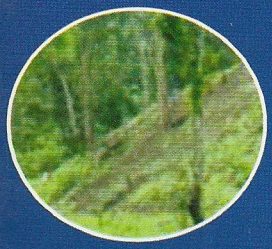
BEST PRACTICES OF SHIFTING CULTIVATION IN MEGHALAYA



Regional Centre
National Afforestation & Eco-Development Board
North-Eastern Hill University, Shillong

2010

BEST PRACTICES OF SHIFTING CULTIVATION IN MEGHALAYA

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The Regional Centre, National Afforestation and Eco-Development Board (RCNAEB), North-Eastern Hill University, Shillong came into existence on 26th October, 1989. Since then Centre has been working in the areas related to afforestation and eco-development in the seven north-eastern states viz., Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura as per the mandate contained in the Memorandum of Understanding (MoU) signed between the National Afforestation and Eco-Development Board (NAEB), Ministry of Environment and Forests, Government of India and North-Eastern Hill University (NEHU), Shillong

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INTRODUCTION

Shifting cultivation is a widely prevalent farming system of the world in which the fields are cleared and generally cultivated for periods shorter than those for which they are fallowed (Conklin, 1957). Shifting cultivation is the oldest system of cultivation of crops and is regarded as the first step in transition from food gatherer to food producer. The practice is considered to be nearly 9000 year old (Sharma, 1976). The system involves clearing of hill slope by cutting and burning of forests and bushes and growing of various crops in mixture. This form of agriculture is still prevalent in many parts of Africa, Latin America, South East Asia and the Indian subcontinent (Dwivedi, 1992). In India the practice is significant in the hill tracts of eastern and north-eastern India, Eastern Ghats, and states of Andhra Pradesh, Kerala, Karnataka, Tamil Nadu and Orissa. Shifting cultivation is frequently called as 'slash and burn' agriculture, though the term 'Swidden' is preferred by some anthropologists (Ekwall, 1955). In India, different tribes use different names such as 'Jhum' in north-east India, 'Podu' in Orissa, 'Daihya' in Madhya Pradesh and 'Kumon' in Western Ghats.

Shifting cultivation is prevalent mostly in the tropical countries. Some conservative estimates suggest that 300 million to 500 million people were engaged in shifting cultivation during 1980s (IFAD, IDRC, CIIFAD, ICRAF and IIRR, 2001). However others have argued that more than 400 million people in Asia alone are forest - dependent and that many of them are engaged in shifting cultivation. It is possible that about one billion people (22% of the total population of the developing world in tropical and subtropical countries) rely directly or indirectly on some form of shifting cultivation (IFAD, IDRC, CIIFAD, ICRAF and IIRR, 2001). In India, 22.69 lakh ha land is under shifting cultivation with estimated 607,536 families engaged in this practice (Satapathy et al., 2003). The total estimated area under the shifting cultivation in the north-eastern states is 19.82 lakh ha which is 87% of the total shifting cultivation area in the country. For ethnic tribes of north-east India 'jhum' is not just a means of their livelihood, but is often considered as a way of life. Their social and cultural events, festivals and rituals revolve around the shifting cultivation. At least 100 different indigenous tribes and sub-tribes in the seven states of north-east India depend on shifting cultivation for their subsistence (Ramakrishnan, 1992).

A growing pool of more recent literature has shown that shifting cultivation is universally unsustainable and destructive of forests and wildlife. Over three decades ago, Stracey (1967) listed a number of problems that are caused by slash-and-burn cultivation or 'jhum' practiced by indigenous tribes in north-east India. According to him, this 'primitive' form of agriculture is the major cause of loss of forest cover, erosion of topsoil, desertification, and decline in forest productivity. Others have also described 'jhum' as an inefficient form of agriculture, an impediment to progress of forestry and an agent of

destruction of biodiversity (Borah and Goswami, 1973; Dwivedi, 1993; Rao and Hajra, 1986). Such beliefs have been widespread since British times, and have even resulted in forcible suppression of the practice, oppression and relocation of tribals in Central India and other hill regions (Von Furer-Haimendorf, 1982). The national governments across the world have given high priority to discouraging shifting cultivation and facilitating the adoption of more intensive forms of agriculture (Darlong, 2000).

Detailed anthropological studies, starting with the work by Harold Conklin (1957) in the Philippines evolved a much more favourable assessment of shifting cultivation. They presented persuasive evidence that it is a rotational farming system in the context of the constraints and opportunities inherent in remote upland areas. Conklin pointed to its long history as evidence of sustainability. More recent studies point to the custodial role often played by shifting cultivation communities in preserving forest ecosystems and natural species, and to the tight linkages between biological and cultural diversity (IFAD, IDRC, CIIFAD, ICRAF and IIRR, 2001). Tiwari (2007) described the spatio-temporal patterns and processes of shifting agriculture in north-eastern India. He categorized the shifting agricultural systems in the north-eastern region into four types i.e. traditional, distorted, innovated and modified shifting agriculture.

Shifting cultivation is an age old practice whereby people started cultivation of plants for their use much before the advent of civilization. The persistence of this form of agriculture in north-east India and elsewhere in spite of all policy odds indicates some sort of benefit of this system over sedentary cultivation. The reasons for the persistence of this system of cultivation could be its suitability to the local climatic and soil conditions, economic security and its cultural value to the indigenous tribes. Absence of access to market and poor capital and technical knowledge of more commercially rewarding alternatives are other causes for not opting for other occupations. In fact, the practices associated with this form of cultivation have evolved through years of experience and traditional knowledge, wisdom and technology. This method of cultivation not only provides food security but also at times has helped in wildlife protection. For example, Wharton (1968) has provided convincing evidences that the distribution of species of large mammals in the tropics of Southeast Asia was highly dependent on shifting cultivation, as mature tropical forests conceal most of their edible products high in the canopy beyond the reach of terrestrial herbivores.

Indigenous knowledge is reflected in all practices, beliefs and rituals that form part of the shifting cultivation. It extends from details like the best way to harvest a particular crop to decisions on the declaration of certain forests as sacred and the level of community organization required to control fires while burning. (Darlong, 2000). The tribes of different regions have the knowledge of their environment and therefore have evolved various ways to enhance productivity of fallow land or to make fallow land more useful. For

example, the Noctes and Nishis of Arunachal Pradesh pollard or prune *Macaranga denticulata* and other trees at the time of clearing the forests for 'jhum'. Similary, the Wanchos leave *Schima wallichii* trees in the field. The Konyaks of Mon district, Nagaland plant *Macaranga* trees along with the crop to facilitate development of forest after cropping period is over. In Angami villages of Nagaland, Alder trees (*Alnus nepalensis*) are pollarded and left in the area. The Alder trees develop nitrogen fixing root nodules that help maintain the soil fertility and ash of the burnt leaves and twigs is mixed with soil before cultivation to improve nutrient availability to plants.

Depending on the rainfall of the area, mixed cropping is done with different crops. For instance, nitrogen fixing plants such as Soyabean in Meghalaya and Kolar bean in Nagaland are cultivated continuously with practically no intervening fallow period. Intensification of fallow management by growing non-traditional crops in the 'jhum' field in the states of Arunachal Pradesh, Mizoram and Meghalaya has been reported by Tiwari (2001). Shifting cultivation system varies tremendously in terms of intensity of fire, soil fertility management practices, legal status of land, crop composition and the goal of this land use envisaged by the farmers (Tiwari, 2007).

Shifting cultivation also embodies many elements which are eco-friendly and have conservation value. However, the practices are adapted to local communities and knowledge which is location specific. However the traditional ecological knowledge recorded from many shifting cultivation communities is often limited. The present study was undertaken with an aim to document examples of best practices of shifting cultivation among Khasi, Karbi and Garo communities of Meghalaya with special emphasis on management practices related to soil, water and biodiversity conservation.

STUDY AREA

The state of Meghalaya having an area of 22,489 km^2 is situated between 25°00' to 26°10'N latitude and 89°45' to 92°47'E longitude. The state is divided into 7 districts namely; East Khasi Hills, West Khasi Hills, Ri Bhoi, Jaintia Hills, East Garo Hills, West Garo Hills and South Garo Hills. The state has a population of 23, 06,069 (2001 census) with a density of 103 persons per square km.

The physical feature of Meghalaya is well defined in three different regions - the Khasi Hills in the Central part of Meghalaya, Jaintia Hills in the eastern part of Meghalaya and Garo Hills in the western part of Meghalaya. The State covers a wide range of elevation from 150m to 1960m above mean sea level. The climate of the State is directly influenced by the South - West monsoon and North - Eastern winter winds. The region experiences tropical monsoonic climate that varies from Western to Eastern part of the plateau. The average annual rainfall in most part of the state varies from 2000mm to 3360mm. Cherrapunjee- Mawsynram belt receives more than 12000 mm annual rainfall. There are mainly three types of soil namely, red loam on hill slopes, the laterite soil and the old alluvium soil.

The richness of the vegetation of Meghalaya is well known and has been studied by many botanists and foresters. A variety of forests are found in Meghalaya and each type harbours a rich flora and fauna. Hooker (1906) described the flora of Khasi Hills in Meghalaya as 'the richest in India and probably in the whole of Asia'.

The state is predominantly inhabited by three tribes: the Khasi, the Jaintia and the Garo. The Khasi people reside in the centre of the state, the Jaintia in the east and the Garo in the West. Khasi, Jaintia, Bhoi and War collectively known as the Hynniewtrep people, are of Austro Mon-Khmer race and Garo who prefer to call themselves as Achiks are of the Tibeto-Burman race.

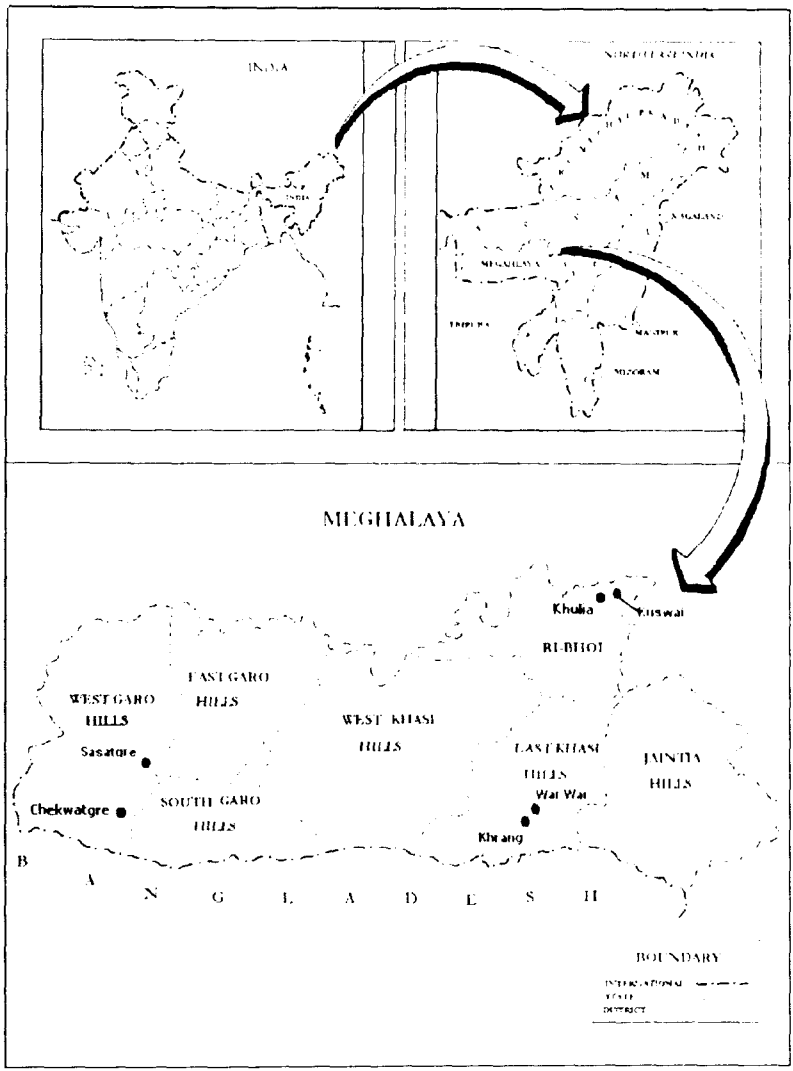

Figure 1 : Location of Study Area

Meghalaya is basically an agricultural state with about 80 per cent of its population depending entirely on agriculture for their livelihood. Shifting cultivation locally known as *jhum* is the predominant system of farming in Meghalaya. The estimated number of population engaged in it is 257140; i.e. 14% of total rural population of Meghalaya. Total area under shifting is estimated 442 sq. km i.e. 1.97% of total geographical area. (Jeeva *et al.*, 2006).

After considerable deliberations and discussions, the following criteria were developed and used for the selection of study sites:

1. The selected sites should represent diverse landscapes encompassing different topography, elevation, agro-climatic zones and geographical spread.
2. Shifting cultivation system should be widely prevalent in the selected villages.
3. The villages should be selected in such a way as to cover different ethnic communities.
4. The villages should represent the widely practiced indigenous land tenure system in Meghalaya.

The six villages selected for the study are: Kuswai, Khulia, War-War, Khrang, Chekwatgre and Sasatgre. Kuswai and Khulia fall under Umling community development block of Ri Bhoi district and are inhabited by Karbi community while Warwar and Khrang comes under Khatarshnong-Laitkroh block of East Khasi Hills district and is predominantly inhabited by Khasi community. Chekwatgre falls under Gambegre community development block of West Garo Hills and Sasatgre comes under Rongram community development block of West Garo Hills. These two villages are inhabited by the Garo community.

Ri Bhoi district is a part of Meghalaya Plateau. It is located between 25°40'N to 26°10'N latitude and 91°11'E to 92°18'E longitude. The district has an area of 2448 sq. km which represents nearly 10.91% of total area of the state. The district shares its boundary with Assam on the north, north-east and north-west and by East and West Khasi Hills districts of Meghalaya on the south and south-west by.

The East Khasi Hills district is bordered by Jaintia Hills district in the east, Ri Bhoi district in the north, West Khasi Hills district in the west and Bangladesh in the south. Its latitudinal extent is between 25°8'N to 25°43'N latitude and 91°20'E to 92°12'E longitude. Umngot and Ummanra rivers act as the natural boundary for the district in the east and west. The southern part of the district borders with Surma valley of Bangladesh. The district has an area of 2748 sq. km. It covers about 12.3 % of total geographical area of the state.

The West Garo Hills district lies on the western part of the state of Meghalaya bounded by the East Garo Hills district on the east, the South Garo Hills on the south-east, the Goalpara district of Assam on the north and north-west and Bangladesh on the south. The district has an area of 3714 sq km. The district is situated approximately between the latitudes 90°30' and 89°40' E, and between 26° and 25°20' N longitudes.

Demography of study sites

The socio-economic profile of the villages Khrang, War-war, Khulia, Kuswai, Sasatgre and Chekwatgre have been presented in the Table 1:

Table 1 : Socio-economic profile of the six studied villages						
	Villages					
	Khrang (Khasi)	War-war (Khasi)	Khulia (Karbi)	Kuswai (Karbi)	Sasatgre (Garo)	Chekwatgre (Garo)
Demography						
Geographical area (ha)	1508	69	890	343	678	700
No. of household	102	38	49	30	61	33
Total population	430	193	300	280	305	278
Family size	5	6	7	7	6	6
Shifting cultivation area (ha)	98	18.31	100	43	41	50
Mean shifting cultivation area per household (ha)	1.03	0.61	2.2	1.4	0.69	1.67
Occupation and Education						
Percentage of families involved in shifting cultivation	93	78	92	100	97	91
Postgraduates (Number)	0	0	0	0	0	1
Graduates (Number)	4	1	2	0	0	4
Higher Secondary (Number)	0	2	4	5	16	3
Secondary (Number)	17	10	30	20	219	80
Primary (Number)	70	50	100	50	65	171
Amenities						
Health facilities	✓(1)	x	x	x	x	x
Veterinary services	✓(1)	x	x	x	x	x
Road connectivity	✓	✓	✓	✓	✓	✓
Electricity	✓	✓	✓	✓	✓	✓
Drinking water	✓	✓	✓	✓	✓	✓
Telephone connection	✓	✓	✓	✓	✓	✓
School	✓(1)	✓(1)	✓(3)	✓(2)	✓(1)	✓(1)

Note : Figures in bracket indicate number of a particular type of amenity in the village; ✓ = Present; x = Absent. The name of the tribe inhabiting the village is given in parenthesis

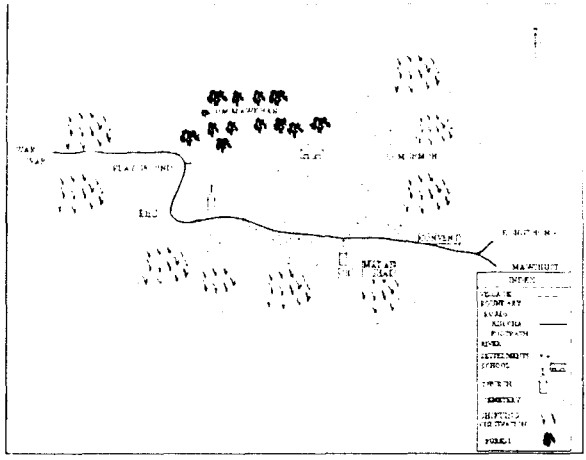

Figure 2 : Landscape elements of Khrang village

In Khasi Hills, Khrang village has a geographical area of 1508 ha with a total population of 430. There are 102 households in the village and the average family size is 5. The shifting cultivation area is 98 ha and 93% of the families are involved in shifting cultivation. The shifting cultivation area per household is 1.03 ha. There are 4 graduates, 17 secondary and 70 persons have completed primary education. Basic amenities like health facility, veterinary services, road connectivity, electricity, drinking water, telephone connection and school are all available in the village. In War-war village, the total geographical area is 69 ha with a total population of 193. The number of households is 38 and the average family size is 6. The shifting cultivation area is 19 ha and 78% of the families are involved in shifting cultivation. The shifting cultivation area per household is 0.61 ha. There are 1 graduate, 2 higher secondary, 10 secondary and 50 persons have completed primary education. The basic amenities of the village are: road connectivity, electricity, drinking water, telephone connection and school. There is no healthcare facility in the village (Table 1).

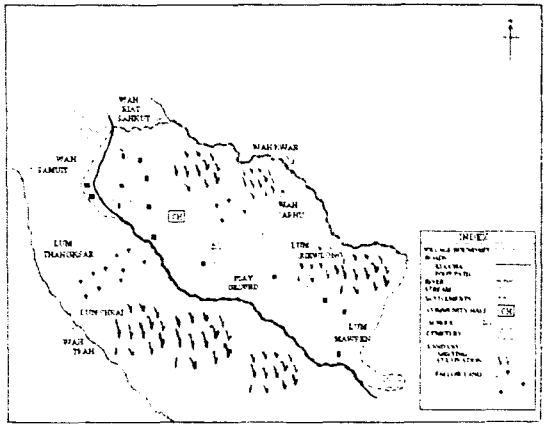

Figure 3 : Landscape elements of War- War village

In Ri Bhoi district, Khulia village has a total geographical area of 890 ha. The total population of the village is 300. There are 49 households with an average family size of 7. The shifting cultivation area in the village is 100 ha and 92% of the families are involved in shifting cultivation. The mean shifting cultivation area per household is 2.2 ha. None of the villagers has the post graduate degree and only 2 persons have completed graduation. Only 4 and 30 persons have passed higher secondary and secondary level examinations, respectively. 100 persons have completed primary level education. The basic amenities of the village are road connectivity, electricity, drinking water, telephone connection and school. There is no healthcare facility and no veterinary service in the village. Kuswai village has a total geographical area of 343 ha with a total population of 280. The number of households in the village is 30 and the average family size is 7. The total area under shifting cultivation is 43 ha and 100% of the families are involved in shifting cultivation. The shifting cultivation area per household is 1.4 ha. There are no post graduates and graduates in the village. Only 5 persons have passed higher secondary, 20 secondary and 50 persons have completed primary education. The basic amenities like road connectivity, electricity, drinking water, telephone connection and school are present in the village. There is no healthcare facility and veterinary service in the village.

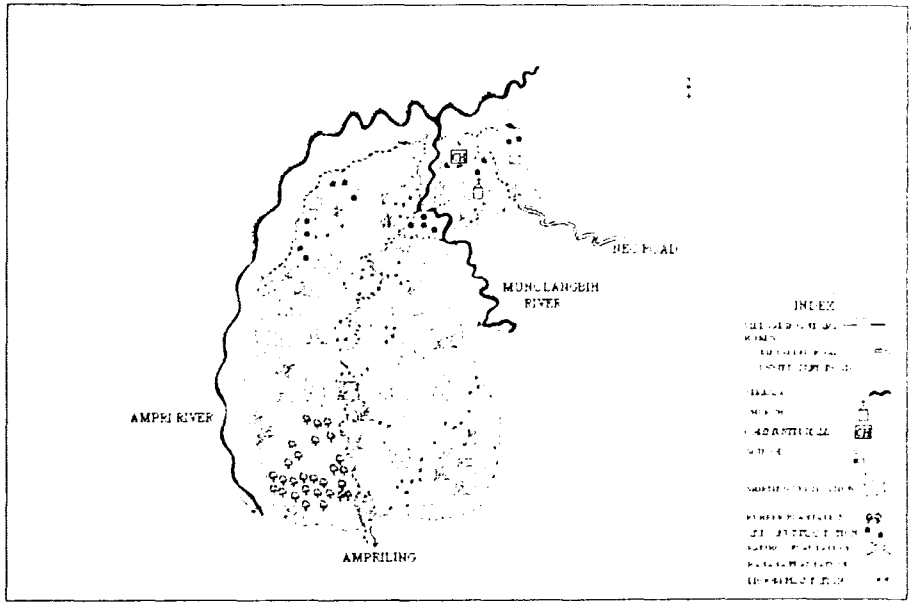

Figure 4 : Landscape elements of Khulia village

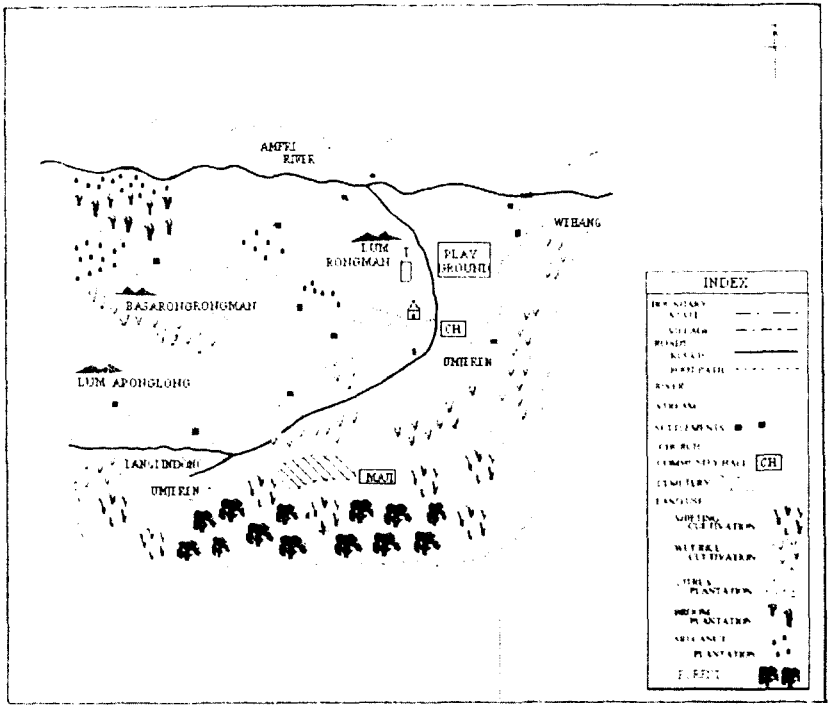

Figure 5 : Landscape elements of Kuswai village

In Garo Hills, Sasatgre village has a total geographical area of 678 ha with a total population of 305. The total number of households in the village is 61 and the average family size is 6. The shifting cultivation area is 41 ha and 97% of the families are involved in shifting cultivation. The shifting cultivation area per household is 0.69 ha. There is no one in Sasatgre village having graduation and post graduation degree, however, 16 persons have passed higher secondary, 219 secondary examinations and 65 persons have completed primary education. Basic amenities like road connectivity, electricity, drinking water, telephone connection and school are present in the village. There is no healthcare facility and veterinary service in the village. The total geographical area is 700 ha with a total population of 278. There are 33 households in the village with an average family size of 6. The shifting cultivation area is 50 ha and 91% of the families are involved in shifting cultivation. The shifting cultivation area per household is 1.67 ha. There are 1 postgraduate and 4 graduates in the village. Only 3 persons have passed higher secondary, 80 secondary and 171 persons have completed primary level education. Basic amenities like road connectivity, electricity, drinking water, telephone connection and school are present in the village but there is no health care facility and veterinary service in the village.

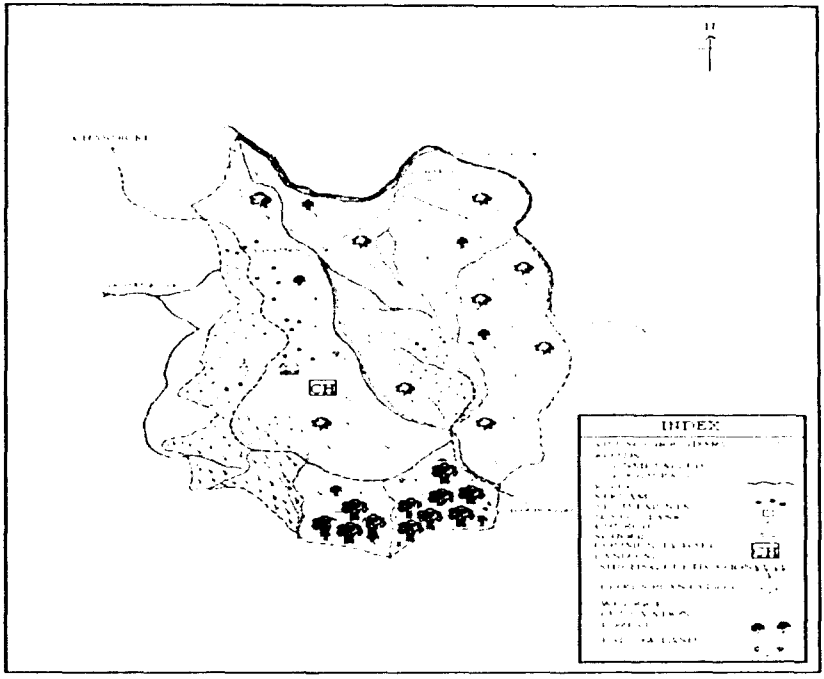

Figure 6 : Landscape elements of Sasatgre village

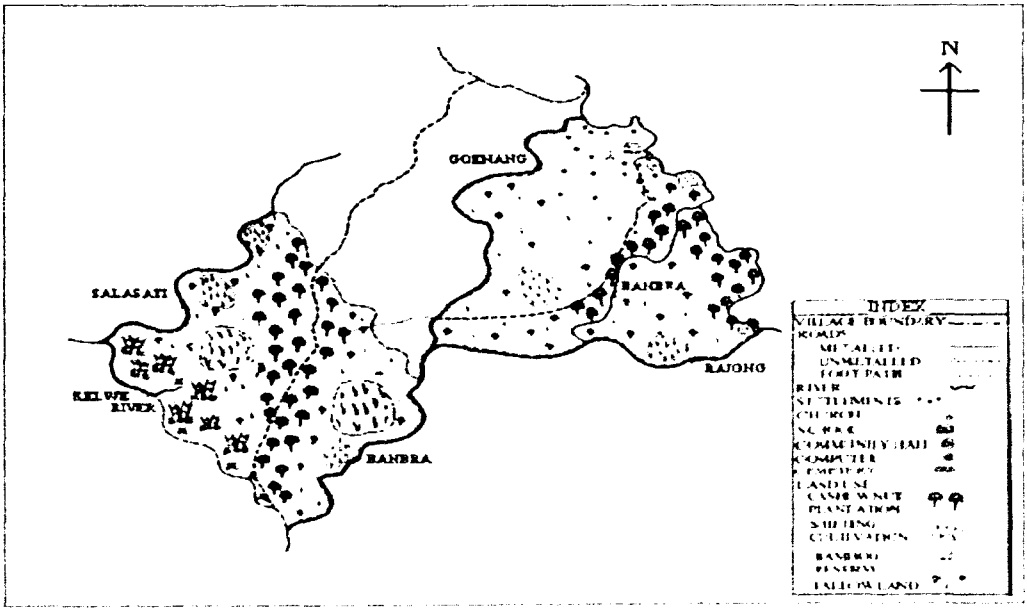

Figure 7 : Landscape elements of Chekwatgre village

METHODOLOGY

Both secondary and primary data were collected for the study. The secondary data pertaining to total estimated area and total rural population engaged in shifting cultivation have been collected from district level government publication viz., statistical reports. Primary data was collected through structured questionnaire - based survey and through discussions with the village communities and village headmen. While making questionnaires the parameters taken into considerations and the methodology followed are given below:

i) **Socio-economic and demographic data:**

The primary data pertaining to socio-economic and biophysical resources were collected through PRA, household survey, discussions and resource mapping. Village level questionnaires were used for gathering informations related to socio-economic condition of the people and available biophysical resources in the village(Appendix I). Household questionnaires were used for collecting household level data. At least 10% of the households were selected for household survey (Appendix II).

A resource map was drawn with the help of the local people from the village for mapping/identification of available biophysical resources, depicting forest types, roads, settlements, water resources and broad categories of land use elements found in the area. Particular emphasis was given on shifting cultivation areas. The study team accompanied by a local representative undertook a transect walk across the village to validate the various resource survey data as given by the villagers during discussions and resource mapping.

ii) **Management practices:**

The data and information on management practices were collected through focused group discussions and short group discussions with the village elders. Spot visits were also made to the shifting cultivation fields by the research team with the local people that combined the well known methods of walk, talk and see.

CHAPTER 1

SHIFTING CULTIVATION PRACTICES IN KHASI HILLS

The shifting cultivation practiced in War-War and Khrang villages of East Khasi Hills district and in Khulia and Kuswai villages of Ri Bhoi district showed considerable differences. The Khasi communities in War-War and Khrang villages locally call shifting cultivation as *rep shyrti* while the Karbi people in Khulia and Kuswai villages call it as *ret*. Shifting cultivation is practiced extensively in these villages and is one of the main occupations and sources of their livelihood. It is intertwined with the life of the people living in these areas which they have been practicing since time immemorial.

The shifting cultivation plots in these villages are privately owned. In War-War and Khrang villages where more than 80% of the people are landless, most people practice shifting cultivation on rented fields owned by the people from their own villages or from other villages. It was found that people from other nearby villages also hire the field in War-War and Khrang Village for shifting cultivation.

Steps involved in shifting cultivation

The activities involved in shifting cultivation in the two districts of Khasi Hills vary according to terrain, climate, edaphic condition, distance from human settlements, manpower availability and type of crops. However despite the variations, the basic features of shifting cultivation in these villages and many other parts of the areas are quite similar. This includes: slashing and clearing of forest vegetation either fully or partially, burning of biomass after drying, mixed cropping for a limited period and leaving the land fallow for regeneration of forests on the original plot for the process to be repeated once again in future. The activities taken up during different months of the year in the jhum cycle by both the Khasi and Karbi communities inhabiting Khasi Hills are presented in Table 2 and Table 3.

Table 2 : Jhum calendar of Khasi communities in East Khasi Hills

Jhum activities	Months											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Slashing												
Burning												
Fencing												
Field preparation												
Sowing												
Weeding												
Harvesting												

Table 3 : Jhum calendar of Karbi communities in Ri Bhoi district.												
Jhum activities	**Months**											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Slashing												
Burning												
Fencing												
Field preparation												
Sowing												
Weeding												
Harvesting												

Ownership of Land and site Selection

As the land in these villages are privately owned, the question of site selection does not arise except in case of landless people in War-War and Khrang if sufficient land is available for rent the site selection in such case takes place during November-December (Table-4).

Table 4 : Ownership of shifting cultivation lands			
Villages	**Private**	**Community**	**Rented**
War-War (Khasi)	✓	x	✓
Khrang (Khasi)	✓	x	✓
Khulia (Karbi)	✓	x	x
Kuswai (Karbi)	✓	x	x

Note : ✓ = Present; x = Absent. The name of the tribe inhabiting the village is given in parenthesis

Slashing and Clearing

Slashing and clearing of forest vegetation in village War-War and Khrang (East Khasi Hills) are carried out during November to February while in Khulia and Kuswai during February- March. The slashing and clearing involves felling of the small trees/shrubs, pollarding of the trees and slashing of the undergrowth. The debris felled after slashing and felling are then collected in heaps for drying. Short tree stumps and large tree boles are left intact in most of the fields in War-War and Khrang while in Khulia and Kuswai only large trees are retained. This laborious work of slashing and clearing is usually carried out by male members from their own families or by hired laborers.

Burning

Within a gap of two to three months after slashing and clearing when the collected debris get dried, burning is started. Towards the end of February or beginning of March in

War-War and Khrang villages the debris collected together with the standing trees are burnt *in situ* while in Khulia and Kuswai villages this task is carried out during March-April. Before burning the fire lines measuring 7-9 ft in width are made by cleaning the vegetation around the plot to be burnt to check the spread of fire. The burning is usually carried out in late afternoon or evening between 3-6 p.m. Burning is often repeated to reburn any unburnt material. Burning of the plots is also done by male members of the family together with hired labourers if needed.

Field Preparation

After burning, the farmers inspect the plots and reburn any unburnt material and clean the field to prepare for sowing. Demarcation of the fields is also made during this time by placing the bamboo poles around the plots. In War-War and Khrang villages after dressing the patches numerous young wood poles are laid across the slopes in a staggered manner (Plate 1.7). Here field preparation is usually done during February-March, while in Khulia and Kuswai villages it is done during April-May. Before sowing they make a hut with thatch and bamboo locally called *trep* for storage of materials and for use as a rest house.

Cropping

In shifting cultivation, mixed cropping is followed (Fig.2). Sowing is done immediately after field preparation. The methods carried out during sowing of crops are broadcasting, dibbling and hoe sowing. The types of sowing method practiced for each crop in the four villages studied is given in Table 5. Simple tools are used in this method like a sharp stick made of bamboo, and a hoe (locally known as *mohkhiew* in Khasi *and ku* in Karbi) which are locally available. A mixture of cereal, pulse, oilseed, vegetable and tuber crops is planted in all the four villages. Although most of the crops grown by the farmers are for self consumption, the surplus produce are also sold in the markets for cash income. In War-War and Khrang villages the major cash crops sown are: potato, maize and colocasia. While in Khulia and Kuswai villages ginger is the main cash crop followed by potato, colocasia, pumpkin and chili to some extent. In all, 14 to 16 crops are grown in War-War and Khrang villages while 24 crops each are in Kuswai and Khulia villages. The crops sown in the four villages studied in Khasi Hills with their sowing month, harvest month and production are given in Table 6 to Table 9. The first sowing in War-War and Khrang villages starts in March and continues till the last week of May (Table 2), while in the other two villages it starts a little later in the month of April-June (Table 3). The first crops planted by both the communities are tuber crops like colocasia and potato followed by cereals and vegetables.

Table 6 : Production of crops grown in jhum fields of War-War village				
Crops	**Months of sowing**	**Months of harvest**	**Percentage of families growing the crop**	**Average yield(kg/ha)**
Cereals				
Maize	March-April	June-July	55	187
Millet	March-April	Nov- Dec	10	211
Sohriew (seed)	March-April	Nov-Dec	52	41
Vegetables				
Pumpkin	March-April	June-July	10	24
Jaiing (leaf)	March-April	June-July	55	149
Soyabean	March-April	Nov-Dec	62	16
Cucumber	March-April	June-July	28	243
Tuber crops				
Colocasia	March-April	Nov-Jan	76	109
Potato	Feb-March	June-July	97	260
Sweet potato	Apr- May	Nov-Dec	21	256
Tapioca	March-April	Nov- Dec	10	113
Spices				
Turmeric	March-April	Nov-Dec	3	56
Ginger	March-April	Nov-Dec	17	51
Sesame	March-May	Nov- Dec	69	13

Table 7 : Production of crops grown in jhum fields of Khrang village				
Crops	**Months of sowing**	**Months of harvest**	**Percentage of families growing the crop**	**Average yield(kg/ha)**
Cereals				
Maize	March-April	June-July	71	259
Millets	March-April	Nov- Dec	46	165
Sohriew (seed)	March-April	Nov-Dec	79	180
Vegetables				
Beans	April-May	Nov-Dec	11	57
Bitter gourd	April-May	June-July	7	30

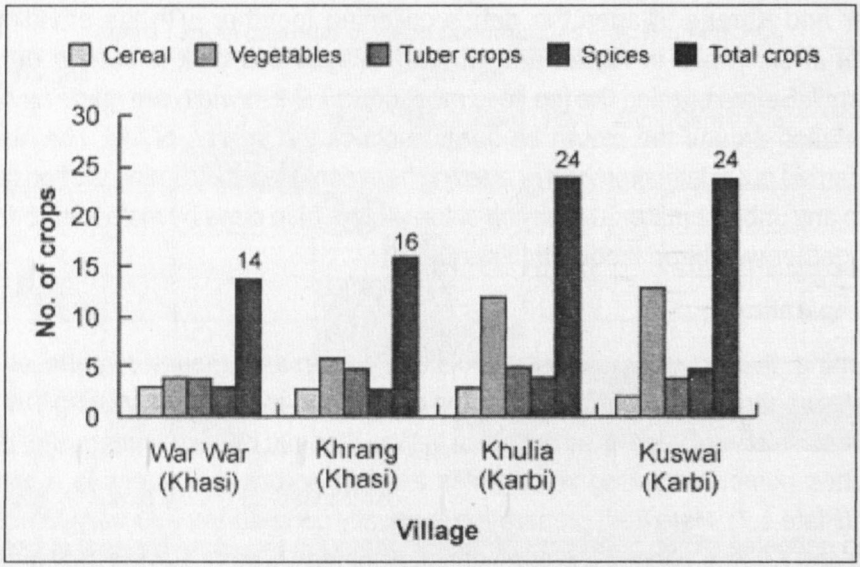

Fig 8 : Various categories of crops grown in the four villages of Khasi Hills

(The name of the tribe inhabiting the village is given in parenthesis)

Table 5 : Methods of crop sowing in the four villages of Khasi Hills

	Crops			
Sowing method	**War-War (Khasi)**	**Khrang (Khasi)**	**Khulia (Karbi)**	**Kuswai (Karbi)**
Broadcasting	Jaiing (leaf), Millets and Sesame	Jaiing (leaf), Millets and Sesame	Konidhan (cereal), Chili, Paddy and Sesame	Brinjal, Chili, Paddy and Sesame
Dibbling	Cucumber, Maize, Pumpkin and Soyabean	Bean, Bitter gourd, Coix (sohriew), Cucumber, Maize and Soyabean,	Bangi (fruit), Tita Begona (fruit), Bitter gourd, Cucumber, Dioscorea, Jhika (fruit), Lady's finger, Lao, Maize, Mesta, Pumpkin, White and Watermelon.	Bean, Bitter gourd, Cucumber, Garlic, Jhika (fruit), Lady's finger, Lao, Pumpkin, Maize, Mesta, Sponge gourd, Watermelon and White pumpkin,
Hoeing	Colocasia, Ginger, Potato, Sweet potato, Tapioca and Turmeric	Colocasia, Dioscorea, Ginger, Potato, Sweet Potato, Tapioca and Turmeric	Colocasia, Ginger, Potato, Sweet Potato, Tapioca and Turmeric	Banana, Colocasia, Ginger, Potato, Sweet Potato Tapioca and Turmeric

Cucumber	March-April	June-July	50	255
Jaiing (leaf)	March-April	June-July	54	914
Pumpkin	April	Nov-Dec	50	110
Soyabean	Mar-April	Nov-Dec	79	30
Tuber crops				
Colocasia	March-April	Nov-Jan	100	642
Dioscorea	March-April	Nov- Dec	7	450
Potato	Feb-March	June-July	93	672
Sweet potato	Apr- May	Nov-Dec	11	1524
Tapioca	March-April	Dec-Jan	14	2000
Spices				
Chilli	March-April	June-July	7	31
Ginger	March-April	Nov-Dec	36	190
Sesame	March-May	Nov- Dec	64	67

Table 8 : Production of crops grown in jhum fields of Khulia village

Crops	Months of sowing	Months of harvest	Percentage of families growing the crop	Average yield(kg/ha)
Cereal				
Konidhan (cereal)	April-May	Sept-Dec	13	15
Maize	May-June	Sept-Oct	9	2
Paddy	April-June	Sept-Dec	100	172
Vegetables				
Bangi (fruit)	May-June	July-Aug	13	37
Bitter gourd	May	July-Aug	26	2
Cucumber	May-June	Jul-Nov	65	9
Jhika (fruit)	May	Aug-Sept	35	6
Lady's finger	May	Aug-Sept	26	3
Lao	May	Sept-Dec	30	6
Pumpkin	May-June	Sept-Nov	87	12

Mesta	May-June	Aug-Nov	70	18
Tita begona (fruit)	May	Jul-Aug	4	1
Watermelon	May-June	Aug-Oct	13	21
White pumpkin	May-June	Jul-Nov	43	9
Tuber crops				
Colocasia	April-May	Nov-Dec	91	14
Dioscorea	April-June	Nov-Dec	4	25
Potato	April-May	Oct-Nov	4	27
Sweet potato	April-June	Nov-Dec	4	14
Tapioca	April-May	Sept-Dec	65	29
Spices				
Chili	June	Aug-Dec	9	4
Ginger	April-May	Nov-Jan	35	98
Sesame	May-June	Nov-Dec	56	8
Turmeric	April-May	Nov-Dec	83	12

Table 9 : Production of different crops grown in jhum areas of Kuswai village

Crop	Time of sowing	Harvesting time	Families growing the crop %	Average yield(kg/ha)
Cereal				
Maize	Apr-May	Sept-Oct	23	2
Paddy	Apr-May	Sept-Dec	95.5	164
Vegetables				
Banana	May-June	Sept-Jan	27	102
Bean	May-June	Aug-Nov	4.5	13
Bitter gourd	May-June	Aug-Nov	54.5	31
Brinjal	May-June	Aug-Nov	27	17
Cucumber	May-June	Jul-Nov	27	132
Jhika (fruit)	May-June	Aug-Sept	45.5	4
Lao	May-June	Sept-Dec	36	50

Lady's finger	May	Sept- Nov	55	4
Mesta	May-June	Aug-Nov	59	65
Pumpkin	May-June	Sept-Dec	82	13
Sponge gourd	May-June	Sept-Dec	9	59
Watermelon	May-June	Sept	27	13
White pumpkin	May-June	Jul-Nov	32	5
Tuber crops				
Colocasia	Apr-May	Dec-Jan	90	32
Potato	Apr-May	Oct-Nov	32	38
Sweet potato	Apr-May	Nov-Dec	4.5	5
Tapioca	Apr-May	Sept-Dec	50	18
Spices				
Chili	June	Aug-Dec	50	134
Garlic	April-May	July-Sept	9	197
Ginger	April-May	Nov-Jan	68	178
Sesame	May-June	Nov-Dec	50	48
Turmeric	April-May	Nov-Jan	86.4	117

Weeding

Weeding is also one of the main activities in shifting cultivation which is usually done by women even though men and children also take part. It is the most time consuming and tedious activity of the cropping period. The Khasi community in War-War and Khrang villages does weeding (locally called as *thiew kynbat* or *thiew niut)* twice in a year. The first weeding is done during June-July and the second weeding is carried out after the rainy season in September-October. This is usually done by hand or using simple instruments such as hand knives and a sort of a long knife attached to a wooden handle locally known as *wait.* The Karbi farmers in Khulia and Kuswai villages also do weeding (locally known as *bap kephu)* two times,the first weeding in early July and the second in August.

Harvesting

Harvesting of crops is done in different periods for different crops as they are sown at different times. It is carried out almost continuously for a period of nine months from June to February in Khulia and Kuswai villages while in War-War and Khrang villages

the farmers harvest the crops during June-July, and during November - January. Harvesting is done differently depending on the type of crop. Some crops are plucked with hands like maize, pumpkin, cucumber and others are harvested by using simple tools such as *mohkhiew* and spatulas for root crops while leafy vegetables are harvested using knives and sickles. There is no proper storage facility or granary in most household. The crops after harvesting are brought from the field to the settlements carried in bamboo baskets locally called as *'Khoh'* (Plate 1.9) by the Khasi communities in War- War and Khrang while the Karbis call the basket *'Hap'* (Plate 1.10). This activity is done by both men and women.

Fallow-period

The cropping on the jhum land is done only for one year, after which the land is left fallow. In earlier times when the lands were plentiful, fallow periods used to be long enough to restore soil fertility. But with the increasing population, the pressure on land has increased and farmers are compelled to reduce the fallow period. In War-War and Khrang villages the lands are left fallow for a period of 8-15 years and 10-15 years, respectively (Table 7). In Khulia and Kuswai villages the fallow period is only for 3-5 years. During this period the land is totally set aside without any form of management practice. Except in Khrang village where on some fallow land the farmers plant bay leaf, jackfruit and black pepper and in Kuswai village banana and broom grass are planted (Table 7).

Table 10 : Jhum cycle and fallow management in Khasi Hills

Village	Cropping Period (year)	Fallow Period (years)	Fallow Management
War-war (Khasi)	1	8-15	Left as such
Khrang (Khasi)	1	10-15	Bay leaf, jackfruit and black pepper plantation.
Khulia (Karbi)	1	3-5	Left as such.
Kuswai (Karbi)	1	3-5	Banana and broom plantation.

The name of the tribe inhabiting the village is given in parenthesis

Field observation

Visual observations revealed several interesting facts. It was seen that the clearing of the forest vegetation was not done completely in most of the jhum fields. Both the communities (i.e. the Khasi and the Karbi) retain important tree species in jhum fields. These trees were used for house construction and furniture, timber, firewood and also for honey bee rearing. Fruit bearing trees were also not cut (Table-11).

In War-War and Khrang villages numerous tree stumps are left standing after slash and burn operation to support the climbers and twiners to grow and to check soil erosion and to retain soil moisture (Plate 1.4 and 1.5). It was also noticed that more stumps were left on steep slopes than on gentle slopes. The dead stumps are collected and used for fuelwood after harvesting the climbers and twiners. But in Khulia and Kuswai villages this practice was not found, instead *Bambusa tulda* (jatibha) was planted along the boundaries of jhum fields for checking soil erosion. It was also observed that before sowing, rows of bamboo and young wood poles are laid across the slope in a staggered manner which act as barriers against erosion of soil and also help retain soil moisture and fertility (Plate 1.7). Along these woody barriers, potatoes are sown and after the potatoes are dug out the poles are removed and used for fuelwood (Plate 1.8). This practice was seen in the Khasi community of Khrang and War-War villages. In all the four villages it was observed that to divert the flow of water in fields located in steep slopes water channels were constructed. This was done for checking soil erosion. The poles laid in the field also help in control of termites (Dr. A. S. Panwar Personal communication).

Table 11 : Trees retained in shifting cultivation fields in Khasi Hills

Village	Tree species	Purpose
War-war (Khasi)	*Artocarpus champaca*, *Betula alnoides*, *Castanopsis tribuloides*, *Citrus* sp., *Ficus bengalensis*, *Litchi chinensis*, *Mallotus nepalensis*, *Mangifera indica*, *Musa* sp., *Myrica esculenta*, *Prunus nepalensis*, , *Quercus* sp. and *Schima wallichi*	Honeybee rearing, fuel wood, fruits.
Khrang (Khasi)	*Castanopsis tribuloides*, *Cinnamomum tamala*, *Duabanga grandiflora*, *Engelhardlia spicata*, *Eurya japonica*, *Eurya acuminata*, *Michelia champaca* and, *Schima wallichi*.	House construction, furniture and fuel wood.
Khulia (Karbi)	*Albizia procera*, *Artocarpus* sp., *Cassia fistula*, *Duabanga* grandiflora, Gmelina arborea, Michelia champaca, Shorea *robusta*, *Tectona grandis* and *Toona ciliata*,	House construction, furniture and fuel wood.
Kuswai (Karbi)	*Artocarpus chapalasa*, *Cassia fistula*, *Duabanga grandiflora*, *Gmelina arborea*, *Litchi chinenses*, *Michelia champaca*, *Schima wallichi*, *Shorea robusta*, and *Toona ciliata*,	House construction, furniture, fruits, fuel wood.

CHAPTER 2

SHIFTING CULTIVATION PRACTICES IN GARO HILLS

Shifting cultivation is widely practiced across the hilly tracts of Garo Hills. Sasatgre and Chekwatgre villages of West Garo Hills district were selected for the study which are predominantly inhabited by the people belonging to Garo tribe. Shifting cultivation is known as *'A.ba'* by the Garo communities and it is a means of livelihood of a large population of village communities in Garo Hills. The shifting cultivation plots in Garo Hills are community land and are under the ownership/custodianship of the *Nokma* (Village Headman and traditional chief).

Table 12 : Jhum calendar for Garo people living in Sasatgre and Chekwatgre villages

Jhum activities	Months											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Allotment and site selection											■	■
Slashing	■											■
Burning			■									
Field preparation			■									
Sowing			■	■								
Weeding					■		■					
Harvesting	■							■	■	■	■	■

In the two studied villages, though inhabited by the same community, the practices and local knowledge associated with shifting cultivation differ slightly from each other. Differences are observed in the crop mixtures, length of cropping and fallow periods and method of cultivation. However, despite the dissimilarities, the jhum calendar depicting various activities and the nature of gender participation in these activities are noticeably similar and are summarized in Table 12.

Site selection and allotment of jhum plots

The selection of jhum plots is made during November-December in both villages. However, the selection of site in Sasatgre is done for whole village community and it is done on one hillock. After selection of sites for the coming year cultivation, the village people gather in *Nokma's* house during the same months, and then *Nokma* allots the plot of land to each household. The size of plot allotted to each household varies from 0.2-1.25 ha depending on the household size and capacity of the family to do the work. In Chekwatgre village, the jhum plots are not in one hill, it is scattered within the village and the individual family selects the land they intend to cultivate. In a meeting called by the

Nokma for the allotment of plots, these families bring to the notice of the whole village community the selected piece of plot. Taking into consideration the household size and the number of working hands in the family, the *Nokma* allots the land which the families have identified.

Slashing and Clearing

Jungle clearing takes place in the month of December-January both in Sasatgre and Chekwatgre villages. The process of clearing which takes more than a month is labour intensive and is done with the help of indigenous and hand - held tools. The community as a whole is collectively responsible for the clearing of the selected piece of land in Sasatgre while in Chekwatgre the clearing is done by the respective family to whom the land has been allotted. Both adult males and females take active part in slashing of the vegetation of jhum fields. The shrubs, herbs and trees are slashed and left in the field for drying during winter months. All trees are not cut from ground level. Also some trees are left standing which are used as a support for the climbers.

Fire line cutting

"*Agal gala*" or fire line cutting is done just before the burning in order to prevent the spread of fire to other areas. A minimum spacing of 2-4 metres in Sasatgre village and 1.5-2 metres in Chekwatgre village is cleared between the jhum plots and the adjoining natural vegetation or forest.

Burning

The dried debris as well as the trees standing in the plot are set on fire during 2nd or 3rd week of March. In both Sasatgre and Chekwatgre villages, people prefer broadcast burning technique because it requires the least labour. However, in Sasatgre village, the burning operation is done together as a community and only adult males take part in this operation. While in Chekwatgre, burning operations is done by individual families or sometimes they take help from friends or neighbours. The cultivators take care that the fire does not spread outside the jhum plot. After the burning is complete, the unburnt or partly burnt debris are collected in one place and reburnt.

Cropping

Before sowing starts evil spirits are worshipped and sacrifices are made to *Misi Saljong* (The Great Giver) for good crop and prosperity of the family, the ritual, locally known as *"agalmakka"* is performed on the next day of burning and is done by the individual jhum farmers in their respective jhum fields. But now sacrifices before sowing the crops is not a common practice in these two studied villages since most of the households have converted to Christianity. Three types of sowing methods are practiced in the two studied villages (Table 13). Seeds of crops like millets, chilies, brinjal, and local lettuce are mixed

Plate 1.1: Shifting cultivation areas


Plate 1.2 : Burning of the slash

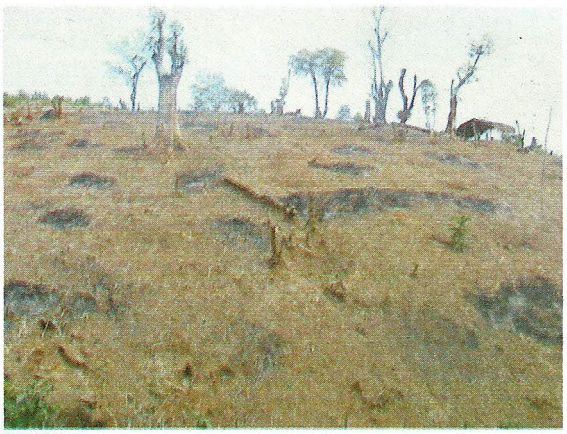


Plate 1.3 : The jhum field after burning

Plate 1.4 : Field preparation after burning

Plate 1.5 : Jhum field prior to sowing

Plate 1.6 : Trees after slash and burn.

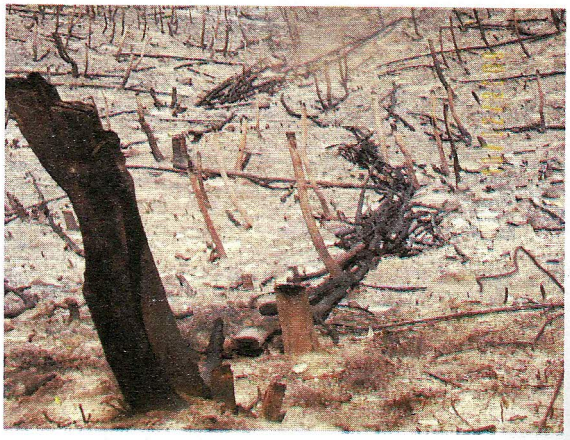

Plate 1.7 : Poles stack along water courses.

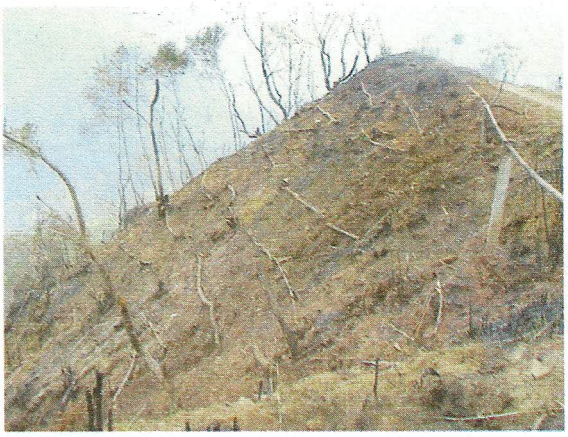

Plate 1.8 : Poles laid across the slopes in staggered manner.

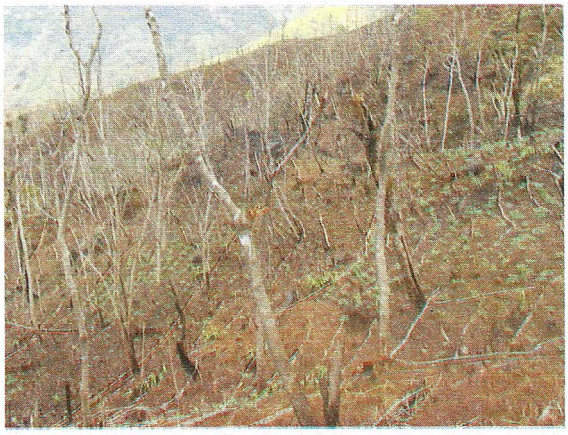

Plate 1.9 : Potatoes grown along the sides of woody barriers.

Plate 1.10 : Thatch areas left uncleared.

Plate 1.11 : Poles supporting climbers and twiners

Plate 1.12 : *Khoh* (Khasi basket)

Plate 1.13 : *Hap* (Karbi basket)

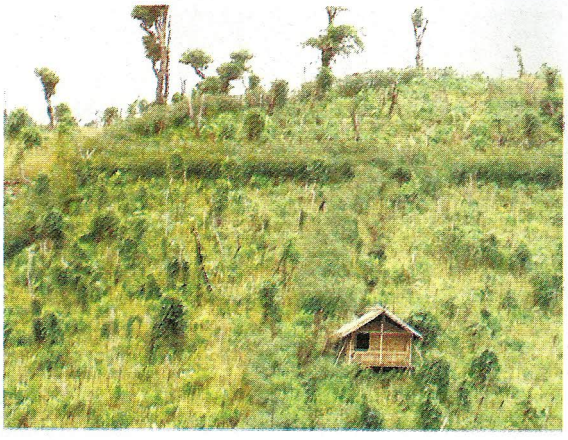

Plate 1.14 : Hut constructed in jhum field

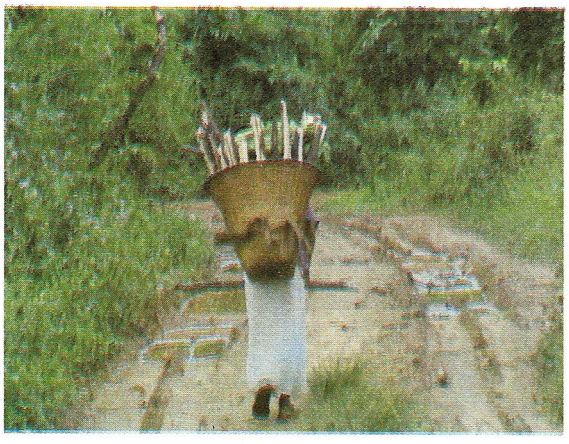

Plate 1.15 : Woman carrying produce from jhum field

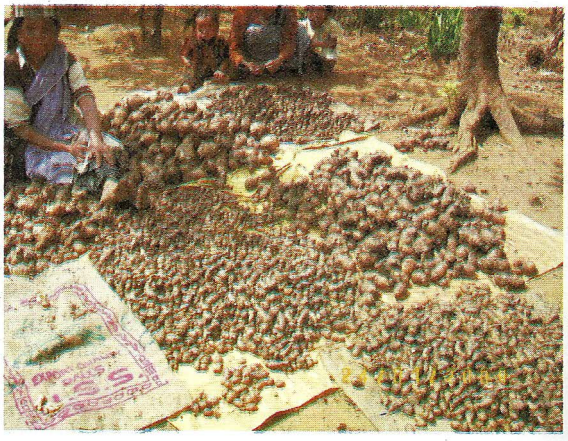

Plate 1.16 : Produce from jhum fields in Meghalaya

with dry soil from the site to ensure uniform distribution and broadcasted preferably on the next day of burning. Sowing and dibbling of other crops like paddy, maize and some vegetables will follow thereafter. Hoeing method is adopted for sowing of tuber crops like ginger, colocassia, tapioca etc. Sowing of all the crops are completed by the end of April. The soil is never ploughed and no irrigation is done. Fencing of the individual jhum plots is not practiced in both in Sasatgre and Chekwatgre villages. However, in Sasatgre village farmers grow tapioca along the boundary of their plots which acts as a demarcation between the plots.

So far as the cropping patterns are concerned, the jhum farmers adopt mixed cropping. The farmers in both the villages grow a mixture of cereals, vegetables, oilseeds, tuber crop, spice crop, fibre crop along side of fruit bearing and fuel wood and timber trees. Among the cereals — rice, maize, millets are the principal crops. The crops sown, the number of families growing the crops and the average yield of each crop are presented in Table 14 and Table 15. The important vegetables grown are: tomato, brinjal, sponge gourd, pumpkins, cucumber, melons, gourds, local beans, sorrels, lady's finger and local lettuce. A total of 28 and 35 crops are grown in the shifting cultivation fields of Chekwatgre and Sasatgre villages, respectively.

Soon after the sowing of the crops is completed, the cultivators of Sasatgre village build a small miniature house called *'Jamatal'* in their jhum fields which is used to store the harvested grains. In Chekwatgre village *Jamatal* or the field house was not seen.

Table 13 : Methods of crop sowing in two villages of Garo Hills

Sowing method	Crops	
	Sasatgre	**Chekwatgre**
Broadcasting	Brinjal, Chilli, Lai sak (leaf), Local lettuce, Millet, Sesame	Brinjal, Chilli, Lai sak (leaf), Local lettuce, Millet, Sesame
Dibbling	Apolka (fruit), Anem (legume)Bean, Bilik (legume), Cucumber, Gourd, Jingka (fruit), Kanem (legume), Karek (fruit), Lady's finger, Lau, Maize, Mesta, Melon, Paddy, Pumpkin, Solanum, Sponge gourd, Tomato	Bean, Bilik (legume), Cotton, Cucumber, Gourd, Kharek (fruit), Jingka (fruit), Lady's finger, Lau, Lentil, Maize, Melon, Mesta, Paddy, Pumpkin.
Hoeing	Colocasia, Dioscorea, Ginger, Onion, Sweet potato,Turmeric, Tapioca, Tajong (tuber), Tamatchi (tuber), Te.e raja (fruit).	Banana, Colocasia, Ginger, Pineapple, Tapioca, Tajong (tuber), Tama (tuber)

Table 14 : Production of crops grown in shifting cultivation fields of Sasatgre village				
Crops	**Months of sowing**	**Months of harvest**	**Percentage of families growing the crop**	**Average yield(kg/ha)**
Cereals				
Maize	March-April	June-Aug	74	550
Millet	March-April	Aug-Sep	63	204
Paddy	March-April	Aug-Sep	96	632
Vegetables				
Gourd	March-April	Sep-Nov	63	179
Anem (legume)	March-April	Dec	15	90
Apolka (fruit)	March-April	July-Sep	7	385
Solanum/Baring Kimkha	March-April	June-Aug	26	129
Brinjal (kg)	March-April	July-Sep	93	632
Tomato	March-April	June-Aug	19	150
Bilik (Legume)	March-April	Oct-Nov	19	173
Cucumber	March-April	June-Aug	44	169
Lady's finger	March-April	June-July	52	85
Mesta	March-April	June-Sept	37	235
Local lettuce	March-April	May-June	33	351
Beans	March-April	Oct-Nov	67	264
Pumpkin	March-April	Sep-Oct	100	259
Jingka (fruit)	March-April	Oct-Nov	4	80
Kanem (legume)	March-April	Dec-Jan	22	47
Karek (fruit)	March-April	Aug-Oct	56	94
Lai sak (leaf)	March-April	May-June	19	436
Lau (kg)	March-April	Sep-Nov	37	88
Sponge gourd	March-April	June-Aug	4	25
Melon	March-April	Aug-Oct	48	374
Tee-raja (fruit)	March-April	Aug-Sep	11	80
Spices				
Ginger	March-April	Dec-Jan	85	3363

Turmeric	March-April	Dec-Jan	4	75
Chilli	March-April	Aug-Dec	93	261
Onion	March-April	Sep	4	38
Sesame	March-April	Nov-Dec	48	22
Tuber crops				
Colocasia	March-April	Dec-Jan	96	1059
Tapioca	March-April	Sept- Dec	93	1072
Tajong (tuber)	March-April	Nov-Dec	41	152
Tamatchi (tuber)	March-April	Dec	41	78
Sweet potato	March-April	Sep-Oct	44	213
Dioscorea	March-April	Nov-Dec	11	17

Table 15 : Production of crops grown in shifting cultivation fields of Chekwatgre village

Crops	Months of sowing	Months of harvest	Percentage of families growing the crop	Average yield(kg/ha)
Cereals				
Paddy	March-April	Aug-Sept	87	114
Maize	March-April	June-Aug	53	583
Millet	March-April	Aug-Sept	13	350
Vegetables				
Pumpkin	March-April	Sept-Oct	93	114
Melon	March-April	Aug-Oct	33	892
Karek (fruit)	March-April	Aug-Oct	60	245
Beans	March-April	Oct-Nov	40	200
Lau	March-April	Sept-Nov	27	169
Local lettuce	March-April	May-June	40	450
Brinjal	March-April	July-Sept	67	277
Lentil	March-April	Nov-Dec	33	216
Mesta	March-April	June-Sept	27	841
Jingka (fruit)	March-April	Oct-Nov	20	350
Lai sak (leaf)	March-April	May-June	7	200
Bilik (legume)	March-April	Oct-Nov	27	156
Cucumber	March-April	June-Aug	20	158
Gourd	March-April	Sep-Nov	27	542

Banana	March-April		13	500
Lady's finger	March-April	June-July	7	1
Pineapple	March-April	Nov-Dec	7	5
Fibre crops				
Cotton	March-April	Nov-Dec	20	61
Spices				
Chilli	March-April	Aug-Nov	67	61
Ginger	March-April	Dec-Jan	67	318
Sesame	March-April	Nov-Dec	7	50
Tuber Crops				
Colocasia	March-April	Dec-Jan	40	811
Tapioca	March-April	Sept-Nov	80	1855
Tajong (tuber)	March-April	Dec-Jan	53	472
Tama (tuber)	March-April	Dec-Jan	20	525

Weeding

Weeding is most important activity in jhum. Weeding is done twice in a year. The first weeding is done during the month of May and second weeding in July both in Sasatgre and Chekwatgre villages. Weeding is done mainly by hand hoeing.

Harvesting

Since different crops are sown in the same field at different times, harvesting of crops is done in different periods starting from June till February in accordance with the maturity of the crops, thereby providing the people with varied food produce for nearly six to nine months in the year (Table 15 and Table 16). Harvesting is done by sickle or small *dao* or sometimes the produce are plucked by hand depending on the type of crops.

Harvesting is always associated with some festivity. "*Wangala*" is a harvest festival practiced by the Garo communities. It is usually performed after almost all the major crops like paddy, millet, maize etc., have been harvested, usually during the month of October or November. To start *Wangala* festival, the *Rugala* or thanksgiving offering to goddess *Mi-n'-ma Rokkimema* is performed on the first day where rice bear, cooked rice etc. are first offered to the goddess along with performance of rituals. After *Rugala* there will be dancing, feasting and merry making to mark the occasion which may last up to a week or more. Young girls and boys select their life partners during these festivities.

Fallow period

The jhum land is cropped for a period of 1 year in Sasatgre and for 2 years in Chekwatgre village and thereafter the land is abandoned to recuperate. Occasionally, some residual

crops are collected from the abandoned jhum fields. The present fallow period is 7-9 years in Sasatgre and 7-8 years in Chekwatgre (Table 16).

Table 16 : Jhum Cycle in Garo Hills		
Village	**Cropping Period(years)**	**Fallow period(years)**
Sasatgre	1	7-9
Chekwatgre	2	7-8

General observation

In both villages the people are mostly dependent on jhum for their livelihood. In Sasatgre village the people earn cash income mostly by selling produce like ginger, chilli, pumpkin and colocasia. These crop products are sold in large quantities. Few crops like melons, cucumber, sesame and other vegetables are also sold in small quantities. The productivity of crops like cucumber and melons is also good, but they cannot be sold due to lack of market linkages.In Chekwatgre village, however, the crops grown are mostly for self consumption. In this village, only a small quantity of pumpkin, colocasia, cucumber and cotton are sold for cash income. In jhum plots of Chekwatgre village, cashew is grown together with shifting cultivation crops and when Cashew trees are fully grown the plots are converted into plantation area. From the discussions and transect walk of the two studied villages, it was found that the management of the fallow land is not practiced. The farmers leave the area as such to regain its fertility. In the two studied villages of Garo Hills some economically important trees are retained during slashing and weeding (Table 17). The retained trees in shifting cultivation fields are used mainly for fuelwood, construction of houses, etc. It was also observed that the farmers do not adopt any soil conservation and water conservation measures. They only practice the traditional type of shifting cultivation. It is noteworthy that while clearing the jhum plots, the thatch growing areas are left uncleared. The villagers opined that if crops were grown in such area, the thatch grass would hamper the productivity of the crops.

Table 17 : Trees retained in shifting cultivation fields of Garo Hills		
Village	**Tree species**	**Purpose**
Sasatgre	*Actinodaphne obovata, Albizia chinensis, Albizia* odoratissima, *Callicarpa arborea, Careya arborea, Duabanga grandiflora, Eurya japonica, Gmelina arborea, Macaranga* sp., and *Trema orientalis*	House construction, furniture, fruits, fuelwood.
Chekwatgre	*Albizia procera, Aporusa dioica, Bauhinia* sp., *Bombax ceiba, Callicarpa arborea, Careya arborea, Ficus* sp., *Gmelina arborea, Litsea monopetala, Macaranga* sp., *Syzygium* sp. and *Trema orientalis.*	House construction, furniture and fuelwood.

Table 18 : Variability in cropping patterns among the three tribal communities of Meghalaya.			
Activities	**Name of the tribes**		
	Khasi	**Karbi**	**Garo**
Land ownership	Private	Private	Community
Allotment of plot	Not necessary	Not necessary	Practiced
Labour for slashing & burning	Family members	Family members	Community
Burning Months	February-March	April	March
Sowing Months	March-May	April-June	March-April
No. of crops grown	14-16	24	30-35
Weeding	Two times	Two times	Two times
Harvesting period	June-July, Nov-Jan	June-Feb	June-Feb
Cropping period (years)	1	1	1-3
Soil & water conservation measures	+	+	-
Fallow period (years)	8-15	3-5	7-9
Fallow management	+	-	-
Trees retained	+	+	+
Cash crop	Occasional	Occasional	Occasional

Note : (+) is Present; (-) is absent

CHAPTER 3
GENERAL DISCUSSION

The study on identification of the best practices of shifting cultivation in Meghalaya indicates that the type of shifting cultivation practiced by the Garo people in Sasatgre and Chekwatgre villages are more traditional than the villages inhabited in the Khasi and Karbi communities. The jhum cultivation in Garo villages is carried out on community land with the involvement of the community in the allotment of the plot and sharing of labour in slash and burn operation. More than 30-35 crops are grown in the shifting cultivation fields with long fallow periods. This type of shifting cultivation practices by the Garo villagers can be called traditional shifting cultivation (Tiwari 2007) where there is involvement of traditional institution in regulating land use within the village territories. It was found that in areas where the population pressure is low and per capita land availability is quite high, fallow periods are long and regrowth of secondary successional plants is luxuriant. In Garo Hills villages it was sometimes difficult to distinguish patches of natural forests from the fallow fields. The shifting cultivation practiced by the Khasi and Karbi communities are more of innovative type. This type of system brings out traditional farmers' ability to adopt new methods of cultivation adapted to the changing circumstances and goals of agriculture and livelihood priorities (Tiwari, 2007). The shifting cultivation in Khasi and Karbi villages is done on private lands and mostly only the family members are involved in carrying out jhum activities. Community participation is more Garo hills and parts of Nagaland as described by Tiwari (2007). Soil and water conservation measures are employed, fire prevention and control mechanisms are in place. Principal emphasis is on production of crops for self consumption but invariably cash crops are cultivated for cash income. In these villages the jhum has been to some extent innovated making it akin to modern life style. It allows income generation through marketing of cash crops and at the same time it retains the good practices – like crop diversity, food security throughout the year, nutrition security and maintenance of soil fertility. Introduction of indigenous plantation cash crops like bay leaf, jack fruit, black pepper, and broom grass is another innovation and it is good from ecological as well as economic points of view as they ensure income with least vulnerability and minimum or no ecological damage to biodiversity and soil-water system. In our study it was also found that although the villages of Khulia and Kuswai have adopted the innovated type of shifting cultivation, it was noted that they have short fallow cycle of only 3-5 years which is less compared to the other four studied villages. Such short fallow periods do not permit adequate regeneration of soil fertility through natural restoration, and result in site degradation over a period of time.

While identifying the conservation value of shifting cultivation practices, it was found that there are many good conservation measures practiced by Khasi, Karbi and Garo communities of Meghalaya. Overall different traditional and modern conservation measures are represented in Table 19. Some of the remarkable conservation measures are: retention of fruit and fuelwood trees which prevents soil erosion and helps the

biodiversity conservation (e.g. birds), zero tillage, use of poles for soil conservation, fallow management, use of weeds as cover crop, maintenance of soil cover during rainy season. The above mentioned features of shifting cultivation indicate that shifting cultivation has several elements that help in soil, water and biodiversity conservation and at the same time it provides economic as well as food security to certain degrees particularly in remote villages. Analysing the practices on the lines of four types of shifting cultivation described by Tiwari (2007) , it can be said that Garo system is traditional while the Khasi and Karbi belong to innovative category.

Table 19 : Characteristic features of shifting cultivation practiced in Meghalaya.

Name of the villages	Traditional →											Modern →		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sasatgre	■	■	■	■	■	■	■	■	■	■				
Chekwatgre						■	■	■	■					
Warwar						■	■	■	■	■	■		■	■
Khrang						■	■	■	■	■	■	■	■	■
Khulia						■	■	■	■			■	■	■
Kuswai						■	■	■	■				■	■

1) Community land used for cultivation; 2) Community decides the field for cultivation; 3) Community involved in slash and burn/sharing of labour; 4) More than 25 crops are planted; 5) Festive activities after and before cultivation; 6) Staggered sowing and cultivation; 7) Retention of trees for fuel and timber; 8) Zero tillage is maintained; 9) Construction of bunds in cultivated area; 10) Fallow period is 8-10 years; 11) Use of poles for soil conservation; 12) Fallow management; 13) Soil and water conservation measures are taken; 14) Private lands are used for cultivation.

SUMMARY

Shifting cultivation is prevalent mostly in tropical countries including India. This form of agriculture is extensively practiced by the tribal communities throughout the north - eastern hill region of India. The practices associated with this form of cultivation have evolved through years of experience and traditional knowledge, shared wisdom and technology. This method of cultivation not only provides year round food security but also has conservation value. However, the practices adopted by local communities and knowledge is location - specific. The present study was undertaken in Meghalaya with an aim to document the practices that Khasi, Karbi and Garo communities practice and to analyse their conservation values. The study was carried out in six villages in the state of Meghalaya. The selected six villages included: two Karbi inhabited villages viz; Kuswai and Khulia, two Khasi - inhabited villages viz; Khrang and War-War and two Garo-inhabited villages viz; Chekwatgre and Sasatgre (Fig. 1). These villages were selected for study as they are inhabited by distinct tribal communities and shifting cultivation practices adopted by them are quite diverse. The study area encompasses the distinct characteristics found in the state and can be considered as proper sample of the shifting cultivation villages of Meghalaya. The methods adopted for the present study involved participatory data collection on the socio-economics and bio-physical resources through PRA, household survey, group discussions and resource mapping of village, field visits to the shifting cultivation fields together with the local people that combined the well known methods of walk, talk and see, and documentation of the management practices involved in shifting cultivation.

Shifting cultivation is being practiced extensively in the studied villages and the people are largely dependent on it for food as well as cash income. The activities involved in jhum field operation show considerable variation between the communities. The variations are due to topography, climate, cropping pattern and land ownership. The slash and burn operation starts from November-December among the Khasi communities whereas it starts around March-April among the Karbi communities. While in Garo hills it starts in November with the *Nokmas* (village head) distributing the plots in the community lands. The allotment of the plot by the *Nokmas* to each household varies from 0.2-1.25 ha depending on the household size and to provide labour from within the family, whereas in the other two communities i.e. the Khasi and Karbi the lands are privately owned. The burning operation starts towards the end of February and March in Khasi inhabited villages. In Karbi villages during March-April and in Garo hills nthis operation starts in the second to third week of March. Sowing is carried out immediately after burning in all the six villages. The first crops sown by the Khasi and Karbi communities are tuber crops followed by cereals and leafy vegetables while Garo people sow first the small - seeded plants by broadcasting the seeds, and the cereals and tuber crops are sown afterwards. A total number of 14-16 crops are grown in the Khasi villages, 24 crops in Karbi villages and more than 30-35 crops in the jhum plots of the Garo villages. Although most of the crops

grown by the farmers are for self - consumption, some crops are also sold in the market. The major cash crops in Khasi villages are: potato, maize and colocasia. Ginger is the main cash crops found in Karbi villages and in Garo hills ginger and cotton are being introduced as cash crops by some farmers. Besides, paddy is one of the main crops sown by both the Karbi and Garo communities. Weeding which is one of the main activities in jhum cultivation is undertaken two times by all the tribes. In the Khasi villages this is carried out during June-July and September-October, in the Karbi villages this is done first in early July and second in August, while in the Garo villages, the first weeding is done during May and second weeding in July. Since different crops are grown in the same field, harvesting of crops is done in different periods. It is carried out almost continuously for a period of nine months from June till February in both the Karbi and the Garo communities while in Khasi villages the crops are harvested for about 5 months during June-July and from November to January. The shifting cultivation plots are cultivated for one year in the Khasi and Karbi communities while in Garo villages sometimes the same plots are cultivated for two to three consecutive years following which the lands are fallowed. The fallow periods are 8-15 years in Khasi villages, 3-5 years in Karbi villages and in Garo villages 7-9 years. Regeneration of *Macaranga* sp. is found in the fallow land of Sasatgre (Garo) village. It is a fast growing tree used as fuelwood for construction of houses by the villagers. The fallow lands are left as such in all the studied villages except in Karbi villages. Retaining of important tree species in the shifting cultivation plots is a common practice in all the six villages. It was also observed that numerous tree stumps are left standing after slash and burn operation in the jhum plots of Khasi and Garo villages to provide support to climbers and twiners and to check soil erosion and to retain soil moisture. In Karbi villages however, this was not practiced, instead *Bambusa tulda* were planted along the boundaries of jhum fields for checking soil erosion. Rows of bamboo and young wood poles are laid across the slope in a staggered manner in the fields of Khasi villages which acts as barriers against erosion of soil and also helps retain soil moisture and fertility. The practices that make the system ecologically sustainable are listed in Box 1.

Box 1 : Conservation value of shifting cultivation practices in Meghalaya

- Zero tillage to ensure that there is little or no erosion during cropping period.
- Tuber crops act as cover crops are planted early which helps in soil binding .
- Use of simple hand tools which offer less disturbance to the soil.
- *Bambusa tulda*, *Toona ciliata*, *Duabanga grandiflora* and *Manihot esculenta* are planted along the boundaries of shifting cultivation areas to check soil erosion and to retain soil moisture.
- Numerous poles are left standing even after slash and burn operation to provide support to climbers and twiners and to check soil erosion and retain soil moisture. Some of these poles regenerate into full grown trees.

- Rows of bamboo and young wood poles are laid across the slope in a staggered manner.
- Potatoes are planted along the woody barriers where soil is deposited to retain soil moisture and fertility.
- It was found that weeds are retained during rainy season and the second weeding is usually carried out after the rainy season is over to protect the soil against erosion by covering the land with the weeds.
- Stone bunding is made in shifting cultivation areas which are near the streams to check water flooding.
- Water channels are constructed upstream to divert the flow of water away from the fields and for irrigation especially in steep slopes.
- Poles are stocked along water courses in steep areas to slow down the flow of water and to arrest soil erosion

Box 2 : Economic value of shifting cultivation practices in Meghalaya

- Harvesting of crops is carried out almost continuously for a period of nine months, which provides food security for almost the whole year. The crop mix is such that it provides all nutritional needs of the people.
- Production of a variety of crops from the same field both for subsistence as well as cash income.
- Least vulnerable to market forces and at the same time taking advantage of the market.
- The systems fulfill almost all day-to-day requirement of the farmer viz., food, fibre, fuelwood, medicines, timber etc.

Potatoes are planted along the woody barriers to prevent soil erosion and to provide support to plants. In all the Khasi and Karbi villages water channels are constructed in the fields located in steep slopes to divert the flow of water. This was also observed in Garo hills in Sasatgre village where the farmers also put numerous poles stocked along water courses to slow the flow of water and arrest soil erosion. The system of shifting cultivation practiced by Khasi, Karbi and Garo people demonstrated several practices that have conservation value. The farmers have adopted several management practices that help in soil, water and biodiversity conservation which in turn bring about sustainability to the system. The practices that make the system economically sustainable are listed in Box 2.

The study reveals that shifting cultivation has several inherent inbuilt mechanisms that make it sustainable and relatively a productive system of farming in hill slopes of humid tropics. Some of these, have potential of being adopted in modern agriculture on hill slopes of northeast India. It is these practices which have contributed to the perpetuation of this form of agriculture for several centuries. The study reveals that even after sufficient exposure to modern agriculture, the people across the communities are following the practice and are modifying it by their own experience and knowledge,for example, the need of cash for modern living is now being met by introduction of cash crops in various combinations.

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APPENDIX - I

Botanical and Khasi names of a few plant species found in Khasi Hills

Botanical Name	Khasi Name
Albizzia procera	Dieng sohkrait
Artocarpus chaplasha	Dieng sohphan
Bambusa tulda	Jaltibha
Betula alnoides	Dieng ling
Cassia fistula	Honaru
Castanopsis armata	Dieng sning
Cinnamomum tamala	Latyrpad
Citrus sp.	Sohjew
Duabanga grandiflora	Dieng bai
Engelhardia spicata	Dieng lba
Eurya acuminata	Dieng shit muit
Eurya japonica	Dieng pyrshit
Ficus elastica	Dieng jri
Gmelina arborea	Dieng laphiang
Litchi chinensis	Dieng sohmanir
Mallotus nepalensis	Dieng lakhar
Mangifera sp.	Dieng sohpieng
Michelia champaca	Dieng rai
Musa sp.	Dieng lakait
Myrica esculenta	Dieng sohphie
Prunus nepaulensis	Dieng sohiong
Quercus sp.	Dieng Soh-ot heh
Schima khasiana	Dieng ngan
Shorea robusta	Dieng Blei
Tectona grandis	Teak
Toona ciliata	Dieng bti

APPENDIX II

Botanical and Garo names of a few plant species found in Garo Hills

Botanical name	Local name
Actinodaphne obovata	Dodekimchong
Albizia chinensis	Bolpi
Albizia odoratissima	Sisoo
Albizia procera	Kelvi
Aporusa dioica	Chamolja
Bauhinia sp.	Megong
Bombax ceiba	Bolchu
Callicarpa arborea	Kimbal
Careya arborea	Gambil
Duabanga grandiflora	Bolchim
Eurya japonica	Chamisi
Ficus sp.	Sakap
Gmelina arborea	Gambari
Litsea monopetala	Bolbet
Macaranga sp.	Chagro
Syzygium sp.	Chambu
Trema orientalis	Pakram

APPENDIX - III
Village Survey Questionnaire

SOCIO-ECONOMIC AND BIOPHYSICAL RESOURCE SURVEY

1. Village:	6. Community/Tribe/Clan:
2. Name of the village head:	7. GPS Records: I. Latitude: II. Longitude: III. Altitude:
3. C. D. Block:	8. Name of interviewer:
4. District:	9. Date:
5. Geographical area of the village:	

I. SOCIO-ECONOMIC SURVEY

10. Demographic profile of the village

Parameter	Number
No. of Households	
Average household size	
Total population	
Male	
Female	
Children	

11. Occupation

Type	Numbers		Total
	Male	Female	
Government Services			
Private sectors			
Daily wage laborers			
Self farm and household works			
Business			
Others			

12. Household Income Pattern

Income class	Range (monthly income in Rs.)	Total number of household
High	>10,000	
Medium	2000-10000	
Low	<2000	

13. Education level

Level of education	Number
Primary (Class I-Class V)	
Secondary (Class VI-Class X)	
Higher secondary (Class XI-Class XII)	
Graduates	
Post Graduates and above	
Illiterate	

14. Village amenities

Sl no.	Parameters	Availability	Type	Status
1	Educational Institution			
2	Health facilities			
3	Veterinary Services			
4	Commercial establishments/ Shops/Cooperatives			
5	Post offices			
6.	Police station			
7.	Water supply			
8.	Irrigation facility			
9.	Road connectivity			
10.	Electricity			

15. Agriculture pattern

i) **Type :** Jhum/WRC/Home garden/Horticulture/Others:

ii) **Where do the village people practice shifting cultivation :** community land/ private land

---

If in community land

a) Who allots the plots to the households?

---

b) Area allotted per household (local unit)?

---

c) Does the household pay to the village council for the allotted land?

Yes/No: If yes, do they pay by means of cash/crops/others (*specify*)

---

d) Do customary rules regulate the use of the allotted land for shifting cultivation? Yes/No :

If yes - i) what are the rules?

---

ii) Are the *Customary* rules enforced for forest use respected by the people?

---

e) Status of the allotted lands (temporary/permanent)?

If temporary (duration of use)

---

iii) Length of jhum cycle :

Cultivation period	Fallow period

iv) Land holdings :

a) Total area of land that the village owns (ha):

b) Land use classification

Category	Area (ha)
Settled agriculture	
Shifting cultivation	
Homestead	
Pond/wetland	
Forest	
Others	

16. Role of different workforce in jhum operation (please tick ✓) :

Activity	Workforce			
	Men	Women	Children	Others(Specify)
Plot allotment				
Slashing				
Burning				
Clearing				
Fencing				
Field preparation				
Sowing				
1st crop				
2nd crop				
3rd crop				
1st weeding				
2nd weeding				
Harvesting				

17. Jhum field operation calendar

Agricultural activity	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Plot allotment												
Slashing												
Burning												
Fencing												
Field preparation												
Sowing												
1st crop												
2nd crop												
3rd crop												
1st weeding												
2nd weeding												
Harvesting												

18. Distance between the jhum area and the adjoining forests:

_____

19. Crop production- Jhum System

HH No.	Crops	Sowing month	Sowing type*	Seed input (kg ha^{-1})	Harvest month	Total annual Production (kg ha^{-1})	Self consumption (kg)	Surplus for sale (kg)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

* Broadcasting=B, Dibbling=D, Both=BT, Line sowing=LS, Others=O

II. MANAGEMENT PRACTICES

20. Fallow management

Type of management	Period	Remark (Brief note on who, when & how)
Protection (fire, cattle, extraction)		
Thinning		
Planting		
Soil conservation measures		

21. Individual biodiversity conservation measures

i) Do they follow any biodiversity conservation method ?_____

(Seed storage and exchange, restriction on extractions, felling of trees, hunting, honey bee rearing)

ii) How do they maintain biodiversity in shifting cultivation area?

_____

_____

_____

_____

iii) Do they retain plants in shifting cultivation areas? Yes/ No

iv) If yes, name the plants

Sl. No.	Plants retained	Habits	Remarks/Reasons

v) Any efforts to protect animal biodiversity? If yes, name them (Honey bee keeping, hunting restrictions, fishing restrictions)

_____

22. Soil conservation measures

i) Conservation type & used for: _____

ii) Material used: (log, stone, earth, vegetation) _____

iii) Does it improve crop yield? If yes, to what extent?: _____

iv) Intervention of modern technology needed/not needed: _____
(Use of fertilizer, pesticides, implements, high yielding varieties)

23. Water conservation measures

i) Conservation type (construction of ponds, mulching, bunding etc.):
_____

ii) Material used: (log, stone, earth, vegetation) _____

iii) Does it improve crop yield : _____

III. BIO-PHYSICAL RESOURCES

24. Water sources

Sl.No.	Names	Season of water availability
(a) **River**		
1		
2		
3		
(b) **Spring**		
1		
2		
3		
4		
5		
6		
(c) **Groundwater**		
1		
2		

25. Major plant species

Sl. No.	Land use type	Important species
1	Forest	
2	Home garden	
3	Shifting cultivation areas	

26. Status of forest

Sl. No.	Type of Forest	Species composition	Area (ha)
1	Degraded forest (<10% canopy)		
2	Open forest (10-40% canopy)		
3	Dense forest (>40% canopy)		

27. Land ownership

Sl. No.	Ownership	Area (ha)
1	Private	
2	Community	
3	Government	
4	Others	

28. Details of livestock

Sl. No.	Animals	Numbers	Purpose of rearing
1	Cow		
3	Buffalo		
5	Pig		
7	Poultry		
8	Goat		
9	Others (specify)		

APPENDIX - IV

Household Survey Questionnaire

I. SOCIO-ECONOMIC SURVEY

1. **a) Name of the Family Head:**

   b) Sex :

   c) Age :

2. **Village :**
3. **C.D. Block :**
4. **Social category:** SC/ST/OBC/GEN
5. **Community/Tribe :**
6. **Type of Family :** Joint/Nuclear
7. **Religion :** Christian/Hindu/Muslim/Others
8. **Family size :**

   Male : *i) Adult :* *ii) Children :*

   Female : *i) Adult :* *ii) Children :*

9. **Level of Education in the family:**

   Primary :

   Secondary:

   Higher secondary:

   Graduates:

   Post graduates:

10. **Land holdings:**

    a) Total area of land that the family owns (ha):

    c) Land use classification

Category	**Area (ha)**
Settled agriculture	
Shifting cultivation	
Homestead	
Pond/wetland	
Forest	
Others	

11. Crop production - Jhum System :

Sl. No.	Crops	Sowing month	Sowing type*	Seed input (kg)	Harvest month	Total annual Production (kg)	Self consum-ption (kg)	Surplus for sale (kg)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

* Broadcasting=B, Dibbling=D, Both=BT, Line sowing=LS, Others=O

12. Spacing between the jhum areas and the adjoining forests

13. Jhum Cycle :

Cropping period	Fallow period

14. INPUT AND OUTPUT :

i. Input :

Category	Domestic (no.)			Hired (no.)		
Agri-activity	**Male**	**Female**	**Child**	**Male**	**Female**	**Child**
Slashing						
Burning						
Field prep.						
Path						
construction						
Fencing						
Sowing						
Weeding						
Harvesting						
Thrashing						
Carrying						
Other						

Note: Labour cost- Rs/day hire Male (Rs.), Female (Rs.), Labour hrs/day_____.

II. MANAGEMENT PRACTICES

15. Fallow management

Type of management	Period	Remark (Brief note on who & how)
Protection (fire, cattle, extraction)		
Thinning		
Planting		
Soil conservation measures		

16. Individual biodiversity conservation measures :

i) Do you follow any biodiversity conservation method ? _____

ii) How do you manage biodiversity in shifting cultivation area ?

_____

_____

_____

_____

iii) Do you retain plants in the shifting cultivation areas? Yes/ No

iv) If yes, name the plants

Sl. No.	Plants retained	Habits	Remarks

v) Plant species (vegetation) along the boundary of your shifting cultivation fields?

_____

_____

_____

17. Individual soil conservation measures :

v) Conservation type & use: _____

vi) Material used: (log, stone, earth, vegetation) _____

vii) Does it improve crop yield? If yes, to what extent?

_____

_____

viii) Intervention of modern technology needed/not needed: _____
(Use of fertilizer, pesticides, implements, high yielding varieties)

18. Modern agricultural tools, inputs (fertilizer, pesticide, etc) used:

19. **Individual water conservation measures :**

iv) Conservation type & use for: (construction of ponds, mulching, bunding etc.)

_____

v) Material used: (log, stone, earth, vegetation)

_____

vi) Does it improve crop yield? If yes, to what extent?

_____

20. **Management in agricultural system :**

Application	Never	Yearly	Others (after 2, 3, 4,or 5 yrs)
Application of manure			
Weed control measures			
Crop rotation			
Mulching with tree leaves			
Making stone walls			

i) Please suggest how the abandoned land can be made productive:

_____

_____

21. Details of livestock

Sl. No.	Animals	Numbers	Purpose of rearing
1	Cow		
3	Buffalo		
5	Pig		
7	Poultry		
8	Goat		
9	Others (specify)		

22. Household assets

Assets	Tick (✓) for yes and (X) for No
Vehicles (car/ motorbike/ scooter/ others)	
Television (colors/ black & white)	
Fridge	
Telephone (Mobile/ land connection)	
Computer	
Furnitures (chairs/stools/tables)	