



## Research Article

# TRADITIONAL FARMING SYSTEM: A CASE STUDY OF GARO TRIBE IN WEST GARO HILLS DISTRICT OF MEGHALAYA, NORTH-EASTERN INDIA

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**Abstract-** Traditional knowledge and life style of the indigenous people have close link with nature. The traditional farming systems are being practiced by indigenous Garo communities of Meghalaya. The study was carried out in four Garo tribe inhabited villages namely Marapara, Sananggre, Romngbokgre and Kamagre of West Garo Hills district of Meghalaya. The method applied for the study was ethnographic approach, an important research tool. A schedule was prepared for collection of data on general information at the household level. Information on traditional farming of Garo tribe was also collected from the secondary source like books, article, research paper etc. Average family size of Garo tribe in the study area was 4-6. Ginger and paddy are the main crops in the study area. It is found that majority of the respondents has annual income in between Rs. 50, 000/- to 1,00,000/- and have primary level of education. The study also reveals that 44.91 ha of area under low land and 265.87 ha of area under up land. The villagers of the area are mainly depending on perennial stream as a source of water for their daily uses. The study showed that Garo tribe practiced traditional farming and applied their indigenous knowledge on plain land, homestead garden, *jhum* management and social forestry. They mainly adopted agro-forestry farming technique for their early income generation activity and livelihoods. Considering the present findings it can be concluded that the indigenous knowledge of Garo tribes is helpful for the conservation of natural resources.

**Keywords-** Tribe, Traditional, Agriculture, Homestead, *Jhum*, Social forestry

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## Introduction

Agriculture is the most primitive occupation of the tribal people. The state Meghalaya is highly blessed with diversified topography, altitude and climatic conditions, the indigenous inhabited Garo communities practice the traditional farming systems. About 83 % of the total population of state depends on agriculture for their livelihood. However, the cultivable lands account for only 48 % of the total geographical area of the state. Rice and maize are the major food crops in the district. Important fruits grown are orange, pineapple, lemon, guava, jack fruit and bananas. Cashew nut, potato, jute, cotton, areca nut, ginger, turmeric, betel leaf and black pepper are the chief commercial crops [17]. *Jhum* or the shifting cultivation are predominant in Garo Hills, bringing land under permanent cultivation in few cases. Tree based farming practices are also prevalent in the state. The crops are grown in association with tree species like alder, *aquilaria*, areca nut, cashew nut, pineapple, coconut, bamboo etc. Due to undulating topography and hilly terrain, the farmers predominantly use bamboo drip irrigation practice. Traditional agriculture was initiated since Indian civilization, when tribal communities learned knowledge of agriculture from Rushi or sage lived in forest areas by constructing their shelters known as Ashram [5]. Traditional knowledge is also a fundamental component of natural resource management. Indigenous communities care much about their surrounding environment and employ a variety of systems and practices to deal with land resources, wild life plants and water etc [11]. We define indigenous knowledge as traditional knowledge used by the local people for natural resource management relating to agriculture, fisheries, livestock, health practices and other activities. Indigenous knowledge is the local knowledge unique to a society, community or culture [8].

Garos have their own traditional knowledge to manage natural resources for their livelihoods. The main livelihood activities of Garos are agricultural practices in the plain land, homestead gardening, *Jhum* or shifting cultivation and in the forestland or participatory forestry in the forest land. The Garo people plough plain land in the foot hills/valley for cultivation of rice through transplanting but in hills they follow the dibbling method of cultivation. However, they managed their homesteads and forest land as traditional farming system of agro-forestry namely agro- silvipastoral system and agri-silvicultural system respectively. Garos managed their plain land and homestead since time immemorial. But they managed the forestland since the independence from the British rule. The principal aim of forest policy must be to ensure stability and maintenance of ecological balance including atmospheric equilibrium, which is vital for substance of all life forms, animal and plant [3]. They cultivate rice in the plain land and different vegetable, spices, timber, livestock in their home garden and upland respectively. Except salt and oil they produced most of their daily necessities. It was estimated that about 26.08 % rural population in Garo Hills practice shifting cultivation [9]. Traditionally the system of cultivation provided year round food security to people inhabiting remote and inaccessible areas [16]. The harvesting of crops adds a new dimension towards improvement of soil fertility. The farmers pick up ear heads of crops only, other parts of plant are left on cultivated land. The farmers store grains in structures, made of soil and plant materials. The seed storage structures are traditional and resistant to insects. Hence, the present study was undertaken to explore the traditional farming system of Garo tribes in West Garo Hills district of Meghalaya. The objective of this study

is to provide insights of the indigenous knowledge related to agriculture, horticulture and community forestry in the district. The study is helpful in conservation and utilization of natural resources in participatory approach.

**Materials and Methods**

The West Garo Hills district is one of the administrative districts of Meghalaya, which lies between 25°20'N to 26° N Latitude and 89°40'E to 90°30'E Longitude at an average altitude of 657 meter above mean sea level. More than 80 per cent of the populations are tribals of which Garos form the majority. They basically follow a matrilineal system of society which focuses on the descent of family and kingship as well as inheritance of property along the female line. The other tribals are Hajong, Koch, Banai and Rabha are also resides in the district. Though the majority of the Garos are now converted to Christianity, yet they still practice their own traditional tribal religion known as "Songsarek", which has its roots in traditional agricultural practices. The study was conducted in four villages in Dalu block and Rongram block of West Garo Hills. The villages were adopted by KVK under NICRA-TDC and CTCRI-ICAR-NEH collaborative project. Out of the four villages two were small and two were big. The villages were Marapara (Latitude 25° 20'N and Longitude 90°14' E and Elevation-48.5m), Sananggre (Latitude 25° 20' N and Longitude 90°18' E and Elevation-54.8m), Rongbokgre (Latitude 25°20'N and Longitude 90°15'E and Elevation-46.25m) and Kamagre (Latitude 25° 29' N and Longitude 90°12' E and Elevation-48.5m). The villages are located about 40-55 Kilometers from West Garo Hills Headquarters. The selected villages were inhabited by Garo tribes only. All the family head of the four villages were our respondents. So, the total of 270 respondents was selected from the four villages (Marapara-64 nos, Sananggre-16 nos, Rongbokgre-15 nos. and Kamagre-175 nos.) The ethnographic approach was applied for conducting the study. The

primary data on socio-economic parameter as well as traditional agricultural practices of the tribe was collected through interview schedule, focus group discussion and informal discussion from the key informants and very old persons of the villages. Information on traditional farming system of Garo tribe was also collected from the secondary source [2, 6, 10] etc. The primary data were analyzed using suitable statistical tools and methods.

**Results and Discussion**

**General Information**

**Family type**

**Table-1** Village-wise distribution of the respondents according to their types of family

Village	Family Type			
	Nuclear	%	Joint	%
Marapara	56	20.74	8	2.96
Sananggre	14	5.19	2	0.74
Rongbokgre	12	4.44	3	1.11
Kamagre	157	58.15	18	6.67
Total	239	88.52	31	11.48

N=270

The above [Table-1] reveals that 88.52 respondents in the villages have nuclear type of family, where as 11.48 percent of the respondents have joint type of family and the average family size in the village ranges from 4-6 nos.

**Land holding**

**Table-2** Village-wise distribution of the respondents according to their categorised land holding

Village	Category of farmers									
	Landless	%	Marginal (< 0.4ha)	%	Small (0.4-0.8 ha)	%	Medium (0.8-1.33ha)	%	Large (>1.33ha)	%
Marapara	3	1.11	16	5.92	27	10.00	8	2.96	10	3.70
Sananggre	1	0.37	2	0.74	14	5.19	0	0.0	0	0.0
Rongbokgre	1	0.37	2	0.74	7	2.59	2	0.74	1	0.37
Kamagre	8	2.96	50	18.52	61	22.59	41	15.18	16	5.92
Total	13	4.81	70	25.92	109	40.37	51	18.88	27	9.99

N=270

[Table-2] reveals that 4.81 percent of respondents are Landless farmer, 25.92 percent of respondents are Marginal farmer, 40.37 percent of respondents are Small farmer, 18.88 percent of respondents are Medium farmer and 9.99 percent of respondents are Large Farmer respectively.

**Livestock**

The tribes of Garo Hills are very much fond of rearing of livestock. Generally they reared pig, goat, poultry and dairy etc as secondary source of income and for home consumption purposes also.

**Table-3** Nos. of livestock beared by the respondents in the Marapara, Sananggre, Rongbokgre and Kamagre village

No. of livestock	No. of respondents							
	Cattle	%	Pig	%	Poultry	%	Goat	%
0-3	141	52.22	151	55.93	53	19.63	113	41.85
4-6	37	13.70	37	13.70	58	21.48	44	16.30
7-10	18	6.66	13	4.81	61	22.59	9	3.33
>10	8	2.96	7	2.59	42	15.55	5	1.85
	204	75.56	208	77.03	214	79.25	171	63.33

N-270

The above [Table-3] shows that in 52.22 per cent respondents have 0-3 nos. of cattle, 55.93 percent have 0-3 nos. of pig, 22.59 per cent have 7-10 nos. of poultry and 41.85 per cent have 0-3 nos. of goat in their house.

**Main source of income**

The above [Table-4] results that majority (37.41 per cent) of the respondents have ginger as a main source of income where as only 31.48 percent of the respondents have paddy as a main source of income. At present, due to continuous decreasing in the yield of cashew nut, only few numbers of farmers are interested in cashew nut cultivation.

**Annual Income**

All the respondents are divided into three categories namely poor, middle, and rich according to their annual income [Table-5]. The study revealed that 19.25 % households were poor(annual income less than Rs. 50,000) whereas 71.1% and 8.88 % of households were fall under middle(annual income above Rs 50,000 to Rs 1,00,000) and rich (annual income above Rs.1,00,000), respectively.

**Literacy Level**

**Table-4** Village-wise distribution of the respondents according to their main source of income

Village	Source of income											
	Paddy	%	Ginger	%	Arecanut	%	Cashew nut	%	Livestock	%	Others	%
Marapara	26	9.63	6	2.00	15	5.56	5	1.85	10	3.70	4	1.48
Sananggre	9	3.33	0	0.0	3	1.11	0	0.0	2	0.74	2	0.74
Rongbokgre	7	2.59	0	0.0	2	0.74	1	0.37	4	1.48	1	0.37
Kamagre	43	15.93	95	35.19	11	4.07	3	1.11	12	4.44	11	4.07
<b>Total</b>	<b>85</b>	<b>31.48</b>	<b>101</b>	<b>37.41</b>	<b>31</b>	<b>11.48</b>	<b>9</b>	<b>3.33</b>	<b>28</b>	<b>10.36</b>	<b>18</b>	<b>6.66</b>

N=270

**Table-5** Village-wise distribution of the respondents according to their annual income

Village	Nos. of respondents					
	Poor	%	Middle	%	Rich	%
Marapara	16	5.92	35	12.96	11	4.07
Sananggre	7	2.59	6	2.22	3	1.11
Rongbokgre	6	2.22	8	2.96	1	0.37
Kamagre	23	8.52	143	52.96	9	3.33
<b>Total</b>	<b>52</b>	<b>19.25</b>	<b>192</b>	<b>71.1</b>	<b>24</b>	<b>8.88</b>

N=270

[Table-6] shows that 43.32 per cent of respondents were primary level of education and only 3.33 per cent of respondents' higher secondary level of education.

**Area distribution**

Topographically the study area has both lowland and upland. It is observed that in four village 31.48 per cent of the respondents have low land area covering 44.91ha of land where as in 65.92 per cent of the respondents have cultivable up land area covering 265.87 ha of land . It is also found that 61.2 ha of area under social forestry and 42.6 ha of area under waste land or unutilized land.

**Table-6** Village-wise distribution of the respondents according to their level of education

Village	Nos. of respondents							
	Illiterate	%	Primary level	%	Secondary	%	Higher Secondary	%
Marapara	13	4.81	40	14.81	13	4.81	4	1.48
Sananggre	1	0.37	9	3.33	5	1.85	1	0.37
Rongbokgre	2	0.74	9	3.33	2	0.74	1	0.37
Kamagre	36	13.33	59	21.85	8	2.96	3	1.11
<b>Total</b>	<b>52</b>	<b>19.25</b>	<b>117</b>	<b>43.32</b>	<b>28</b>	<b>10.36</b>	<b>9</b>	<b>3.33</b>

N=270

**Assets**

The study reveals that they have only 3 nos. of power tiller, 9nos of row marker, 7 nos. of cono weeder and 2 nos of paddy thresher and have 246 nos. of locally available agricultural implements in the village.

**Electrification**

It is found that 94.44 per cent of the families in the villages are electrified and only 5.55 per cent of the families are not yet electrified.

**Road**

The main road of the villages for communication and transportation are *pucca* and it is connected with the national highway where as the road inside villages are *katcha*. During rainy season they face little problems for communication due to flash flood in the villages.

**Source of Water**

Most of the people in the villages are depend on existing river, Perennial stream, Seasonal stream Open well, Deep tube well and supply of PHE water for their daily uses, cultivation practices, rearing of livestock and others purposes.

The study reveals that 51.1 per cent of the respondents depends on perennial streams as a source of water 25.18 per cent depend on river, 5.19 per cent depend on seasonal stream, 9.62 percent depend on open well and where as only 1.48 per cent of the respondents depends on deep tube well and only 5.92 per cent depend on govt water supply (PHE) as a source of water for their needs.

**Family Hierarchy**

It is believed that Garos migrated to Meghalaya about 400 years ago from Tibet. Garo people are also known by the name of '*Achik-mande*' or hill people. As almost all the states in North East in India were explored by Christian Missionaries, most of the Garos adopted Christianity. These tribes speak Garo language, which is also further divided into different sub-languages or dialects. In Garo tribes, women are the owners of property thus making it a matrilineal

society. There is a custom where the youngest daughter inherits the property from her mother and man shifts to his wife's place after getting married.

**Traditional farming system of Garo Tribe**

Traditional agriculture is often considered a step between the local hunt and gather practice, which provides communities with subsistence level of food. The practices of modern agriculture used for mass production of food for global distribution. In the study it is found that Garo community follows four types of farming namely plain land agricultural cultivation, homestead gardening /Agroforestry, shifting cultivation and social participatory forestry. Traditional Crops and cropping system normally followed are presented [Table-7].

The farmers of Garo Hills mainly follow mixed cropping system. Which is at the height of 1000 -1500m MSL. *Jhumland* is the main source of income especially for the small and marginal farmers of Garo Hills region. Whereas in the mid hills, at the height 400-1000m MSL mono cropping is mostly followed by some amount of intercropping. In foothills (200-800m MSL) and plain land (0-200m MSL), they practiced mono cropping to sequential cropping followed by intercropping. Plain land cropping system includes mainly the cultivation of paddy, oilseed crops and pulses.

**Plain land Agriculture**

Topographically the area is characterized by the medium plane tract except some upland. During the interview, it was found that the plain land is generally used for rainfed crop e.g. *sali* rice. Sometime the gentle slope between the upland is used for growing maize, tapioca, colocasea and mustard by applying minimum tillage or no tillage or by using dibbling methods. Slopes around the upland land are protected by raising hedges and which is reduce the run-off of the water to the plain land. All plain land in the study area is suitable for paddy cultivation.

**Traditional Cultivation practices**

**Raising of seedling**

The place where light and air is available and free from water logging is suitable

for raising nursery bed. The land is prepared for nursery bed by ploughing, watering and laddering. The total area of nursery bed is fragmented into several unit plots, which are 10m × 1.25m of size. In between the two units, a drain of 50cm wide and 20 cm depth is prepared for draining, watering, and care of seedlings. Seeds are soaked in water for 3-4 days by covering it with straw/bamboo leaves or gunny bags for sprouting. These sprouted seeds are broadcasted in the muddy nursery bed. Proper watering is done in the seedbed for uniform germination of the seedling. Uprooting and transplanting of seedling

**Table-7 Farming systems practiced according to land situation district**

Land situations	Crops/cropping systems
Jhumland (1000-1500M)	<b>Mixed cropping:</b> Rice, maize, millet, sesame, pumpkin, bitter gourd, mesta, cotton, brinjal, lady finger, gourd, cowpea, muskmelon, cucumber, turmeric, ginger, chilli, mustard, beans and tuber crops etc.
Mid hills (400-1000M)	<b>Monocropping:</b> Orange, pineapple, banana, jackfruit, rubber, tea, coffee, cashew nut, black pepper, areca nut etc. <b>Intercropping:</b> Arecanut + black pepper, Jackfruit + black pepper
Foot hills /Valley (200-800M)	<b>Monocropping:</b> Rice, maize, cabbage, cauliflower, turnip, radish, beat root, brinjal, potato, mustard, blackgram, greengram, sesame etc. <b>Intercropping:</b> Maize +pumpkin, Maize + cowpea, Maize + blackgram / greengram, areca nut+ ginger/turmeric, mango + ginger/turmeric etc. <b>Sequential cropping:</b> Maize (GC)- Vegetables/ mustard/ blackgram/ greengram /Sesame, Rice - rice, Rice- mustard/ vegetables, Rice - fallow etc.
Plain land (0-200M)	<b>Monocropping:</b> Rice, maize, cabbage, cauliflower, turnip, radish, brinjal, potato, lady finger, etc <b>Sequential cropping:</b> Rice-fallow, Rice-mustard, rice-toria /greengram /blackgram, maize (GC)-vegetable /mustard /lentil/pea /blackgram/ greengram /sesame, Rice- boro rice etc.

The seedbed is wetted about 6-8 hours before uprooting of seedling. This is done in such a way that there would no damage in roots and shoots during uprooting. The uprooted seedlings were kept in bundles. Generally transplanting is done in the month of June-July after 40-45 days of sowing in nursery beds. Seedlings are transplanted and sown randomly in 4-6 nos. per hill. They follow random spacing of 25cm from row to row and 15cm spacing from plant to plant. If the seedlings are too old, they cut the upper portion of the seedling before transplanting into the main field.

**Cultural practices**

Generally, in a year, they cultivate sali rice as mono crop into their field. In sali rice cultivation, they kept the land weed free at least for 40-45 days after sowing. Weeding is done by manually only once. On an average, 120 cm water is applied in the life time of the sali rice cultivation usually from the stream or near by source. During the season, if there is any shortage of water, production of the crops results low. They never apply the fertilizer into their field resulted low yield. They uses black polythene to scare the birds by hanging it into their field with a rope. As the Garo tribe have apathy to apply chemical fertilizer, they belief that application of chemical fertilisers may damage their soil. About 13% sali crops are destroyed by the insects attack. Sometimes they applied insecticides for management of insects and pest but without recommended dose and time. After harvesting of rice, the field remained fallow till the next season of rice and during this lean period they practice free grazing for their animals i.e. after Christmas.

**Harvesting**

Paddy is harvested when 80% of the seeds are ripped. The tribal farmers harvest only the ear head of rice with 10 - 20cm length of straw and after harvesting they kept the harvested rice in the field itself for 5-6 days. The green straw in the paddy field is not dried in the sun immediately. An so it is stored in a heap for 5-6 days to increase chemical content and food value in it before threshing. It is also observed that some of the farmers were also kept the harvested rice directly in their store house with straw and threshed when it required. Rice is dried in the sun and stored in traditionally made store house or Jam (in Garo). Generally they obtained

yield is 2.8-3.6 quintal per hectare. The low yield of cereals, pulses and oilseeds is mainly attributed to the use of traditional crop varieties, very low seed replacement ratio, grown on sloppy eroded lands having poor fertility and water holding status couples with less external inputs- subsistence level of farming practices in the tribal areas [1]. They also practice some Indigenous Technological Knowledge (ITK) for controlled of rodent and store pest into their stored house.

**Homestead Gardening/ Agroforestry**

Homestead Gardening is a permanent system of cultivation practices. The home garden farming system is an ancient and widespread agroforestry system. Homestead based farming system involving vegetables, tubers, fruits, poultry, goat/pig will improve the food and nutritional security of tribal farming systems [15]. Three components mainly trees, crops and livestock are consider as main under this farming system.

**Field Preparation**

Land preparation pattern for tree species is done by spot clearing, making pits/hole and digging. But for crops the preparation is involves tillage operations. In general the purpose of field preparation is to provide a proper biophysical environment for the crops.

**Planting materials**

Garo use seed, seedling and vegetative propagules to generate the plant in their home garden. They broadcast or put the seeds in a certain place followed by watering. After germination watering continued and keeps it free from goat and cattle. Sometimes they throw the seeds after consuming the fruits. Some trees are grown from vegetative propagules by layering and cutting. Sometimes they collect vegetative propagules of tree and crops propagated through root and stem viz. Teak, Sal, Taro, colocasea, tapioca and banana etc.

**Sources of planting materials**

Crops and fruits producing species are mostly originated from seed collected for their home garden. Sometimes they collect improved variety of fruits from their neighbours and friends. After consuming the fruits, they sow the seeds. In case of high yielding varieties of crops and fruit tree species, mainly they were collected from market and line departments.

**Planting pattern**

Majority of the Garo farmers follow the traditional planting pattern. They always make their house south facing in order to ensure maximum sunlight and wind. They also do it in order to keep their rooms free from water and heavy storm. Fruit trees are always planted near the dwelling house. Timber species are planted usually away from their home especially in the northwest side of home to protect their living houses. Most of the Garo houses have two-entrance road and backward of the house is planted with arecanut /gue and battle vine. Vegetables (climbing) were planted usually east and south side of their house.

**Cultural practices**

They practices different cultural operation in their homestead garden. They follow weeding operation in time when they had no agricultural works in the field. Their family members also do weeding operation manually. During weeding, if found any fodder species then they collected it for their cattle. In case of vegetable, if any insect attack found then they use ash to prevent it. Most of them use cow dung and ash as manure, no chemical fertilizer was reported to use.

**Harvesting**

The timing of harvesting agricultural crops were depend on the difference in success and failure of the crops. Most of the horticultural crops are harvested at its peak physiological maturity stage. To be sure about the maturity of trees, the farmers observed by striking them with the back of the dao. When it gives metallic sounds, they confirmed about the maturity of the plants. Sometime they harvested the crops by seeing the outer appearance of the crops.



### Shifting or Jhum cultivation

The Shifting cultivation or jhum farming system is an ancient and widespread system of cultivation by Garo tribe and they follows agrosilvipastoral system in their cultivation practices. The primary components under the system are crops and livestock. The shifting cultivation is locally called as A.ba by the Garo tribes in Garo Hills districts of Meghalaya. Analyzed the spatial and temporal variations in shifting cultivation and described four types of shifting agricultural systems viz. traditional, distorted, innovated and modified shifting agriculture [18]. Shifting cultivation helps conservation of soil moisture, enrichment of soil texture, soil structure and development of a good crop canopy due to mixed cropping [10]. In all the village of Garo Hills, shifting cultivation is done on community lands and which is controlled by the Nokma (Village Chief). For cultivation, every Garo participant gets the land nearly 1ha or a complete hillock from their Nokma / Headman of their village with a condition that he/she can't sold it without his/her permission in the future. The size of plot allotted to each house hold varies from 0.2-1.25 ha depending upon household size and capacity of family labour [16]. The plot size somewhat smaller compare to the range (1.0-2.5ha)[14]

### Field Preparation

Land preparation pattern for crops and tree species is done by cutting, clearing and burning of jungles in the month of February to March followed sowing by digging in the month of April. Dominant subsistence crops are Bean, Bitter gourd, Cucumber, Dioscorea, Yam, Pea, Raddish, Lady's finger, Pumpkin, Maize, Mesta, Sponge gourd, Banana, Jhum Paddy, Tuber crop, Turmeric Brinjal, Lai sak (leafy vegetable), Local lettuce, Millet, Mustard, Sesame, Cotton, Cucumber, Gourd, Cowpea, Ridge gourd, Turmeric, Ginger and Chillies etc. Fruit trees *Artocarpus chaplasha*, *Litchi chinensis*, *Mangifera indica*, *Myrica esculenta*, *Prunus nepalensis*, *Artocarpus sp.*, *Musa sp.*, *Citrus sp.* Fuel wood trees *Artocarpus sp.*, *Betula alnoides*, *Castanopsis tribuloides*, *Ficus bengalensis*, *Litchi chinensis*, *Mallotus nepalensis*, *Mangifera indica*, etc [14].

### Planting materials

They use seed, seedling and planting propagule as a planting materials for cultivation purpose. Seeds are sown in the month of April to June.

### Sources of planting materials

Generally, they use seed, seedling and vegetative propagules to generate the plant, which is storage in last year. Sometimes they collect seeds or planting materials of improved variety from their friends, neighbours, market and line departments.

### Planting pattern

Garo practice the traditional package and practices for its cultivation. They follow mixed cropping system. They practice crop rotation from the time of immemorial. Turmeric and ginger are the cash crop mostly grown as annual and biennial crops. It is also seen that after turmeric and ginger crops in a two consecutive years and they either leave that land fallow or grow a legume crop such as arhar, cowpea and beans for 2- 3 years. Again after 2-3 years they grow turmeric and ginger in the same field. They start sowing some of the crops when soil remains minimum heat after burning of the jungles followed by dibbling with dibblers. They prefer to have arecanut and citrus plant in their fallow land. It is reported that horticultural cash crops such as rubber, oil palm, cocoa and coffee are extensively planted by small holders as an outgrowth of shifting cultivation in many part of the world [14].

### Cultural practices

Weeding is done once or sometimes twice in a year manually by them. During weeding, they collected fodder for their cattle. At the time of insect attack in the vegetables crops they use ash and some local indigenous pesticides for its management. They never use chemical fertilizers but use FYM and ash. They used dried plants leaves for mulching of the crops. They used to make a small bamboo house which is locally called Borang on the top of the tree in the field. The purpose of house is to take care of crops to be destroyed by wild animals especially elephant during night time in the cropping season. Sometimes, they

makes small hut into their field for taking rest at the time of sowing, inter culture operation harvesting and to gathered the harvest in the cropping season.

### Harvesting

Harvesting of cereal crops in shifting cultivation is done by picking up the ear heads only, using a knife or sickle where others crops like tapioca, sweet potato, ginger, turmeric, colocasea etc are harvested with small spade or locally called as Gitchi. It is seen that in the later summer, just after one shower of rain, the tribal farmers usually go to the forest in search of tuber crops and wild edible mushroom, they harvest it by digging and plucking respectively. But they refill the pit of harvest tuber crops with the twig or piece of it which provide them the tuber in the next year [7]. After harvesting, proper drying of grains is done by them before storage. The traditionally made storage house in Garo Hills is ventilated outdoor structures constructed with locally available materials such as bamboo, timber and thatch grass. The storage structure is suitable under high humid conditions. Farmers use indigenous plant materials as insect pest and rodents repellent. The traditional knowledge largely remained with local tribal communities as a hidden treasure.

### Social/Community/Participatory Forestry

The West Garo Hills district covers a large area of forest and having both plain and hilly terrain. The forest of hilly area is under the protection of the forest department and social forestry. Most of the land property of the forest is used as social/participatory forestry that is locally called reserved by the Garos. This system was practicing from their ancestor and still it is going on successfully. Local forest department, settlers and the Garo are the key component under the forestry. The land which was occupied by the encroachers is mainly selected for the reserve plantation. Total area of reserved plantation under four village is around 23.5 hectares and nearly all persons of the village in that area were involved in it. Garo participant follows the silvicultural system in this forest land. Tree and bamboo are consider main two components under this system. Under this forestry, the types of tree species in confined land are Teak, Agor, Sal, Non Sal, Sisu, Neem, Cashew nut, Bamboo, Mango, Jackfruit and some wild tree species respectively. They received maximum benefit from the medicinal and horticultural species. The contribution of social forestry project, despite many weaknesses cannot be underestimated as a step towards involvement of people in conservation, plantation or creation of new forest in government or Panchayats waste lands, and ensuring a better environment and generating additional avenues if income from different ways [4].

In social forestry, the local landless and small farmers living in and around the forest area and encroacher were selected as participants and the land is under the jurisdiction of headman or Nokma of the village. The tribe poor, landless and adjacent households to the project area were selected as beneficiaries. Participatory forestry approach is a continuous process. Farmers are given right to enjoy the entire output from the forest products. All intermediate returns from dead trees branches after pruning, thinning, and uprooting are being enjoyed by the stakeholder.

Under the social forestry villagers select the place where forest was already established naturally. For its management of that area, villagers formed a committee namely called village forest management committee and they make role and regulation for its utility and maintenance. If any one of it found not following the role made the committee they he/she had to pay fine fixed the committee. A security guard was also appointed for its take care. Beneficiaries are given right to enjoy the dead trees branches and uprooting only after the approval of the committee. Actually trees are rarely used by the villagers from this social forestry. If the committee think that the reserve or forest have abundant of tree and bamboo species and which more sufficient of the village then the committee decide to harvest or sale. After selling, 5% percent of that amount was given to the security guard and rest amount was deposited to the fund of village forest management committee. The plantation are established on participatory basis are being harvested at the end of rotation and the sale proceeds are deposited on the basis of agreement approved by the village forest management committee. If the reserved forest falls to the position of shortage, the reserved trees or bamboos are

being stopped from harvesting for a period of 4-5 years until the reserved forest regains its maxima. Sometimes, they register their village forest under the Autonomous District Council for its management and protection but its very rare. Forest department sometimes imparts training on related work to the villagers.

### Conclusion

The indigenous tribal people generally living in the upland area and they are mainly depends on available local natural resources to meet their daily needs in respect to their agricultural production, livestock rearing, food and medicine. They are the natural protector of forest. Majority of the Garo people like to rearing of livestock especially pigs and poultry as secondary source of income generation activity. By adopting agroforestry and participatory forestry programme, the hilly people again prove their willingness to save the forest in the study area. Though they are managing their farms well by their indigenous knowledge and management techniques, but now slowly some of the department are implemented modern farming technology and broad credit facilities. Earlier they had faced lot of problems during cultivation, agroforestry and participation in joint forest management. Modern suitable technology on agroforestry or soil and water conservation should introduce to them and motivate them to adopt it, which will result to increase their income, uplift lifestyle and reduce their dependency on forest for their livelihoods that would be useful to the agricultural department, relevant non-government organization, and forest department in the efforts to support their livelihoods. Considering the present findings concluded that the indigenous knowledge of Garo tribes is helpful for the conservation of natural resources.

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