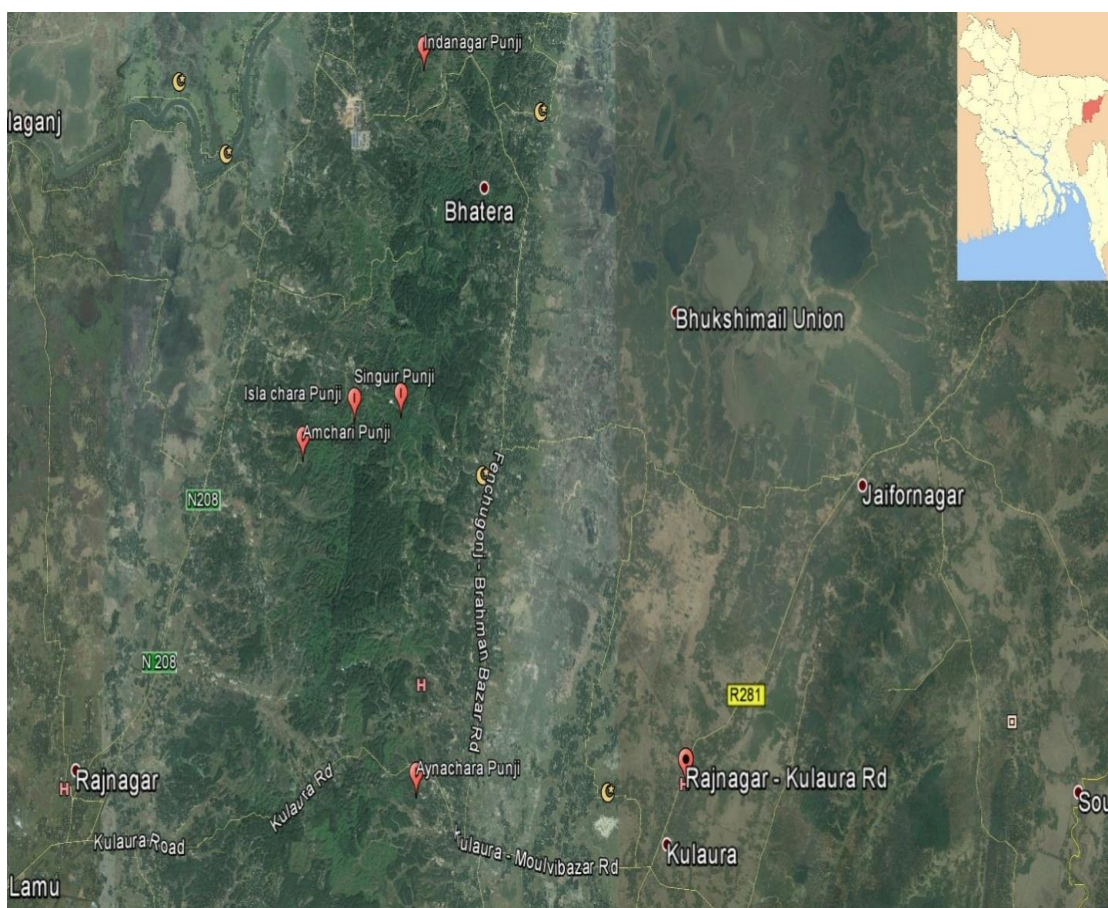


Figure 1-1 Map showing location of the study villages (Source: Google Earth)

1.1.5 Research Justification

This research was carried out in Khasi *punji* (village) where fruit-bearing tree management methods with other categories of trees have emerged as a new farming issue, which is administered by applying traditional and modern knowledge system. The outlook of this integrated cultivation system would impress the researchers, foresters, development workers, policy makers and implementers, and will have been accepted as an emerging viable issue in the recent farming system and agroforestry as well as internal and external region.

Generally, mainstream Bangladeshis do not know much about the Khasi due to their remoteness in the forested uplands. Researchers have been undertaken several studies on the different aspects of their ways of life (Gain, 1998), but there is yet no comprehensive study on indigenous knowledge base uphill-tree management methods. However, due to concurrent global changes, commercialization and depletion of natural resources, indigenous farming knowledge has not strictly practiced in the fields (Guha & Gadgil, 1995; Gupta, 1996 & Shiva, 1997). Conversely, they have been conducting tree-crop farming in mixed-mode for subsistence. Therefore, it is necessary to know the present political, socioeconomic impact, and ethnoecological knowledge dynamics of Khasi. In addition, we should know the ways and opinions of the participants that external (global) or scientific knowledge has influenced and enriched Khasi overall knowledge system.

Khasi's external and internal need with diverse factors forces them to draw on different sources of knowledge – formal, informal and scientific for tree crop cultivation, which is comprised of link and cross-link of sub-system of knowledge. It is practiced optimally in concrete level through the understanding of the higher level farming concepts. This knowledge is feasible acquaintance, which might disperse in

agricultural and forestry development at diverse level through innovation and diffusion. The Khasi farming system reveal the consequence of experiential local and global mixture knowledge benefit in terms of tree production and land fertility, which deal with land preparation for planting, fertilizing, weeding, pruning, watering, pest, and diseases control. It can be practiced in local, regional, agroforestry as its form of eco-friendly universality.

Indigenous farming knowledge at community level has defined as system perspective traditional knowledge, but the global homogenization and economic liberalization confine the expansion of this knowledge. Local participants understand this form of knowledge in practical level and due to inadequacy of natural farming resources, integrate old and new knowledge for sustainable farming, and construct structures of knowledge system of tree management. This knowledge could be characterized through the understanding of researcher rigorous thought, disciplinary laws and regularities as farming knowledge paradigm. It could stimulate scholars to advocate and use in a larger extent.

Khasi farming system exposes that the tree cultivation strategy has a scientific basis and closer to the modern agroforestry system and complement of modern farming system (Shiva, 1997). Therefore, traditional peoples' farming thought and experiences could be adapted to the interest of larger farming people with ecology and the environment. This knowledge accumulation process might contribute to tree management system to bring changes and cope with diverse difficulties of farming issues by using diverse knowledge in particular tree-fields considering the biophysical milieu.

Today for scientific basis Khasi tree management knowledge can be incorporated with agriculture and agroforestry for higher yielding sustainable tree

crop varieties production. At policy level, their local knowledge may contribute and participate in development-process, which feedback might be enjoyed by different localities. Khasi hills-farming system is a knowledge continuum, which originates through diachronic approach and may supplement new pieces of information about farming knowledge of upland people. It may strengthen the constituents of agricultural anthropological knowledge. This study is a new endeavour and may help to nourish ethnoecological farming knowledge and contribute to agricultural ‘development thought’ by examining formal and informal knowledge of farming system.

1.1.6 Organization of the Study

This dissertation is organized into eight chapters and this chapter has discussed the general background of the research subject, with an opening to indigenous people, ethnoecological knowledge and local farming and tree management system. Secondly, it justifies the research using a precise of previous studies pertaining to this subject. The factors that lead me to carry out the research in this area are briefed. Later the objectives and research questions are discussed with justification of the study.

Chapter 2 outlines the literature review of the study which has included a comprehensive account of theoretical perspectives of indigenous knowledge and scientific knowledge along with the effectiveness of indigenous knowledge in tree resource management and farming. The review includes a short description and unites the gap which carefully focuses and links the research objectives and questions. This chapter focuses on the conceptual framework, which is important to understand the uphill-tree crop farming system of Khasi.

Chapter 3 is discussed the research design and methodology, which incorporates an explanation of research design and planning with qualitative approach to complete this study. Subsequently the sampling procedure, including the selection of various types of participants, getting entry in the field and build up an effective rapport with the informants is given. Afterward, in the research a detailed account of the data collection process and recording, validation and reliability of gathering information are explained.

Chapter 4 introduces the place, people and trees, especially the history of the local landscape, ethnohistory of people, local participants' socio-demographic information and local cultivated tree-species with natural ones of Khasi are explained. This chapter outlines Khasi tree crop farming and management system on the basis socio-cultural, economic, and ethnoecological knowledge. It highlights Khasi diverse farming culture in connection with uphill forest surrounding environment.

In chapter 5 and 6, the analysis of the data gathered is presented. A thematic analysis is used and the recognized main and sub themes are shown based on the theoretical perspectives and tree management conceptual framework. The results are categorized under the traditional, local and global hybrid farming knowledge system and practice to the perceptions of the participants on practical tree-crop farming management systems. Later the analyzed findings are discussed in the present and previous studies context for getting the objectivity of the issues of the study.

Chapter 7 is also the findings of collected data analysis of field participants. The results are categorized under the farming difficulties especially various threats and challenges along with coping strategies and observation of the informants on the

existing support and services. Later is discussed the coping mechanism of farming issues and difficulties.

Chapter 8 consists of the overall summarization of findings of the study, which presents Khasi local and global knowledge combination process along with from diverse knowledge to practice adopting various tree crop farming concepts are illustrated. It also includes farming difficulties and coping strategies of farming, and holds closing comments and presents a brief discussion of the key information emerging from the findings. I explain the methodological constraints faced throughout the study process and next solutions to defeat the challenges concerning to carry on further scientific study. Finally, the chapter details an agricultural changing trend of Khasi, and a suggestive synopsis of overcoming farming difficulties.

CHAPTER TWO

LITERATURE REVIEW

2.1 Literature Review

This chapter discusses and reviews indigenous knowledge with an overview of Khasi indigenous and global/scientific knowledge of trees management and farming system. The review includes a short description of effectiveness and conservation practices of indigenous knowledge and unites the contrasts which carefully focuses and link the research objectives. The outcome of the theoretical, empirical and methodological discourses is eventually used to develop a conceptual framework.

This section also highlights the nature of knowledge integration process with indigenous and scientific knowledge, including local and global tree-crop farming systems. It also emphasizes on Khasi tree organizational strategy, practical aspects of tree management and challenges with coping strategies and my reflection on indigenous tree management practices. Finally, it portrays the conceptual framework of Khasi tree management.

2.1.1 Indigenous Knowledge: An Overview

In this study, indigenous knowledge refers to the local or traditional knowledge that consists of a “cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission” (Berkes, 1999, p. 8). In its widest sense, indigenous knowledge is

measured to be cultural knowledge that is distinctive to a given culture or community (Bank, 1997) and surrounds the cultural traditions, values, beliefs, and world's conception of the native peoples. In natural resource management, native knowledge is the root for native-level decision-making (Warren, 1991). As indicated by Flavier et al., (1995) native knowledge is based on fact for a society, which assists transmission and decision-making. Indigenous knowledge systems are dynamic, and are constantly biased by internal innovation and test with communication of outer systems (Warren, 1991).

Indigenous knowledge is peoples' practical experience, a holistic and comprehensive type of understanding with common sense knowledge (Dei, 1993). Indigenous knowledge and biocultural diversity are intertwined and its necessary components protect and balance the ecosystem (Agrawal & Gibson, 1999). It is linked to agriculture, food, home gardening, and handicrafts (Turner, 2005).

Indigenous people protect their local environment because they possess valuable message on how to effectively manage their environment and its natural resources. Emery (1996) said, "The recent worldwide ecological crisis, scientists recognize that indigenous people are habituated to live for generations, and manage the environment without massively damaging local ecologies".

Indigenous knowledge may in fact integrate with scientific knowledge by giving hand-on experience and experiential understanding in conserving ecosystems. However, traditional ecological language varies from the scientific method. The former generally includes: metaphorical images and spiritual manifestation, representing differences in environment, and motive (Berkes, Kislalioglu, Folke, &

Gadgil, 1998). Indigenous know-how and native technologies depend on local skills and resources and are frequently much cost-effective than external technologies (IIRR, 1996).

Indigenous people being local specialist has specialized training to protect their ethnoecological environment. Indigenous knowledge comprises surrounding social responsibility, respect of nature, diverse production system and well balanced resource utilization (DeWalt, 1994).

Indigenous knowledge is based on exceptional epistemologies and insights, which are separate from scientific principles and methods. A few cultural insights are related to supernatural beliefs about spirits or ancestral ghosts which are normally unbelievable to western scientists. In accordance with Rappaport (1968), local knowledge is dynamic knowledge that is altered over time through testing and adaptations to changes in the socioeconomic and biophysical milieux.

Some analysts have discussed indigenous knowledge as myths. It is believed that native peoples are savage. This insulting conception indicated indigenous people are unprogressive. Social Darwinism strongly supported the outlooks of the need to transfer and improve the unimproved people (Thrupp, 1989). Nevertheless, some analysts accepted that farmers are' "backwardness" in western science is not a subject of "foolishness", but it is an expression of poverty and inaccessibility to resources (Chambers & Ghildyal, 1985; Chambers, Pacey, & Thrupp, 1989).

Indigenous peoples are sometimes described noble savages because of their optimal resource consumption with respect of nature (Kalland, 1994). They are loyal to ecology and the environment, and collect natural resources only for subsistence.

They give importance on diversified and multiple production system and conserve environment (DeWalt, 1994). Indigenous knowledge includes outside knowledge and able to adapt to new conditions and maintain conservation moral, social accountability to protect community ties including nature and culture.

Indigenous people thinking knowledge is a source of power, that sense is pertained to them, obscure popular information from the outsider, whereby certain people can have control on it. Specially, native people practice it on plants and seeds knowledge (Juma, 1989).

Local way of life contains cultural knowledge and indigenous knowledge, but sustainable development researcher has found the grading systems for plants, animals, soils, water and weather as well as flora, fauna and non-living resources in agriculture and agroforestry. The indigenous people distinguish the worldview and its trend related to the natural world (Emery, 1996). Indigenous knowledge is rooted in spiritual belief which affects each other in a dynamic system. This belief and ritual may impress people's intention to adopt innovative resource management tactics (Mathias, 1996).

Modernization and science affects the traditional ethos. However, traditional resource, customs and associated cultural bodies are existing in rural Bengal societies (Deb & Malhotra, 2001), by the local cultural practices numerous elements of local biodiversity are protected. Traditional conservation morals are still competent of defending much of the county's overwhelming biodiversity and natural resource management. Such as Pandey says (2003) that the ethnic communities in Meghalaya – Khasi, Garos, and Jaintias in India have particular areas of holy forests under

customary regulation. This ethics protects trees and shrubs from any product pulling out by the community.

In fact, indigenous knowledge is locally constructed, which is achieved through test and experiment of surrounding biophysical environment of the native people. This knowledge is dynamic and has potency which is altered over the time added new information through the insight of local people and adapted to global changes. Indigenous knowledge has scientific basis, local people optimally use natural resources with environmental knowledge. It may say complement of science which is related to plants, animals and soils with non-living resources in agriculture.

2.1.1.1 Indigenous Knowledge and Scientific Knowledge Compared

It is assumed that indigenous knowledge is dispersed and associated with low status and the holders of such knowledge may have been made to trust it is low-grade. Scientific knowledge, in compare, is centralized and associated with the machinery of the state and carriers of it assume in superiority (Warren, 1989). Indigenous knowledge is 'concrete' and depends entirely on insight, but science is disclosed systems whose supporters are conscious of the chance of the substitute viewpoints to those adopted at any particular point in time. Conversely, indigenous knowledge is closed system by a shortage of knowing that there could be other ways of experiencing the world (Howes & Chambers, 1980). Local knowledge scrutinizes diachronically and harmonizes the synchronic inspection on which western science is founded (Gadgil, Berkes, & Folke, 1993).

In fact, indigenous knowledge may complement scientific knowledge by giving practical experience of ecosystems. The local people those have a straight connection to the soil and have instant environmental knowledge that is indigenous

knowledge. So, differentiation of indigenous and scientific knowledge is debatable. Indigenous knowledge has assisted the innovations in science, growth of science in India resulting from traditional knowledge (Gandhi, 1982). In India, traditional crafts and rural expert's knowledge present a broad spectrum of knowledge, which cannot be isolated (Gandhi, 1982).

As per Banuri & Apffel Marglin (1993), the distinctive features of indigenous knowledge systems as knowledge framework is that: it is rigid in its certain community, contextually bound, not individually value-laden, does not create a subject/object contrast and needs a dedication to the local context. In contrast, scientific knowledge is assembled, recognized and diffused in a logical consistent and systematic mode (Brokensha, Warren, & Werner, 1980). Levi-Strauss (1962, 1966) argued as cited in Agrawal (1995) that indigenous people in primitive cultures are less inclined to logical analysis, but their mode of thought and knowledge system is more realistic than scientific thought.

The three main degrees that most probably differentiate indigenous knowledge from western knowledge are substantive—there are distinctions in subject matter, historical event and distinctive features of indigenous verses western information (Agrawal, 1995). Indigenous knowledge is fundamentally concerned with the urgent and material requirements of people's every day subsistence (Rocheleau, 1989; Thrupp, 1989). Western knowledge, in contrast, aims at a more objective, abstract, and contextual problem-solving.

Second are the methodological and epistemological issues. These two forms of knowledge use diverse methods to look, understand and explore the reality, and are stimulated by different world-views. Contextually, traditional and western knowledge fluctuate because traditional knowledge is more attached in its context. Some