

Study No. 131

**CURRENT SITUATION OF JHUM CULTIVATION AND TO
ANALYSE JHUM CYCLE**



Prof. K.C. Talukdar

**Agro-Economic Research Centre for N.E. India
Assam Agricultural University
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P R E F A C E

The project entitled "Present Situation of Jhum Cultivation and to Analyse Jhum Cycle" has been undertaken by the Centre at the instance of Directorate of Economics and Statistics, Ministry of Agriculture, Government of India and is a timely attempt of research pertaining to hill agriculture. Agriculture is still the mainstay of people in the hills and jhum as a traditional farming system is being followed as a means to meet domestic food security of the farm families. The system also ensures sustainability of livelihood and provides not only food, but also fuel, cloth and a united society for living. It protected their lives and accentuated their livelihood. They considered it as a ritual and worshiped the system of 'jhum' which could protect their lives. However, with advent of time, the primitive system of agriculture has shown some derogative effect on ecology and environment. Such effects have been felt as persuasive by the more illiterate and traditional jhumias who consider jhuming as a way of living. It is felt that the livelihood of jhumias can be improved through alternative agriculture and other measures. The study indicated that jhum cycle was affected by level of education, communication, nearness to city etc. It was also affected by some other socio-economic factors in the remote villages. As evident from the study the cropping pattern, was dominated by food crops for living. In both the states, jhuming has not been eliminated much even after so much of right measures followed by the Government during different plan periods. The study concluded that adoption of different measures like improvement in land tenure system, small scale entrepreneurship, proper distribution system, marketing facilities, health care, long term communication and plantations, improvement in rural education will improve the livelihood of the jhumia families.

I congratulate and sincerely acknowledge the help and coordination of the Government officials in Meghalaya and Mizoram and research staff of Agro-Economic Research Centre for North East India during the research period. I am specially thankful to the Director of Agriculture in Meghalaya and Mizoram and Dr. Gautam Kakaty, Mr. Debajit Borah, Rupam Kr. Bordoloi and to Mr. Nabajit Deka due to their sincere efforts and continuous help in absence of which the report could not have been completed.

I hope, the report will provide first hand information to the farm planners, policy makers and researchers for development of hill agriculture.

March, 2009

K. C. Talukdar
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Scenario of *Jhum* Cultivation in N. E. Hills of India



CHAPTER-I

INTRODUCTION

1.1 The issues and problems of shifting cultivation

Shifting cultivation is also locally known as *jhum* and it is widely practiced in North East India. It is primarily practiced in the hill states, but it is also used in the plains which are declining due to population pressure and other social factors. Land in the valley bottoms and plains has been converted into wet rice cultivation locally known as *pani kheti*. *Jhum* is the main stay of the tribals in the hills. High population pressure and frequent and over use of land have lowered the land productivity affecting the socio economic conditions of living of the *jhumias*. The issue of *jhum* cultivation is under scanning from view points of ecology and environment, economic and social conflicts.

Social change in an agrarian society largely depends on the household income generated from the farms which helps accelerating education and other parameters of quality living. If the production system is outmoded and less paying the incumbents will search for viable alternatives. An attempt has been made in this study to examine the economy of *jhum* cultivation and its remedial measures. The broad objectives are:

- i. To study the current pattern of crop cultivation in the hill areas
- ii. To study the economics of *jhum* cultivation in terms of generation of employment, income and profitability in *jhum* cultivation as compared to competing crops cultivated in the hill areas
- iii. To study the impact of Government sponsored *jhum* control measures in the North Eastern region to wean away the *jhumias* from *jhuming*
- iv. To study the *jhum* cycle in the hill states of the region.
- v. To suggest policy implications

1.2 Importance of shifting cultivation

Shifting cultivation has been recognized as an ideal system of agriculture in certain parts particularly in the hilly region for earning livelihood of the tribals. In ancient times, population density was low and land was sufficient for use in shifting cultivation. Jhuming was practiced by slashing and burning the vegetation and forest trees. The tribals earned their livelihood through jhuming. Production of crops under jhum cultivation was low and it was not sufficient to meet the food requirement of a family. Soil gradually lost its fertility and the families had to shift its farmstead to other places. Food security in the forest was sustained by gathering other food products from natural forest such as tubers, fruits, herbs, shrubs, wild animals and fish during scarcity. In ancient times, jhum cycle was quite long for natural regeneration of vegetation and to recover the damage caused to environment.

It is accepted that about 60-95 per cent of the nutrients in tropical forest ecosystem are stored in the subsoil. Practice of slash and burn system both soil acidity and aluminium manganese toxicity is controlled. The fertility status stored during the period is used for 2-3 consecutive cropping on natural soil fertility built up.

A modified form of jhuming is practiced in Meghalaya for potato and ginger cultivation. It is known as 'rip bun'. The modified form consists of heaped sods in which heaping of the bundle of branches and twigs of trees or turf along the slope of a plot in rows of beds measuring about 1 m wide and 2-3 m long. Sods are turned over with the spade and exposed for a time to get dry. Then twigs and branches are used, they are covered by soil for about 10-15 cm thickness and left sod with earth covering. These heaps are completely burned during February to April.

1.3 The North Eastern Region

The North Eastern Region of India has unique entity in climate and topography and is known as a land of seven sisters. The region is isolated from rest of the country and pace of economic development is slow due to slow growth of industry and agriculture. The region is mostly hilly and out of total geographical area about 75 per cent of it are covered by hills. A large section of the population in the hill districts belong to scheduled tribes.

Among the tribes of Meghalaya, the Khasis and the Jaintias are very progressive and they have developed good terrace cultivation and horticulture and a small section undertakes jhuming. Lyggam or Megams who inhabit in the western part of the Khasi hills are mainly jhumias. On the other hand, the major section of Garos of the hill Mouzas practices jhuming.

Shifting cultivation is a cultural stage in society of hill people and it has a distinct economic system of its own. The important factors of production in shifting cultivation are land and labour. In actual sense it is labour intensive and land extensive. It is traditionally practiced without mechanisation. Land requirement for sustainable living is high within the cycle and so it is extensive. Due to high population density jhum cycle has gradually declined in the region.

Land is owned by the group. In Garo hills land is owned by a clan. In Mizoram, on the otherhand, land is owned collectively by the residents of the village or group of villages and the decision making is done in a group.

1.4 Present situation of jhum

Shifting cultivation is an agricultural system in which plots of land are cultivated temporarily, then abandoned. In this system jungles are cleared in a piece of land and kept fallow for years for wood harvesting. When the fertility of soil will be lost, it is left to be reclaimed by natural vegetation or converted to a long term cyclical farming practice. About 250 million people derive subsistence from the practice of shifting cultivation. In the process ecological consequences are deleterious.

Many cultivators of shifting cultivation practice slash- and -burn and others use clearing without burning while some are quite migratory and do not use any cyclical method on a given plot. Sometimes no slashing is needed when the vegetation is grass after re-growth. In this system a larger part of the field is kept fallow for re-growth for a relatively long time. In the fallow land during the cycle, use the successional vegetation species widely for timber, firewood, thatching, ropes, clothing, tools, carrying devices and medicines. Orchards are also practiced in the fallow lands. Some nitrogen fixing shrubs or species are also planted in the fallow lands. In a stable shifting cultivation system, the fallow is long enough for the natural vegetation to recover to the original state.

There is no universal optimum relationship between the length of the cropping period and the length of the fallow period. In favourable agricultural environments, cropping periods may be longer and fallow periods may be shorter. The length of fallow period is required to prevent net loss of soil nutrients. Stable shifting cultivation systems are highly variable, closely adapted to micro environments and are carefully managed by farmers during both the cropping and fallow stages. Shifting cultivators know about the local environments and of the crops and the native plant species they exploit. Complex and highly adaptive land tenure system sometimes exists under shifting cultivation. Both food crops and cash crops are skillfully integrated in some shifting cultivation system.

Shifting cultivation systems are perceived as primitive, backward, wasteful, unproductive and exploitative causing widespread environmental degradation. Shifting cultivators are also blamed for wide destruction of world's tropical forest, land degradation, atmospheric pollution and global climatic change.

In the tropical developing world, shifting cultivation in its many diverse forms remains a pervasive practice. Shifting cultivation was one of the very first forms of agriculture practiced by humans and its survival into the modern world suggests that it is a flexible and highly adaptive means of production. This system is susceptible to rapid increase in population and economic and social change in the world.

Increase in human population has put tremendous pressure on land. Increase in food production to feed the increased population more forest and grass land area was brought under cultivation. According to one estimate, about 40 per cent of the land surface was converted into crop land and permanent pastures by 1990. Besides, more than 6 per cent area of tropical forest was converted to shifting cultivation between 1980 and 1990 across all tropical countries. About 10 per cent of forest land was converted to shifting cultivation in Asia during this period. It has been estimated by FAO that each year about $1.9-3.6 \times 10^6$ ha land of primary close forest, $3.4-4.0 \times 10^6$ ha land of secondary close forest and $6.9-21.9 \times 10^6$ ha land of secondary open forests are being lost due to shifting cultivation.

1.5 Shifting cultivation in different states of India

Table-1.1 shows the distribution of area and tribal families engaged in jhum cultivation. It indicated that highest area under jhum cultivation was in Orissa followed by Tripura, Meghalaya and Madhya Pradesh. The highest number of tribal families engaged in jhum was in Orissa followed by Meghalaya and Mizoram. In India about 5 million tribal families extensively practice shifting cultivation in 4.37 million hectares of land covering 11 states. It is also prevalent in other countries of Asia, Africa, South America and Australia.

Table-1.1
SHIFTING CULTIVATION IN DIFFERENT STATES OF INDIA

State	Total families (million)	Total area (Million hectares)
Andhra Pradesh	0.11	0.15
Arunachal Pradesh	0.43	0.21
Assam	0.31	0.31
Bihar	0.23	0.19
Madhya Pradesh	0.19	0.18
Manipur	0.36	0.26
Mehgalaya	0.61	0.47
Mizoram	0.40	0.19
Nagaland	0.19	0.12
Orissa	2.00	1.60
Tripura	0.19	0.49
Total	5.02	4.37

Source: Shifting cultivation in India, ICAR

1.6 Shifting cultivation in North Eastern States

All states of north east India, practice shifting cultivation. People of eastern and north eastern states practice shifting cultivation on hill slopes. About 85 per cent of total cultivation in north east India is done by shifting cultivation.

Studies indicated that loss of forest cover was mainly due to shifting cultivation. A substantial area is also covered by scurby vegetation which can check soil erosion from the hilly slopes. The shifting cultivation is generally practiced in the following sequences.

- Selecting a forest patch and clear fell the vegetation normally in December and January

- Burning of vegetation, short cut trunks portion and roots are normally not removed. Shrubs and twigs and branches are burnt in February and March.
- Sowing of seeds by dibbling is done mostly for cereals, vegetables and oil seeds in April and May.
- Cultivation is continued for few years.
- Abandoning the cultivated site and shifting to other forest sites
- Returning to former site, and once again practice shifting cultivation on it.

It is seen that in some places jhum cycle has reduced from 20-30 to 2-3 years degrading land by removing the soil nutrients from top soil. This reduces crop yield and the families move in search of other virgin soil. Shifting cultivation has already affected 2.70 million hectares of land and every year 0.45 million hectares are affected in north east India.

Shifting cultivation has affected ecology in the region. Forest area has declined, habitat has been fragmented, native species have been disappeared and weeds and other plants have invaded. It is also seen that weed invasion is more vulnerable in jhum cycle of 5-10 years compared to 15 year cycles. In long cycle period more soil nutrients are regained with higher number of species with high energy output to input. Repeated short cycle jhuming has created canopy gaps evident from barren hills.

Shifting cultivation is different from slash –and- burn. Slash-and-burn is a mere land clearing method to open up forest land to use it for permanent agriculture. Shifting cultivation on the other hand is an integrated farming system involving forestry, agriculture and strong social organization on the part of the communities.

The Indian Forest Act of 1927 excluded the forest of NE region from protection which is controlled by the communities. In the recent years, the Act has been modified for NE India including conversion of large forest areas into reserved forest or protected areas, development of land use system.

B.K. Tewari, a professor of NE Hill University has classified shifting agriculture into four types: traditional, distorted, innovated and modified. Traditional agriculture is prevalent in the remote areas, free from population pressure and sustainable and satisfies the needs of the rural population. It may not fulfill the needs of a modern society but it helps conserve forest.

In the second type due to decline in land-man ratio fallow period has reduced in places distorting the shifting cultivation. In Mizoram, for this reason, jhum cultivation has been shifted to the hill slopes which have been converted to plantation crops like bamboo brakes and scrubs

In the third type, new methods of cultivation has been followed. This method has been widely adopted to the current availability of resources suited to present day societal requirement. In some cases they have introduced pulse crops to increase fertility of the soil.

The modified shifting agriculture has been recently introduced. One such development project in Meghalaya and also in Manipur and in the hill districts of Assam in the name of North Eastern Region Community Resource Management Project (NERCORMP) has been implemented. Another such project like Nagaland Environment Protection and Economic Development (NEPED) has improved livelihood through promotion of tea husbandry and cash crops. NERCORMP has worked on institutional building and microfinance. It is imperative that through multi pronged development strategies and intervention the productivity of shifting cultivation can be enhanced with sustainability. The integrated approach can save the marginal and small farmers from forced conversion of shifting to permanent form of cultivation. Otherwise, the poorest farmers will leave farming and land will be degraded. However, any approach should meet the socio economic needs of the people.

Table-1.2
DISTRICTWISE JHUMIA FAMILIES OF MEGHALAYA

Name of District	Total population (Rural)	Jhumia families dependent on Jhum	Jhumia population dependent on Jhum	P.C of the jhumia population from total rural population	Annual area under jhum in Sq.Km	P.C. of Annual Jhum Area from the total geographical area
East Khasi hills	383027	721	3605	0.94	6.20	0.23
Ri-Bhoi	179630	4351	21755	12.11	27.40	1.53
West Khasi hills	260595	5374	26870	10.31	46.19	0.88
South Garo Hills	90462	7900	39500	43.66	67.87	3.67
Total	1853457	51428	257140	13.87	442.00	1.97

Table-1.2 clearly indicates that annual area under jhum cultivation was higher in south Garo hills followed by west Khasi hills. Jhumia population was also higher in south Garo hills.

1.7 Shifting cultivation in other parts of the world:

In the tropical developing world, shifting cultivation in its many diverse forms remains a pervasive practice. It was one of the very first forms of agriculture practiced by humans and its survival in to the modern world suggests that it is a flexible and highly adaptive means of production. Shifting cultivation was till being practiced as a viable and stable form of agriculture. In many parts of the world at the end of 19th century and in some places well in to the 20th century also. In the Ruhr in the late 1860's a forest-field rotation system known as Reutbergwirtschaft was using a 16 years cycle of cleaning, cropping and fallowing with trees to produce bark or tanneries, wood for charcoal and rye for flour. Swidden farming was practiced in Siberia at least until the 1930's, using a specially selected variety of "Swidden-rye". In the east part of Europe and north part of Russia the main Swidden crops were turnips, barley, flax, rye, wheat, oats, radishes and millet. Cropping periods were usually one year, but were extended to two or three years on very favourable soils. Fallow periods were between 20 to 40 years. Shifting cultivation was disappearing from some part of Finland because of a loss of agricultural labour to the industries of the towns. The shifting cultivation being practiced in Sweden in the 1900s, and in Estonia, Poland, Caucasus, Serbia, Bosnia, Hungary, Switzerland, Austria and Germany in 1930s to the 1950s.

The loss of forest in Indonesia, Thailand and Philippines during the 1990s was preceded by major ecosystem disruptions in Vietnam, Laos and Cambodia in the 1970s and 1980s caused by warfare. Forests were sprayed defoliant, thousands of rural forests dwelling people uproots from their homes and moved and roads driven in to previously isolated areas. The loss of forests and destruction fragile ecosystems could be provided from the Amazon Basin, by large scale state sponsored colonization forest land or from the central Africa where endemic armed conflict is destabilizing rural settlement and farming communities on a massive scale.

Nevertheless, shifting cultivation system is particularly susceptible to rapid increases in population and to economic and social change in the large world

around them. The blame for the destruction of forest resources is often laid on shifting cultivators. But the forces bringing about the rapid loss of tropical forests at the end of 20th century are the same forces that led to the destruction of the forests of Europe, urbanization, industrialization and the application of latest technology to extract ever more resources from the environment in pursuit of political power by competing groups.

1.8 Effects of shifting cultivation

Practice of shifting cultivation causes loss to flora and fauna which include precious tree plants, shrubs, medicinal plants, and minor forest products. The ill effects of shifting cultivation have been summarized below.

- i. it is an easy method of deforestation
- ii. the wild animals lose their shelter
- iii. springs below the hills dry up
- iv. causes heavy flood in the rivers below
- v. increases water/moisture scarcity for plants, animals and human beings
- vi. siltation to the tanks, drains, rivers and reservoirs
- vii. ecology is disturbed and distorted which never restored
- viii. causes soil erosion

1.9 Views on impact on ecology

There are diverse opinions on impact of jhum cultivation on ecology. One school of thought agrees its adaptation in a specific ecology in the hills while other school of thought argues its deleterious effect on environment like depletion of soil nutrients, reducing the forest cover, causing land slides etc. Such arguments against jhum have come from forest Department, DONER, World Bank for trade promotion. Some private entities also want to utilize jhum land abolishing the villagers for industrial purposes and which have been observed in Meghalaya like mineral extraction industries and bamboo cultivation by corporations. Scientists from different research institutes like

1.10 Eco development plan for areas under shifting cultivation

Shifting cultivation in the hill slopes causes several ecological adversities affecting flora and fauna and heavy siltation due to erosion. To check this the region needs to eco development plan integrating with farm forestry. It is because of high protective value greater than annual crops, ensures minimum soil degradation, provides fodder and firewood, and it has other several advantages of revived forest cover. This will help in generating forest resources and production of milk than production of food grains. Forest produce per unit is higher than food production. In the hill slopes, practice of

Chapter-II

CURRENT PATTERN OF CROP CULTIVATION IN THE HILL AREAS

2.1. Shifting cultivation in NE India:

Table 2.1 indicates that annual area under shifting cultivation in square kilometers was more in Manipur, Assam, Arunachal Pradesh, Mizoram and Meghalaya and the fallow period varied from 2.10 years in Assam to 5.90 years in Tripura followed by Nagaland and Meghalaya. The minimum area under shifting cultivation one time or other was more in Manipur and Meghalaya. In Tripura quite less number of families were engaged in shifting cultivation and it was the highest in Nagaland followed by Manipur. The Table also indicated that annual area under shifting cultivation per family was the lowest in Nagaland.

Table-2.1
SHIFTING CULTIVATION IN N. E. REGION

States	Annual area under shifting cultivation (sq Kms)	Fallow period (In year)	Minimum area under shifting cultivation one time or other (sq Kms)	No. of families practicing shifting cultivation
Arunachal Pradesh	700	3.10	2,100	54,000
Assam	696	2.10	1,392	58,000
Manipur	900	4.70	3,600	70,000
Meghalaya	530	5.70	2,650	52,290
Mizoram	630	3.40	1,890	50,000
Nagaland	190	5.80	1,913	116,046
Tripura	223	5.90	1,115	43,000

Source: Basic Statistics for NE India, 2000, NEC, Shillong

2.2. Cropping pattern in NE region:

Table-2.2 shows that cropping pattern in the hills of NE region was dominated by cereals. During 1990-91, area under food grains out of gross cropped area was the highest in Manipur (90.00%) and it was the lowest in Meghalaya (54.70%) followed by Sikkim and Tripura. In most of the states of NE India proportionate area under food grains was higher than country average. About 7.50 per cent of gross cropped area was under

Table-2.2
CHANGES IN CROPPING PATTERN IN NE REGION (% to GCA)

States	1990-91					2003-04						
	Rice	Maize	Cereals	Food grains	Oilseeds	Fruits & Vegetables	Rice	Maize	Cereals	Food grains	Oilseeds	Fruits & Vegetables*
Arunachal Pradesh	49.30	15.20	74.00	74.00	8.60	13.40	44.10	14.30	68.20	70.90	9.80	15.20
Assam	65.60	0.50	68.60	71.60	8.40	5.50	64.00	0.50	66.40	69.30	7.60	7.40
Manipur	87.40	2.60	90.00	90.00	1.40	8.60	71.40	2.00	73.40	76.00	0.90	12.20
Meghalaya	42.70	7.60	53.40	54.70	3.70	23.50	39.50	6.10	46.90	48.60	3.50	25.90
Mizoram	69.30	8.90	78.20	79.90	7.40	12.20	50.30	8.90	59.30	63.40	6.40	17.00
Nagaland	60.70	11.40	76.50	81.00	7.90	4.30	39.80	9.50	54.80	61.50	12.50	8.70
Sikkim	12.70	26.30	53.40	64.00	8.90	4.60	11.00	27.50	48.40	53.70	7.40	7.50
Tripura	61.60	0.00	62.40	64.90	3.20	18.90	56.20	0.40	56.90	58.90	1.30	24.30
NE												
Region	62.50	2.80	68.40	71.30	7.50	7.90	58.50	2.80	63.80	66.90	7.10	10.30
All India	23.00	3.20	55.60	68.80	12.90	3.60	22.30	3.80	52.50	64.80	12.50	4.30

Note: * refers to the year 2002-03

Source: FAI (2005), <http://agricoop.nic.in>

oilseeds and were found to be quite low in Meghalaya and Tripura. Similarly fruits and vegetables shared 7.90 per cent of gross cropped area and it was dominated in Arunachal Pradesh, Meghalaya, Tripura and Mizoram. The area under fruits and vegetables was more than double of all India average.

During 2003-04, area under food grain predominated in the states of NE region. However, there was some shift from food grains to fruits and vegetables in most of the states. Oilseed area gained in Arunachal Pradesh and Nagaland and declined more in Tripura, Sikkim and Manipur. In all states of NE region, area under fruits and vegetables was found to shift. About 10.30 per cent of gross cropped areas were shared by fruits and vegetables.

2.3. Shift in area:

Shift in area was also examined from 1990-91 to 2003-04 in different states of North Eastern region. It was observed from Table 2.3 in all states of NE India percentage of grossed cropped area under rice declined over the years. It marginally increased for maize in Sikkim and Tripura and declined in all other states. Its decline

Table-2.3
SHIFT IN AREA IN 2003-04 OVER 1990-91 (% to GCA)

State	Rice	Maize	Cereals	Food grains	Oilseeds	Fruits & Vegetables
Arunachal Pradesh	-5.20	-0.90	-5.80	-3.10	1.20	1.80
Assam	-1.60	0.00	-2.20	-2.30	-0.80	1.90
Manipur	16.00	-0.60	-16.60	-14.00	-0.50	3.60
Meghalaya	-3.20	-1.50	-6.50	-6.10	-0.20	2.40
Mizoram	19.00	0.00	-18.90	-16.50	-1.00	4.80
Nagaland	20.90	-1.90	-21.70	-19.50	4.60	4.40
Sikkim	-1.70	1.20	-5.00	-10.30	-1.50	2.90
Tripura	-5.40	0.40	-5.50	-6.00	-1.90	5.40
NE Region	-4.00	0.00	-4.60	-4.40	-0.40	2.40
All India	-0.70	0.60	-3.10	-4.00	-0.40	0.70

was more in Nagaland and Meghalaya. Proportionate area under cereals declined faster in Nagaland, Mizoram and Manipur. The proportionate area of food grains declined for all states of NE region. Decline was much higher in Nagaland, Mizoram and in Meghalaya.

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In case of oilseeds, except Arunachal Pradesh, in all states of NE India proportionate area of oilseeds declined. It was observed that proportionate area increased in all states of NE India and the shift was higher in Tripura, Nagaland, Mizoram and also in Manipur.

2.4. Distribution of land holdings

Table 2.4 indicates the number of holdings and area in different states of NE India. Data under marginal, small, semi medium, medium and large holdings showed that average size of holdings was higher in Nagaland followed by Arunachal Pradesh. It was lower than one hectare in Tripura. Number of holdings and area in each size of holding were higher in Arunachal Pradesh which shared 74.95 per cent of holdings of NE India sharing 75.82 per cent of area. Out of total holdings in the country NE India shares 12.24 per cent of it covering 11.60 per cent of area. Small holdings were more in NE India followed by semi medium. Large holdings were the lowest. In all states of NE India small and semi medium holdings were relatively higher.

2.5. Growth in gross and net cropped area in NE India:

Table 2.5 indicates that NE region shares 3.13 per cent of total net cropped area in the country and Assam shares the highest. Net sown area was low in Mizoram, Tripura and Manipur. Net sown area as percentage of reporting area was the highest in Assam followed by Sikkim, Nagaland and Meghalaya. Its change over the last years was higher in Nagaland, Tripura and also in Meghalaya. In NE India it increased from 13.50 per cent in 1970-71 to 18.20 per cent in 2002-03.

Study of cropping intensity indicated that Arunachal Pradesh had the highest cropping intensity followed by Assam (142%), Manipur (141%) and Sikkim(124%). It was 135 per cent in the entire NE region against 133 per cent in the Country. In the states of Nagaland, Meghalaya and Tripura it was almost monocropping indicating more scope to intensify cultivation in those states.

2.6. Productivity of major crops in NE India

Table 2.6 indicates the productivity of paddy, maize, pulses and oilseeds. It was found that rice productivity was the highest in Manipur followed by Tripura. The average productivity of rice in the NE region was 1618 kg per hectare. The annual shift from 1990-91 to 2003-04 was higher in Meghalaya and Mizoram. Productivity change of

Table-2.4
DISTRIBUTION OF LAND HOLDINGS, 1995-96

States	Marginal		Small		Semi-medium		Medium		Large		Total		Average Holdings (ha.)
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	
Arunachal Pradesh	6300	2904	2262	3229	1395	3736	563	3231	83	1273	10603	14373	3.31
Assam	1669	621	561	770	351	924	96	495	5	328	2682	3138	1.17
Manipur	69	39	49	67	21	54	3	14	0	0	142	174	1.22
Meghalaya	72	35	44	55	39	94	6	27	0	2	161	213	1.33
Mizoram	28	17	26	36	12	28	0	4	0	0	66	85	1.29
Nagaland	9	5	21	23	40	104	64	381	14	206	148	719	4.83
Sikkim	24	10	10	14	6	18	3	18	1	13	44	73	1.66
Tripura	247	81	40	56	12	30	1	6	0	9	300	182	0.60
NE Region	8418	3712	3013	4250	1876	4988	736	4176	103	1831	14146	18957	1.34
All India	71129	28121	21643	30722	14261	38953	7092	41398	1404	24163	115529	163357	1.41

Note: Number of holdings in '000 and Area operated in '000 hectare

Source: CMIE, 2006

Table-2.5
GROWTH IN GROSS AND NET CROPPED AREA IN NE STATES, 1970-71 to 2002-03

States	Net sown area (NSA), '000Ha.				Gross Cropped Area, '000 Ha.				NSA % to reporting area				Cropping Intensity			
	1970-71	1980-81	1992-93	2002-03	1970-71	1980-81	1992-93	2002-03	1970-71	1980-81	1992-93	2002-03	1970-71	1980-81	1992-93	2002-03
Arunachal Pradesh	115	112	150	164	130	141	255	255	2	2	2.7	3	113	126	170	155
Assam	2236	2696	2706	2793	2793	3373	3837	3964	28.5	34.3	34.5	35.6	125	125	142	142
Manipur	178	140	140	155	187	219	187	219	8	6.3	6.3	8.2	105	156	134	141
Meghalaya	163	193	201	230	203	223	239	248	7.2	8.6	9	10.3	125	116	119	108
Mizoram	39	77	65	90	40	106	102	90	1.9	3.7	3.1	4.4	103	138	157	100
Nagaland	101	148	204	324	101	158	228	370	6.1	13.7	13.2	20.3	100	107	112	114
Sikkim	240	251	263	280	345	405	443	346	22.9	24	25.1	26.7	144	161	168	124
Tripura	-	86	95	116	-	91	125	127	-	12	13.4	17.3	-	106	132	109
NE Region	3072	3703	3824	4152	3799	4716	5416	5619	13.5	16.2	16.5	18.2	124	127	142	135
All India	144267	148002	142509	132788	155791	172630	185487	175988	46.2	46	46.1	41.6	118	121	130	133

Table-2.6
PRODUCTIVITY OF MAJOR CROPS OF N.E. REGION (Kg/ha.)

States	Paddy		Maize		Total Cereals		Total Pulses		Foodgrains		Oilseeds	
	1990-91	2003-04	1990-91	2003-04	1990-91	2003-04	1990-91	2003-04	1990-91	2003-04	1990-91	2003-04
Arunachal Pradesh	1170	1297	1215	1412	1173	1284	-	1068	1173	1276	934	1030
Assam	1313	1534	626	719	1303	1512	428	552	1266	1472	530	524
Manipur	1742	2346	2478	2295	1763	2345	-	517	1763	2282	500	474
Meghalaya	1155	1830	1196	1533	1157	1769	750	745	1142	1733	607	653
Mizoram	1244	1914	1682	1933	1294	1917	1417	878	1296	1849	1182	720
Nagaland	1227	1377	933	1489	1161	1403	1160	830	1161	1341	891	1068
Sikkim	1218	1442	1500	1556	1409	1443	1019	958	1344	1395	1067	747
Tripura	1830	2173	-	895	1830	2174	578	614	1783	2122	715	717
NE Region	1361	1618	1222	1442	1347	1590	559	560	1315	1546	601	634
All India	1751	2077	1524	2039	1573	1987	576	637	1382	1731	769	1067

Source: FAI (various year)

rice was almost stagnant in Arunachal Pradesh. Relative to rice productivity shift was low in maize in almost all the states of NE region. In terms of total cereals, Manipur experienced the highest productivity followed by Tripura. The productivity of cereals in NE region was 1590 kg per hectare. The productivity of cereals in the region shifted positively. Productivity of pulse and its shift in the region was quite dismal. Productivity of pulse was low in Meghalaya, Mizoram, Nagaland and in Sikkim.

Productivity of pulse was the highest in Arunachal Pradesh and it was 560 kg per hectare in the region. Foodgrains productivity in the region is 1546 kg per hectare with an annual shift of 1.35 per cent during 1990-91 to 2003-04. The highest annual shift of foodgrain productivity was in Meghalaya followed by Mizoram and it was almost stagnant in Arunachal Pradesh and Sikkim. The national average productivity of food grains in India is 1731 kg per hectare and the average productivity in the region is about 1546 kg per hectare and it has grown at the rate of 1.35 per cent per annum.

Productivity of oilseeds was found low and almost stagnant in this region. The productivity was at par with higher annual growth in Nagaland followed by Arunachal Pradesh. In all other states it was low with low annual growth. The table reveals that productivity of food grains and oilseeds in this region was lower than national average and needs policy measures to increase productivity.

2.7. Share of area under food and non food grain crops:

The share of area under food grain and non food grain crops to gross cropped area and annual growth rate of area under food grain crops of eight North Eastern States along with all India level has been presented in Table-2.7.

In NE region the percentage of food grain crops area was 72.65 in 1970-71 and 1980-81. But it decreased to 70.18 percent in 1992-93 and then 69.62 percent in 2002-03. Among the eight states of NE Region the share of area under food grain crops was highest for Manipur (79.45%) and lowest for Meghalaya (54.03%) in 2002-03. In case of Sikkim there were no any records for the year 1970-71 and 1980-81, but in 2002-03, table-2.7 reveals that, the area under food grain crops was decreased from 62.40 percent in 1992-93 to 56.69 percent. In all India level, the share of area under food grain crops also decreased over decades. It was 74.98 percent in 1970-71 to 64.70 percent in 2002-03.

Table-2.7

**GROWTH IN AREA UNDER FOOD GRAINS AND NON-FOOD RAINS IN NE STATES
(PERCENTAGE SHARE IN GROSS CROPPED AREA)**

States	Food grains				Non-food grains				Annual growth of area under food grains in 2002-03 over 1970-71
	1970-71	1980-81	1992-93	2002-03	1970-71	1980-81	1992-93	2002-03	
Arunachal Pradesh	43.08	88.65	71.76	77.65	56.92	11.35	28.24	22.35	34.57
Assam	74.90	74.74	71.25	69.37	25.10	25.26	28.75	30.63	-5.53
Manipur	77.01	91.78	81.72	79.45	22.99	8.22	18.28	20.55	2.44
Meghalaya	59.11	55.61	55.23	54.03	40.89	44.39	44.77	45.97	-5.08
Mizoram	40.00	31.13	70.59	76.67	60.00	68.87	29.41	23.33	36.37
Nagaland	60.40	78.48	82.46	67.03	39.60	21.52	17.54	32.97	6.63
Sikkim	-	0.00	62.40	56.69	-	100.00	37.60	43.31	56.69
Tripura	78.55	73.58	58.92	77.17	21.45	26.42	41.08	22.83	-1.38
NE Region	72.65	72.65	70.18	69.62	27.35	27.35	29.82	30.38	-3.03
All India	74.98	73.37	66.39	64.70	25.02	26.63	33.61	35.30	-10.28

Source: CMIE (1998, 2005)

The trend of area share under non-food grain crops of N.E Region was found to increase from 27.35 percent in 1970-71 to 30.38 percent in 2002-03. Though Assam and Meghalaya showed an increasing trend of area share for non-food grain crops, the decadal growth rate was very slow. In Assam, the area share increased from 25.10 percent in 1970-71 to 30.63 percent in 2002-03. In Meghalaya it increased from 40.89 percent in 1970-71 to 45.97 percent in 2002-03. Table-2.7 also reveals that the area under non-food grain crops was highest for Meghalaya (45.97%) and lowest for Manipur (20.55%) in 2002-03 among the eight states of NE Region. In 1970-71 and 1980-81 the area under non-food grain crops was more than the all India level. During 1992-93 to 2002-03, it found more for the country.

The annual growth of area under food grain crops during 1970-71 to 2002-03 was found highest for Mizoram (2.78%) and lowest for Tripura (-0.05%) Among the eight NE Region states of India the growth of area under food grain crops has been found

negative for three states viz. Assam (-0.22%), Meghalaya (-0.26%) and Tripura (-0.05%). The annual growth of area under food grain crops for all India level also found negative with -0.42%.

(PERCENTAGE CHANGE IN AREA UNDER FOOD GRAIN CROPS)

States	Food grain crops	
	Area	Change (%)
All India	100	-0.42
Andhra Pradesh	100	0.15
Assam	100	-0.22
Bihar	100	0.10
Chhattisgarh	100	0.05
Gujarat	100	0.20
Haryana	100	0.30
Karnataka	100	0.18
Kerala	100	0.12
Madhya Pradesh	100	0.08
Madhya Pradesh	100	0.25
Maharashtra	100	0.15
Manipur	100	-0.10
Mizoram	100	-0.15
Nagaland	100	-0.26
Odisha	100	0.10
Punjab	100	0.25
Rajasthan	100	0.15
Tamil Nadu	100	0.10
Telangana	100	0.15
Uttar Pradesh	100	0.10
West Bengal	100	0.15
Goa	100	0.10
Himachal Pradesh	100	0.15
Jharkhand	100	0.10
Karnataka	100	0.15
Kerala	100	0.10
Madhya Pradesh	100	0.15
Maharashtra	100	0.10
Manipur	100	-0.10
Mizoram	100	-0.15
Nagaland	100	-0.26
Odisha	100	0.10
Punjab	100	0.25
Rajasthan	100	0.15
Tamil Nadu	100	0.10
Telangana	100	0.15
Uttar Pradesh	100	0.10
West Bengal	100	0.15
Goa	100	0.10
Himachal Pradesh	100	0.15
Jharkhand	100	0.10

The trend of area under food grain crops in India has been declining since 1950-51. The decline in area under food grain crops is due to various reasons. One of the main reasons is the shift of land from agriculture to other uses such as industrial and residential. Another reason is the increasing population and the need for more land for housing and infrastructure. The government has been trying to increase the area under food grain crops by various measures such as land reclamation and afforestation. However, the decline in area under food grain crops is still a major concern for the government.

Chapter-III

SOCIO-ECONOMIC PROFILE OF THE SAMPLE HOUSEHOLDS

3.1 Population distribution of farm households

In Ri-bhoi district of Meghalaya children and adult population was higher. The farm families had more number of children upto 15 years followed by young adults in the age group of 15-25 years. Composition of aged people was quite less in the farm families. Distribution of population in the working class in the age group of 25-45 years was 26.90 per cent in the district. Female population was marginally low. About 2.03 per cent of population in the district were old over 55 years. (Table-3.1)

Table-3.1
DISTRIBUTION OF POPULATION OF THE SAMPLE HOUSEHOLDS
ACCORDING TO AGE-GROUPS IN MEGHALAYA

Age Group	Meghalaya							
	Ri-bhoi District				West Garo Hills District			
	Male	Female	Total	Percentage	Male	Female	Total	Percentage
Below 15 Yrs.	39	38	77	39.09	25	26	51	28.49
15 - 25 yrs	25	25	50	25.38	32	22	54	30.17
25 - 35 yrs	8	11	19	9.64	8	9	17	9.50
35 - 45 yrs	17	17	34	17.26	12	13	25	13.97
45 - 55 yrs	8	5	13	6.60	13	11	24	13.41
55 - 65 yrs	3	0	3	1.52	5	3	8	4.47
65 yrs & above	1	0	1	0.51	0	0	0	0.00
Total	101	96	197	100.00	95	84	179	100.00
Avg. Family Size	3.37	3.20	6.57	-	3.17	2.80	5.97	-

In west Garo Hills district pattern of distribution of population in the farm families was almost similar with Ri-bhoi district. Male population was marginally higher over female population and 28.49 per cent were children below 15 years and 30.17 per cent in the age group of 15-25 years. The district did not have family members above 65 years. It was observed that in both the districts population was skewed towards lower age groups. The average size of population in Ri-bhoi district was 6.57 while it was 5.97 in West Garo hills district of Meghalaya.

The average family size in Mizoram was lower than Meghalaya. In Aizal district average family size was 5.43 while it was 6.03 in Kalasib district. In both the districts male and female ratio was almost same. It was observed that more than 60.00 per

cent of population was under the age group of below 25 years. Percentage of old people was higher in both the districts of Mizoram. (Table-3.2)

Table-3.2
DISTRIBUTION OF POPULATION OF THE SAMPLE HOUSEHOLDS
ACCORDING TO AGE-GROUPS IN MIZORAM

Age Group	Mizoram							
	Aizwal District				Kalasib District			
	Male	Female	Total	Percentage	Male	Female	Total	Percentage
Below 15 Yrs.	24	27	51	31.29	26	35	61	33.70
15 - 25 yrs	27	24	51	31.29	28	26	54	29.83
25 - 35 yrs	9	6	15	9.20	10	9	19	10.50
35 - 45 yrs	10	13	23	14.11	12	9	21	11.60
45 - 55 yrs	8	8	16	9.82	7	8	15	8.29
55 - 65 yrs	4	2	6	3.68	5	3	8	4.42
65 yrs & above	1	0	1	0.61	2	1	3	1.66
Total	83	80	163	100.00	90	91	181	100.00
Average Family Size	2.77	2.67	5.43	-	3.00	3.03	6.03	-

3.2 Educational status of sample households in Meghalaya

In Ri-bhoi district of Meghalaya only 5 per cent of total population were illiterate. A family member with higher education was 2.50 per cent only. About 4.17 per cent passed HSLC and the rest were upto HSLC. Age and education were inversely related in the district. (Table3.3)

Table-3.4 indicates that illiterate persons were more in West Garo Hills district. Rate of literacy percentage was also comparatively lower. The percentage of literate upto HSLC was higher in the district. Highly educated persons were low in the families. In this district also age and education were inversely related.

3.3 Educational status of sample households in Mizoram

Table-3.5 indicates that in Aizwal District of Mizoram more number of farm family members was found to be educated in 15-25 and 35-45 age groups. Literate people were scarce in upper limit of age groups. All the households had educated members in the middle level of education. Members with higher education were limited. Higher secondary and graduate level educations in the households were quite negligible. About 82.14 per cent of total population had education from primary level upto High School level. It was observed that age and education had inverse relationship in the district.

Table-3.3
EDUCATIONAL STATUS OF THE SAMPLE HOUSEHOLDS OF RI-BHOI DISTRICT (MEGHALAYA) BY AGE- GROUP

Age Groups	Illiterate			Lit. up to Primary			Up to M.E.Std.			Up to High School Std.			H.S.L.C. Passed			H.S. Passed			Graduate & Above			Total			
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F		
15 - 25 yrs	1	1	2	2	0	2	4	5	9	11	13	24	3	2	5	2	3	5	2	2	4	1	3	25	25
25 - 35 yrs	0	0	0	0	5	5	1	5	6	7	1	8	0	0	0	0	0	0	0	0	0	0	0	8	11
35 - 45 yrs	0	4	4	6	9	15	4	3	7	5	1	6	2	0	2	0	0	0	0	0	0	0	0	17	17
45 - 55 yrs	0	0	0	3	1	4	4	3	7	1	1	2	0	0	0	0	0	0	0	0	0	0	0	8	5
55 - 65 yrs	0	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0
65 yrs & above	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Total	1	5	6	12	15	27	15	16	31	25	16	41	5	2	7	2	3	5	2	3	5	2	1	62	58
Percentage	0.83	4.17	5.00	10.00	12.50	22.50	12.50	13.33	25.83	20.83	13.33	34.17	4.17	1.67	5.83	1.67	2.50	4.17	1.67	0.83	2.50	51.67	48.33		

Note: Population under 15 years are not considered. M = Male, F = Female, T = Total

Table-3.4
EDUCATIONAL STATUS OF THE SAMPLE HOUSEHOLDS OF WEST GARO HILLS DISTRICT (MEGHALAYA) BY AGE- GROUPS

Age Groups	Illiterate			Lit: up to Primary			Up to M.E. Std.			Up to High School Std.			H.S.L.C. Passed			H.S. Passed			Graduate & Above			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
15 - 25	2	1	3	0	0	0	5	9	14	14	8	22	4	1	5	5	2	7	2	1	3	32	22	54
25 - 35	0	1	1	1	2	3	3	2	5	4	4	8	0	0	0	0	0	0	0	0	0	8	9	17
35 - 45	0	2	2	1	6	7	3	3	6	6	2	8	1	0	1	1	0	1	0	0	0	12	13	25
45 - 55	2	2	4	4	5	9	2	1	3	2	3	5	3	0	3	0	0	0	0	0	0	13	11	24
55 - 65	1	3	4	1	0	1	1	0	1	2	0	2	0	0	0	0	0	0	0	0	0	5	3	8
65 & above	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	5	9	14	7	13	20	14	15	29	28	17	45	8	1	9	6	2	8	2	1	3	70	58	128
Percentage	3.91	7.03	10.94	5.47	10.16	15.63	10.94	11.72	22.66	21.88	13.28	35.16	6.25	0.78	7.03	4.69	1.56	6.25	1.56	0.78	2.34	54.69	45.31	100.00

Note: Population under 15 years are not considered.

Table-3.5
EDUCATIONAL STATUS OF THE SAMPLE HOUSEHOLDS OF AIZWAL DISTRICT (MIZORAM) BY AGE- GROUPS

Age Groups	Illiterate		Lit. up to Primary		Up to M.E.Sd.		Up to High School Sd.		H.S.L.C. Passed		H.S. Passed		Graduate & Above		Total									
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female								
15 - 25 yrs	0	0	4	5	6	7	12	8	3	2	2	4	0	0	27	24	51							
25 - 35 yrs	0	1	1	1	2	1	3	2	1	1	0	0	0	0	9	6	15							
35 - 45 yrs	0	2	1	6	2	3	5	2	1	0	1	1	0	0	10	13	23							
45 - 55 yrs	0	1	4	3	2	1	3	3	1	0	0	0	0	0	8	8	16							
55 - 65 yrs	1	1	0	0	2	1	1	0	0	0	0	0	0	0	4	2	6							
65 yrs & above	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1							
Total	1	5	6	11	14	13	24	15	6	3	9	3	2	5	0	0	59	53	112					
Percentage	0.89	4.46	5.36	9.82	13.39	23.21	12.50	11.61	24.11	21.43	13.39	34.82	5.36	2.68	8.04	2.68	1.79	4.46	0.00	0.00	0.00	52.68	47.32	100.00

Note: Population under 15 years are not considered.

Table-3.6
EDUCATIONAL STATUS OF THE SAMPLE HOUSEHOLDS OF KALASIB DISTRICT (MIZORAM) BY AGE-GROUPS

Age Groups	Illiterate			Lit. up to Primary			Up to M.E. Std.			Up to High School Std.			H.S.L.C. Passed			H.S. Passed			Graduate & Above			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
15 - 25	0	0	0	2	4	6	6	10	16	10	8	18	5	2	7	5	2	7	0	0	0	28	26	54
25 - 35	1	0	1	1	3	4	4	3	7	3	3	6	1	0	1	0	0	0	0	0	10	9	19	
35 - 45	1	1	2	1	4	5	2	3	5	6	1	7	1	0	1	1	0	1	0	0	12	9	21	
45 - 55	1	1	2	2	2	4	1	1	2	1	3	4	2	1	3	0	0	0	0	0	7	8	15	
55 - 65	1	2	3	2	1	3	1	0	1	1	0	1	0	0	0	0	0	0	0	0	5	3	8	
65 & above	1	1	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	1	3	
Total	5	5	10	8	14	22	15	17	32	21	15	36	9	3	12	6	2	8	0	0	0	64	56	120
Percentage	4.17	4.17	8.33	6.67	11.67	18.33	12.50	14.17	26.67	17.50	12.50	30.00	7.50	2.50	10.00	5.00	1.67	6.67	0.00	0.00	0.00	53.33	46.67	100.00

Note: Population under 15 years are not considered.

In Kolasib district of Mizoram pattern of educational status was almost same (Table – 3.6). More number of members from farm family was found to be educated in the age group of 15-25 years. It declined with the increase in age groups. About 8.83 per cent of farm family members were illiterate and there was no graduate. About 30.00 per cent were above M.E. standard. Only 10.00 per cent of the members had education upto HSLC level. About 85.02 per cent had education for primary level to High School Standard. Middle level education was higher in the district. It was observed that with the increase in age group, level of education was found to decline. Older members were less educated. It indicated that decision makers in the farms were less educated in the farm families.

2.4 Economic status of sample households in Meghalaya

Table-3.7 and Table-3.8 show the economic status of farm households in Ri-bhoi and West Garo Hills districts of Meghalaya. It was observed that in Ri-bhoi district 21.83 per cent were earners while 33.50 per cent were earning dependents and 44.67 per cent were non-earners. Earning dependent and non-workers were more in the age group of below 25 years. It declined with the increase in ages of the farmers. Total earners were higher at 35-45 years of age. Male members were more in earning groups. Employment status in the district was quite low.

In West Garo Hills districts, status of earners was low. About 41.34 per cent were earning dependent and 39.11 per cent were non-workers. Earners were higher in 15-25 age group. Earning dependent and non-workers were also more in this age group. At higher level of age group, number of earners declined. Over 55 years, number of earners, earning dependent and non-workers were quite negligible in the district.

Table- 3.7
ECONOMIC STATUS OF SAMPLE HOUSEHOLDS ACCORDING TO AGE GROUPS
IN RI-BHOI DISTRICT OF MEGHALAYA

Age Groups	Earner			Earning Dependent			Non-Worker			Grand Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Below 15 Yrs.	0	0	0	5	3	8	34	35	69	77
15 - 25 yrs	3	0	3	15	19	34	7	6	13	50
25 - 35 yrs	5	8	13	2	1	3	1	2	3	19
35 - 45 yrs	10	8	18	7	8	15	0	1	1	34
45 - 55 yrs	7	1	8	1	4	5	0	0	0	13
55 - 65 yrs	1	0	1	1	0	1	1	0	1	3
65 yrs & above	0	0	0	0	0	0	1	0	1	1
Total	26	17	43	31	35	66	44	44	88	197
Percentage	13.20	8.63	21.83	15.74	17.77	33.50	22.34	22.34	44.67	100.00

Table: 3.8
ECONOMIC STATUS OF SAMPLE HOUSEHOLDS ACCORDING TO AGE GROUPS
IN WEST GARO HILLS DISTRICT OF MEGHALAYA

Age Groups	Earner			Earning Dependent			Non-Worker			Grand Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Below 15 Yrs.	0	0	0	5	4	9	20	22	42	51
15 - 25 yrs	3	6	9	15	8	23	14	8	22	54
25 - 35 yrs	2	4	6	6	3	9	0	2	2	17
35 - 45 yrs	8	2	10	4	9	13	0	2	2	25
45 - 55 yrs	7	2	9	6	8	14	0	1	1	24
55 - 65 yrs	1	0	1	3	3	6	1	0	1	8
65 yrs & above	0	0	0	0	0	0	0	0	0	0
Total	21	14	35	39	35	74	35	35	70	179
Percentage	11.73	7.82	19.55	21.79	19.55	41.34	19.55	19.55	39.11	100.00

3.5 Economic status of sample households in Mizoram

Table-3.9 and Table-3.10 show that in Aizwal district of Mizoram 40 per cent of members of farm households were earners while 33.74 per cent were dependent.

Table: 3.9
ECONOMIC STATUS OF SAMPLE HOUSEHOLDS ACCORDING TO AGE GROUPS
IN AIZWAL DISTRICT OF MIZORAM

Age Groups	Earner			Earning Dependent			Non-Worker			Grand Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Below 15 Yrs.	0	0	0	4	8	12	20	19	39	51
15 - 25 yrs	2	1	3	8	17	25	17	6	23	51
25 - 35 yrs	8	5	13	1	1	2	0	0	0	15
35 - 45 yrs	10	7	17	0	5	5	0	1	1	23
45 - 55 yrs	4	2	6	2	5	7	2	1	3	16
55 - 65 yrs	1	0	1	2	2	4	1	0	1	6
65 yrs & above	0	0	0	0	0	0	1	0	1	1
Total	25	15	40	17	38	55	41	27	68	163
Percentage	15.34	9.20	24.54	10.43	23.31	33.74	25.15	16.56	41.72	100.00

Table: 3.10
ECONOMIC STATUS OF SAMPLE HOUSEHOLDS ACCORDING TO AGE GROUPS
IN KALASIB DISTRICT OF MIZORAM

Age Groups	Earner			Earning Dependent			Non-Worker			Grand Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Below 15 Yrs.	0	0	0	5	9	14	21	26	47	61
15 - 25 yrs	2	0	2	19	18	37	7	8	15	54
25 - 35 yrs	5	5	10	3	4	7	2	0	2	19
35 - 45 yrs	8	7	15	4	2	6	0	0	0	21
45 - 55 yrs	4	5	9	3	2	5	0	1	1	15
55 - 65 yrs	2	1	3	2	2	4	1	0	1	8
65 yrs & above	0	0	0	0	0	0	2	1	3	3
Total	21	18	39	36	37	73	33	36	69	181
Percentage	11.60	9.94	21.55	19.89	20.44	40.33	18.23	19.89	38.12	100.00

Non-workers were 41.72 per cent in the district. It was observed that female earners were more in the district. More number of middle aged people was earners. Non-workers were higher at lower age groups. The district had less number of earning members.

In Kolasib district of Mizoram, the economic status was almost similar. Earners were 21.55 per cent out of whom 11.60 per cent were male and 40.33 per cent were earning dependent. Numbers of non-workers were higher at lower age groups. Total number of earners was more at the middle aged group of farm family members. Relatively more number of males was the earning members. It was observed that earning dependents were more in the district at lower age groups. Analysis indicated that more than 75 per cent of members in the farm families were earning dependent and non-workers in both the districts of Mizoram.

Chapter-IV

ECONOMICS OF JHUM CULTIVATION

4.1 Introduction:

Cultivation of crops in jhum field is labour intensive with minimum use of fertilizer and irrigation water. Use of HYV seeds are also not common as the traditional jhumias use their own seeds which sustain in the hills under rainfed condition. Crops are also cultivated in the terraces and in the foot hills as settled cultivation under rainfed condition. It was also cultivated in the plains with spring water. Mixed cropping is generally practised in the jhum field for meeting their domestic requirement. High value crops are also cultivated for commercial purpose where there are good marketing facilities. In this chapter an economic analysis of jhum cultivation has been presented to examine the economic returns from jhum cultivation in the hills.

4.2 Population of the sample households engaged in jhum cultivation

Table-4.1 indicates the pattern of distribution of population engaged in jhum cultivation. It was observed that about 41.11 percent of total populations in farm families were engaged in jhum. It was more in Meghalaya (86.47%) and marginally low

Table- 4.1
DISTRIBUTION OF POPULATION OF THE SAMPLE HOUSEHOLDS
ENGAGED IN JHUM CULTIVATION

State / District	Total Population			Population Engaged in Jhum			Percentage of Jhumias		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
A. Meghalaya :									
Ri-Bhoi	101	96	197	42	37	79	21.32	18.78	40.10
West Garo Hills	95	84	179	48	35	83	26.82	19.55	46.37
B. Mizoram :									
Aizawl	83	80	163	37	24	61	22.70	14.72	37.42
Kalasib	90	91	181	40	33	73	22.10	18.23	40.33
Grand Total	369	351	720	167	129	296	23.19	17.92	41.11
Percentage Share	51.25	48.75	100.00	56.42	43.58	100.00	-	-	-

in Mizoram (77.75%). In both the states more than 77.00 per cent of members in farm families were engaged in jhum cultivation. In both the states male persons were engaged more than females. It was also observed that 56.42 and 43.58 per cent of total persons engaged in jhum were male and female respectively.

4.3 Land utilization pattern of sample households

It was observed from Table-4.2 that cropping intensity in both the districts of Meghalaya decreased with the increase in farm size. The average cropping intensity was 111.99 and 113.99 per cent respectively in Ri-bhoi and West Garo hills districts of Meghalaya.

4.4 Cropping pattern in jhum land:

The principal food grain crops grown in the jhum areas were rice followed by maize and millet while non food grain crops were sesamum, chilies, ginger and tapioca (Table-4.3). Cotton was the important non food crop grown by the jhumias both in Meghalaya and Mizoram. It was observed that out of total gross cropped area, about 87.08 per cent were occupied by food grains and about 10.40 per cent were occupied by non food grain crops. Area under non food crops was 2.02 per cent in Meghalaya. Rice was the main crop under food grains followed by chili under non food grain crops. West Garo hills district of Meghalaya practiced more of jhum cultivation with higher gross cropped area under paddy, maize, chili and ginger in the district. It was observed that about 98.00 per cent of gross cropped area was shared by food crops in jhum cultivation. It was also found that at lower level of holding gross cropped area was more under food crops in both the districts of Meghalaya and the area under non food crops was higher at higher level of holding.

In Mizoram the cropping pattern was almost similar to Meghalaya. Rice was the principal food grain crop followed by maize and millets. Ginger and chilies were the important non food grain crops in both the districts of Mizoram. Food crops occupied more than 98.00 per cent of gross cropped area and it was higher at lower level of holding. Gross cropped area was higher in Meghalaya relative to Mizoram. Cotton cultivation in Meghalaya was more as commercial cash crop in Kolasib district of Mizoram. Gross cropped area was higher at marginal and small holdings due to higher area put under rice cultivation in the jhum land. Large farmers in the Kolasib district of Mizoram did not cultivate crops under jhum

Table- 4.2
LAND UTILISATION OF SAMPLE HOUSEHOLDS UNDER JHUMING IN MEGHALAYA AND MIZORAM

State / District	Farm Size Group	No. of HH	Net Area Under Jhum (Ha)	GCA (Ha)	Cropping Intensity (%)	Jhum Cycle (Yrs)	Area per Worker (Ha)	Area Under WRC (Ha)	Area Under Terrace (Ha)	Area Under Horticultural Crops (Ha)	Area Under Plantation Crops (Ha)	Area Utilised other than Crops (Ha)	Total Opl. Area (Ha)	Total area (Culti.+ Un-culti.) (Ha)	Avg. Size of Holding (Ha)
A. Meghalaya :															
Ri-Bhoi	0-1 ha	15	9.50	11.14	117.26	3 - 4	0.56	1.20	0.00	1.20	0.00	0.80	11.90	12.70	0.79
	1-2 ha	8	8.60	9.84	114.42		0.66	1.60	1.50	0.50	0.00	0.40	12.20	12.60	1.53
	2-4 ha	4	5.90	6.51	110.34		0.84	1.00	1.80	1.00	0.00	0.20	9.70	9.90	2.43
	4 ha & above	3	7.20	7.45	103.47		1.20	3.00	1.10	1.20	0.00	0.10	12.50	12.60	4.17
	Overall	30	31.20	34.94	111.99		0.73	6.80	4.40	3.90	0.00	1.50	46.30	47.80	1.54
West Garo Hills	0-1 ha	13	6.32	7.90	125.06	7 - 8	0.45	1.80	0.00	2.50	0.00	0.75	10.62	11.37	0.82
	1-2 ha	12	15.25	17.31	113.48		1.09	1.20	0.00	2.25	1.20	0.70	19.90	20.60	1.66
	2-4 ha	3	7.35	7.99	108.76		1.84	0.80	1.00	1.20	0.00	0.22	10.35	10.57	3.45
	4 ha & above	2	3.68	3.96	107.50		0.92	2.00	1.50	2.30	1.00	0.13	10.48	10.61	5.24
	Overall	30	32.60	37.16	113.99		0.93	5.80	2.50	8.25	2.20	1.80	51.35	53.15	1.71
B. Mizoram :															
Aizawl	0-1 ha	15	8.15	9.17	112.45	2 - 3	0.48	0.00	0.00	2.50	0.00	0.80	10.65	11.45	0.71
	1-2 ha	10	8.55	9.32	109.04		0.61	1.35	0.00	1.30	0.00	0.85	11.20	12.05	1.12
	2-4 ha	3	3.60	3.78	104.97		0.72	1.30	0.00	1.50	0.00	0.20	6.40	6.60	2.13
	4 ha & above	2	4.90	5.19	105.97		1.23	2.10	0.00	1.30	0.00	0.13	8.30	8.43	4.15
	Overall	30	25.20	27.46	108.97		0.63	4.75	0.00	6.60	0.00	1.98	36.55	38.53	1.22
Kalasib	0-1 ha	17	12.90	14.84	115.06	3 - 4	0.65	1.60	0.00	0.50	0.00	0.80	15.00	15.80	0.88
	1-2 ha	10	12.70	14.05	110.60		0.91	2.20	0.00	1.45	0.00	0.70	16.35	17.05	1.64
	2-4 ha	3	6.50	7.06	108.62		1.30	2.50	0.00	2.25	0.00	0.26	11.25	11.51	3.75
	Overall	30	32.10	35.95	111.99		0.82	6.30	0.00	4.20	0.00	1.76	42.60	44.36	1.42

Note:- 1. HH: House Hold 2. GCA: Gross Cropped Area, WRC = Wet Rice Cultivation

3. There is no sample in the farm size group '4 ha and above' in Kalasib district of Mizoram.

Table-4.3
PATTERN OF MIXED CROPPING IN JHUM CULTIVATION OF SAMPLE HOUSEHOLDS IN MEGHALAYA AND MIZORAM

State/ District	Farm Size Group	Area (in ha.)										GCA (in ha.)	P.C. of G.C.A.		
		Foodgrain crop					Non-foodgrain crop						Foodgrain	Non- foodgrain	
		Paddy	Maize	Millete	Total	Sesamum	Chillies	Ginger	Tapioca	Total	Non-food crop				Cotton
A. Meghalaya															
Ri-Bhoi	0-1 ha	8.90	0.90	0.20	10.00	0.26	0.36	0.26	0.13	1.01	0.13	11.14	89.77	9.07	1.17
	1-2 ha	7.96	0.52	0.13	8.61	0.21	0.30	0.31	0.20	1.02	0.21	9.84	87.50	10.37	2.13
	2-4 ha	5.20	0.30	0.10	5.60	0.16	0.40	0.13	0.09	0.78	0.13	6.51	86.02	11.98	2.00
	4 ha & above	5.93	0.24	0.09	6.26	0.10	0.34	0.35	0.17	0.96	0.23	7.45	84.03	12.89	3.09
	Overall	27.99	1.96	0.52	30.47	0.73	1.40	1.05	0.59	3.77	0.70	34.94	87.21	10.79	2.00
West Garo Hills	0-1 ha	5.55	0.90	0.13	6.58	0.35	0.35	0.49	0.00	1.19	0.13	7.90	83.29	15.06	1.65
	1-2 ha	14.20	0.82	0.26	15.28	0.30	0.77	0.46	0.20	1.73	0.30	17.31	88.27	9.99	1.73
	2-4 ha	6.77	0.27	0.10	7.14	0.08	0.26	0.11	0.20	0.65	0.20	7.99	89.36	8.14	2.50
	4 ha & above	3.10	0.13	0.08	3.31	0.07	0.13	0.08	0.24	0.52	0.13	3.96	83.59	13.13	3.28
	Overall	29.62	2.12	0.57	32.31	0.80	1.51	1.14	0.64	4.09	0.76	37.16	86.95	11.01	2.05
B. Mizoram :															
Aizawl	0-1 ha	7.20	0.73	0.13	8.06	0.24	0.20	0.40	0.20	1.04	0.07	9.17	87.90	11.34	0.76
	1-2 ha	7.60	0.45	0.10	8.15	0.13	0.40	0.26	0.25	1.04	0.13	9.32	87.45	11.16	1.39
	2-4 ha	2.95	0.20	0.10	3.25	0.09	0.16	0.08	0.00	0.33	0.20	3.78	85.98	8.73	5.29
	4 ha & above	4.45	0.10	0.07	4.62	0.09	0.30	0.05	0.00	0.44	0.13	5.19	89.02	8.48	2.50
	Overall	22.20	1.48	0.40	24.08	0.55	1.06	0.79	0.45	2.85	0.53	27.46	87.69	10.38	1.93
Kalasib	0-1 ha	11.65	1.13	0.30	13.08	0.36	0.40	0.60	0.20	1.56	0.20	14.84	88.14	10.51	1.35
	1-2 ha	11.50	0.67	0.13	12.30	0.26	0.63	0.34	0.28	1.51	0.24	14.05	87.54	10.75	1.71
	2-4 ha	5.70	0.20	0.10	6.00	0.13	0.40	0.13	0.13	0.79	0.27	7.06	84.99	11.19	3.82
	Overall	28.85	2.00	0.53	31.38	0.75	1.43	1.07	0.61	3.86	0.71	35.95	87.29	10.74	1.97

Note: There is no sample in the farm size group '4 ha. and above' in Kalasib district of Mizoram.

4.5 Productivity of crops under jhum cultivation:

It was observed from Table-4.4 that farmers of both the states cultivated rice, maize and millets under foodgrains and sesam, chillies, ginger, tapioca and cotton under non food grains crops in the states. District analysis indicated that productivity of food grain crops was quite low under jhum cultivation. Rice was more productive in Meghalaya while maize was more productive in Mizoram. Productivity of rice varied from 8.48 q/ha in large farms to 9.69 q/ha in marginal farms in Ri-Bhoi district of Meghalaya. In west Garo hills district the productivity of rice was found to vary from 8.87 q/ha in marginal farms to 9.84 q/ha in large farms. Productivity was found to be higher at lower level of holding. Productivity of maize was lower than rice in both the districts of Meghalaya. However, in West Garo hills district marginal and small farms were more productive. Productivity of millets was quite low. It varied from 1.67q/ha to 2.69 q/ha in Ri-Bhoi district and 1.88q/ha to 2.54 q/ha in West Garo hills district. Productivity of millets was higher in lower level of holdings.

In Mizoram, productivity of rice was quite low, and was about one third of Meghalaya. It was mainly because of rat menace. In case of maize, productivity was about double of Meghalaya. In Aizal district productivity of maize varied from 16.50 q/ha to 17.19 q/ha while it varied from 13.25 q/ha to 13.85 q/ha in Kalasib district. Aizal district was found to be more productive for maize in Mizoram. It was also found that productivity of millet was lower in Mizoram. Its productivity was relatively higher in Kalasib district. It was found from the table that Productivity of rice and millets was highly productive in Meghalaya while maize was more productive in Mizoram.

Productivity of non food crops indicated that cash crops like sesamum was higher in the districts of Meghalaya and varied from 1.86 q/ha to 2.92 q/ha and the average productivity was higher in Ri-bhoi district. Productivity of sesamum was relatively lower in Mizoram. Its average productivity was 2.00 q/ha in Aizal district and 2.13 q/ha in Kolasib district. Mizoraam was highly productive for chili. The average productivities of chili in Ri-bhoi and West Garo Hills districts were 4.64 q/ha and 4.27 q/ha respectively while it were 5.09 q/ha and 5.03 q/ha in Aizal and Kalasib districts of Mizoram.

Productivity of chili was higher at lower level of holdings in both the states. In case of ginger, productivity was marginally higher in Mizoram than Meghalaya.

Table-4.4
PRODUCTIVITY OF CROPS UNDER JHUM CULTIVATION.

State / District	Farm Size Group	Productivity (qtl./ha.)										
		Foodgrain crop					Non-foodgrain crop					Non-food crop
		Paddy	Maize	Millete	Sesamum	Chillies	Ginger	Tapioca	Cotton			
A. Meghalaya :												
Ri-Bhoi	0-1 ha	9.69	7.11	2.25	2.92	5.42	20.19	6.92	2.31			
	1-2 ha	9.61	7.12	2.69	2.71	5.60	20.00	6.25	2.24			
	2-4 ha	9.13	7.00	2.50	2.63	4.05	21.15	5.78	2.15			
	4 ha & above	8.48	6.67	1.67	2.50	3.68	17.14	4.88	1.96			
	Overall	9.31	7.04	2.31	2.74	4.64	19.24	5.93	2.14			
West Garo Hills	0-1 ha	9.84	7.44	2.54	3.00	5.29	19.08	0.00	1.92			
	1-2 ha	9.71	7.32	2.46	2.63	4.68	18.91	6.70	2.67			
	2-4 ha	8.98	7.04	2.30	2.25	2.69	18.18	6.20	2.50			
	4 ha & above	8.87	6.92	1.88	1.86	2.31	18.13	5.92	1.92			
	Overall	9.48	7.31	2.37	2.69	4.27	18.86	6.25	2.37			
B. Mizoram :												
Aizawl	0-1 ha	3.47	17.19	1.92	2.29	5.75	21.13	5.50	3.57			
	1-2 ha	3.41	16.89	1.80	2.00	5.38	21.15	5.40	3.46			
	2-4 ha	3.32	16.75	1.50	1.67	5.31	20.00	0.00	3.00			
	4 ha & above	3.28	16.50	1.43	1.56	4.17	19.00	0.00	3.08			
	Overall	3.39	16.99	1.70	2.00	5.09	20.89	5.44	3.21			
Kalasib	0-1 ha	3.89	13.85	2.00	2.22	5.38	20.50	5.00	4.75			
	1-2 ha	3.60	13.36	1.92	2.12	5.08	19.56	4.82	5.00			
	2-4 ha	3.42	13.25	1.50	1.92	4.63	18.08	4.23	4.63			
	Overall	3.68	13.63	1.89	2.13	5.03	19.91	4.75	4.79			

Note: There is no sample in the farm size group '4 ha and above' in Kalasib district of Mizoram.

The average productivity of ginger was 19.24 q/ha and 18.86 q/ha in Ri-bhoi and west Garo hills districts while it were 20.89 q/ha and 19.91 q/ha in Aizal and Kolasib districts of Mizoram respectively. Marginal and small farms were more productive in both the states. Tapioca was a popular tuber crop in Meghalaya and also in Mizoram. The medium and large farmers of Mizoram did not cultivate tapioca. It was found to be more productive in Meghalaya than in Mizoram. The average productivities of tapioca in Ri-bhoi and West Garo hills districts were 5.93 q/ha and 6.25 q/ha respectively while it were found to be 5.44 q/ha and 4.75 q/ha in Aizal and Kalasib districts respectively.

Under non food crop, cotton was the only crop grown in both the states with lower productivity. Mizoram was more productive in cotton cultivation. The average productivities of cotton in Aizal and Kalasib districts were 3.21 q/ha and 4.79 q/ha respectively while it were 2.14 q/ha and 2.37 q/ha in Ri-bhoi and West Garo hills districts of Meghalaya. The marginal and small farms were more productive in the states. It was observed that large size of farms over 4 hectares did not cultivate these crops in Kalasib district of Mizoram.

4.6 Net return per hectare:

Study of cost and return indicated that net return per hectare was marginal to negative in both the states (Table-4.5). It was found higher in lower holdings of Meghalaya. It was negative in all the districts of Mizoram for all classes of holdings. Employment per hectare was marginally higher than 70 MDs and the return per MD was higher in Ri-Bhoi and West Garo hills districts of Meghalaya. In Mizoram it was about half of Meghalaya. Low productivity and low FHP in the hills led to low gross return per unit of land. In Mizoram low productivity was found mainly due to rat menace in the districts.

In Meghalaya, net returns and employment were higher in lower level of holdings. Labour productivity was higher in Meghalaya than in Mizoram.

4.7 Share of jhum area to non jhum area:

It was observed from Table-4.6 that in all the sample farms 31.20 hectares were put under jhum cultivation while 15.10 hectares were put under settled cultivation which shared 67.39 and 32.61 per cent respectively Rbhoi district of Meghalaya. It was 63.49 and 36.51 per cent respectively in West Garo Hills district of Meghalaya. It was

Table-4.5
COST AND RETURNS FROM JHUM CULTIVATION

State / District	Farm Size Group	Gross return /Ha (Rs)	Total cost at C3 /Ha (Rs)	Net return (ha) (Rs)	Employment Mandays /Ha.	Return /Md (Rs)
A. Meghalaya :						
Ri-Bhoi	0-1 ha	6,418.76	5643.60	775.16	79.89	80.34
	1-2 ha	6,449.49	5752.70	696.80	80.12	80.50
	2-4 ha	6,012.98	5849.86	163.12	79.32	75.80
	4 ha & above	5,721.48	5910.59	-189.11	74.58	76.71
	Overall	6,203.13	5769.68	433.45	78.62	78.90
West Garo Hills						
West Garo Hills	0-1 ha	6,635.57	5435.47	1200.10	79.91	83.04
	1-2 ha	6,526.23	5785.91	740.32	80.26	81.31
	2-4 ha	5,942.87	5890.59	52.27	79.32	74.92
	4 ha & above	5,615.91	5708.23	-92.32	75.54	74.34
	Overall	6,327.03	5725.64	601.39	79.45	79.64
B. Mizoram :						
Aizawl	0-1 ha	3,694.38	6570.21	2875.83	78.65	46.97
	1-2 ha	3,282.56	6684.15	3401.59	78.48	41.83
	2-4 ha	3,270.63	6761.06	3490.42	77.22	42.35
	4 ha & above	2,754.53	6434.77	3680.24	74.29	37.08
	Overall	3,318.65	6569.14	3250.49	77.54	42.80
Kalasib	0-1 ha	3,747.17	6393.06	2645.89	78.68	47.62
	1-2 ha	3,276.62	6537.63	3261.01	78.43	41.78
	2-4 ha	3,084.28	6538.43	3454.15	77.54	39.78
	Overall	3,433.09	6437.98	3004.90	78.35	43.82

Note: There is no sample in the farm size group '4 ha.and above' in Kalasib district of Mizoram.

also observed that with the increase in size of holdings jhum area declined while the area under settle cultivation was found to increase in both the states. This might be due to food and income security of the farmers at low farm sizes as the farmers at higher income groups could secure food and income and need not to depend more on land for frequent seasonal use.

Table-4.6
SHARE OF JHUM AREA TO NON-JHUM AREAS

State / District	Farm Size Group	Area under Jhum (ha)	Area under Settled Cultivation (ha)	Total area (ha)	Proportionate area (%)	
					Jhum	Settled
A. Meghalaya :						
Ri-Bhoi	0-1 ha	9.50	2.40	11.90	79.83	20.17
	1-2 ha	8.60	3.60	12.20	70.49	29.51
	2-4 ha	5.90	3.80	9.70	60.82	39.18
	4 ha & above	7.20	5.30	12.50	57.60	42.40
	Overall	31.20	15.10	46.30	67.39	32.61
West Garo Hills	0-1 ha	6.32	4.30	10.62	59.51	40.49
	1-2 ha	15.25	4.65	19.90	76.63	23.37
	2-4 ha	7.35	3.00	10.35	71.01	28.99
	4 ha & above	3.68	6.80	10.48	35.11	64.89
	Overall	32.60	18.75	51.35	63.49	36.51
B. Mizoram :						
Aizawl	0-1 ha	8.15	2.50	10.65	76.53	23.47
	1-2 ha	8.55	2.65	11.20	76.34	23.66
	2-4 ha	3.60	2.80	6.40	56.25	43.75
	4 ha & above	4.90	3.40	8.30	59.04	40.96
	Overall	25.20	11.35	36.55	68.95	31.05
Kalasib	0-1 ha	12.90	2.10	15.00	86.00	14.00
	1-2 ha	12.70	3.65	16.35	77.68	22.32
	2-4 ha	6.50	4.75	11.25	57.78	42.22
	Overall	32.10	10.50	42.60	75.35	24.65

Note: There is no sample in the farm size group '4 ha. and above' in Kalasib district of Mizoram.

In Mizoram area under jhum and settled cultivation was relatively lower and more emphasis was put on jhum cultivation in both the districts. Proportionate area under jhum was higher in Kolasib district. It was also observed that like Meghalaya jhum area was higher at lower level of holding while area under settled cultivation was higher at higher level of holding in both the districts of Mizoram. In the state of Mizoram farmers at lower level of holdings practiced jhum cultivation more intensively and the farmers of its counter parts practiced more of settled cultivation.

4.8 Per capita food and non food grain production and marketed surplus under jhum cultivation

4.8.1 Per capita food grain production

Table-4.7 shows that per capita food grain production in terms of kilogram per man equivalent was found to be lower at lower level of holdings. It was relatively higher in Meghalaya than in Mizoram. It was mainly due to high population size and lower size of holding. The average per capita foodgrain production was 139.85 kg/man equivalent in Ri-bhoi district and 166.26 kg/man equivalent in West Garo hills district of Meghalaya. It was found much lower in Mizoram. In Aizal and in Kolasib district, the average per capita food grain production was 62.04 and 74.28 kg/ man equivalent respectively. This was mainly due to low productivity in Mizoram for rat menace.

Table-4.7
PER CAPITA ANNUAL FOOD-GRAINS AND NON-FOOD GRAINS PRODUCTION AND MARKETED SURPLUS FROM JHUM CULTIVATION.

State / District	Farm Size Group	Per Capita Food grain Production (kg /Man Equivalent)	Per Capita Non Food-grain Production (kg / Man equivalent)	Value productivity (Rs / ha)	Value of Marketed Surplus (Rs / ha)	Marketed Surplus as PC of Value of Productivity (Rs / ha)
A. Meghalaya :						
Ri-Bhoi	0-1 ha	94.47	8.99	6,418.76	1,033.68	16.10
	1-2 ha	153.33	18.46	6,449.49	1,095.32	16.98
	2-4 ha	189.78	20.22	6,012.98	1,762.46	29.31
	4 ha & above	264.21	42.28	5,721.48	2,057.81	35.97
	Overall	139.85	16.35	6,203.13	1,405.19	22.65
West Garo Hills	0-1 ha	79.45	15.79	6,635.57	1,358.66	20.48
	1-2 ha	201.80	20.15	6,526.23	1,051.10	16.11
	2-4 ha	351.56	23.02	5,942.87	1,664.03	28.00
	4 ha & above	239.25	27.65	5,615.91	1,900.23	33.84
	Overall	166.26	19.05	6,327.03	1,338.77	21.16
B. Mizoram :						
Aizawl	0-1 ha	46.38	13.80	3,694.38	878.79	23.79
	1-2 ha	61.99	17.04	3,282.56	885.01	26.96
	2-4 ha	81.60	15.95	3,270.63	1,031.24	31.53
	4 ha & above	150.46	21.53	2,754.53	1,232.14	44.73
	Overall	62.04	15.61	3,318.65	968.67	29.19
Kalasib	0-1 ha	60.01	15.84	3,747.17	1,019.62	27.21
	1-2 ha	83.87	19.48	3,276.62	854.61	26.08
	2-4 ha	123.20	27.62	3,084.28	1,142.37	37.04
	Overall	74.28	18.23	3,433.09	979.24	28.52

Note: There is no sample in the farm size group '4 ha.and above' in Kalasib district of Mizoram.

4.8.2 Per capita Non food grain Production

Non food grain production per capita was found to be quite low. Its production was low at lower level of holding in both the states. The average per capita production of non food grain varied from 16.35 to 19.05 kgs in Ri-Bhoi and West Garo Hills districts of Meghalaya respectively. It was 15.61 and 18.23 kgs/man equivalents in Aizal and Kalasib districts of Mizoram respectively. Per capita production in Mizoram was marginally lower than Meghalaya and main emphasis was given for food grain production by the farmers.

4.8.3 Value of productivity

Value productivity of food grains per hectare in Meghalaya was relatively higher than Mizoram. In both the districts value productivity was higher in marginal and small farms and the average value productivity in Ri-bhoi district was Rs 6203.13 while the average value productivity in West Garo hills district was Rs 6327.03. The average value productivity of food grains in Mizoram was about half of Meghalaya. It was marginally higher in marginal, small and medium farms. The value productivity of food grains was Rs 3318.65 in Aizal district while it was Rs 3433.09 in Kolasib district of Mizoram. Value productivity was low because of low farm harvest price and low productivity per hectare.

4.8.4 Level of marketed surplus

Level of marketed surplus of food grains was quite low. It was 22.64 per cent in Ri-bhoi district and 21.16 per cent in West Garo hills district of Meghalaya. Share of marketed surplus of food grains to value productivity in Mizoram was marginally higher than Meghalaya. It was 29.19 per cent in Aizal district and 28.52 per cent in Kalasib district of Mizoram. It indicated that the farmers of Mizoram depended more on grains for generating farm income.

4.9 Food requirement and production from Jhum (Table-4.8)

4.9.1 Meghalaya

Table-4.8 indicated that food grain production from jhum in the Ri-bhoi district of Meghalaya was much lower due to low productivity. The marginal and small farms were relatively more productive and it varied from 52.05 quintals in large farms to 93.05 quintals in marginal farms. Share of food grains from jhum was very low in the district. Out of total food grain requirements share of food grains from jhum cultivation

was 48.87 and 73.53 per cent respectively while it was 87.81 and 114.20 per cent in medium and large farms. It was found to be surplus in all other farms except in marginal farms.

Table-4.8
FOOD CONSUMPTION EXPENDITURE AND CONTRIBUTION OF FOOD
GRAINS FROM JHUM

State / District	Farm Size Group	No. of HH	Population	Total food grain production from jhum	Per capita food grain production from jhum (Kg./Annum)	Per capita food grain requirement per annum	Share of food grains from jhum
A. Meghalaya :							
Ri-Bhoi	0-1 ha	15	99	93.05	94.47	135.07	69.94
	1-2 ha	8	53	80.55	153.33	128.19	119.61
	2-4 ha	4	26	49.85	189.78	118.81	159.74
	4 ha & above	3	20	52.05	264.21	125.06	211.26
	Overall	30	197	275.50	139.85	130.91	106.83
West Garo Hills	0-1 ha	13	78	61.63	79.45	131.29	60.52
	1-2 ha	12	72	144.49	201.80	130.76	154.33
	2-4 ha	3	18	62.93	351.56	128.46	273.67
	4 ha & above	2	12	28.55	239.25	123.88	193.13
	Overall	30	179	297.60	166.26	130.91	127.00
B. Mizoram :							
Aizawl	0-1 ha	15	82	37.80	46.38	135.03	34.35
	1-2 ha	10	54	33.68	61.99	129.99	47.69
	2-4 ha	3	16	13.30	81.60	131.00	62.29
	4 ha & above	2	11	16.35	150.46	136.04	110.60
	Overall	30	163	101.13	62.04	130.91	47.39
Kalasib	0-1 ha	17	103	61.55	60.01	131.31	45.70
	1-2 ha	10	60	50.60	83.87	130.67	64.18
	2-4 ha	3	18	22.30	123.20	127.04	96.98
	Overall	30	181	134.45	74.28	130.91	56.74

Note: There is no sample in the farm size group '4 ha. and above' in Kalasib district of Mizoram.

In West Garo Hills district average production was higher than Ri-bhoi district. Total production was higher in small farms and requirement of food grains in marginal and small farms was higher. However, 40.62 and 95.03 per cent of total requirement of food grains were met from jhum cultivation. Foodgrain production of medium and large farms was surplus over requirements.

4.9.2 Mizoram

In Aizawl district of Mizoram total production of food grains was almost half of Meghalaya because of low productivity. It varied from 13.30 quintals in medium

farms to 33.80 quintals in marginal farms. Requirement of food grains was the highest in marginal farms due to high population size. It was observed that 23.42 and 28.64 per cent of total requirement of food grains were met from jhum cultivation. There was no surplus production from jhum cultivation in this district of Mizoram in all other size of farmers except large farms.

In Kalasib district, there was no large farm and the average production of food grains was marginally higher. A total requirement of foodgrains was relatively higher in this district especially in marginal and small farms. The share of foodgrain productions in total requirements was marginally higher. In both the districts jhum cultivation could not meet the total requirements of foodgrains from jhum cultivation.

4.10 Cropping pattern in settled cultivation

4.10.1 Ri-Bhoi district of Meghalaya

It can be seen from Table-4.9 that the overall net cropped area was 4.40 hectares out of which 1.80 hectare was in 2-4 ha size group followed by 1.50 ha in 1-2 ha size group of farms. Under terrace cultivation, the Gross Cropped hectares were also higher in these two groups and paddy shared 45.94 per cent and 42.40 per cent respectively. It was followed by potato and vegetables. There was more variation in areas of paddy and potato and vegetables and the area of chili was almost constant.

Under Wet Rice Cultivation 6.80 hectares were put out of which 44.12 per cent were shared by the size group of 4 ha and above followed by 23.53 per cent and 17.64 per cent in 1-2 and 0-1 size groups respectively.

Horticultural crops were also cultivated in Ri-bhoi district under terrace. Pineapple was found to be the main crop grown followed by squash. Out of total area of 3.90 hectares under horticultural crops pineapple occupied 74.36 per cent while squash and other vegetables occupied 25.64 per cent. Both marginal and large holdings put more area under horticultural crops. There was no tea cultivation in Ri-bhoi district. Out of total cropped area during survey 38.29 per cent were shared by terrace cultivation while 39.22 per cent were shared by Wet Rice Cultivation and 22.49 per cent by horticultural crops. More area was put under terrace cultivation by small and medium groups while wet rice area was put more by the large groups. Area under horticultural crops was more in the marginal groups followed by medium and large groups.

Table-4.9
CROPPING PATTERN IN SETTLED CULTIVATION OF SAMPLE HOUSEHOLDS IN MEGHALAYA AND MIZORAM

State / District	Farm Size Group	Area (in ha.)										GCA (in ha.)			P.C. of G.C.A.		
		Terrace					WRC					Tea Culti.	Terrace	WRC	Horticultural	Tea Culti	
		NCA	Paddy	Potato	Chilly	Vegetable	GCA	Horticultural Crops			Total						
								Pineapple	Orange	Squash /Other Veg.							
A. Meghalaya :																	
Ri-Bhoi	0-1 ha	0.00	0.00	0.00	0.00	0.00	1.20	1.00	-	0.20	1.20	0.00	2.40	0.00	50.00	50.00	0.00
	1-2 ha	1.50	1.20	0.50	0.13	0.30	2.13	0.40	-	0.10	0.50	0.00	4.23	50.35	37.83	11.82	0.00
	2-4 ha	1.80	1.30	1.00	0.13	0.40	2.83	0.70	-	0.30	1.00	0.00	4.83	58.59	20.70	20.70	0.00
	4 ha & above	1.10	0.85	0.30	0.13	0.40	1.68	0.80	-	0.40	1.20	0.00	5.88	28.57	51.02	20.41	0.00
	Overall	4.40	3.35	1.80	0.39	1.10	6.64	6.80	2.90	-	1.00	3.90	0.00	17.34	38.29	39.22	22.49
West Garo Hills																	
West Garo Hills	0-1 ha	0.00	0.00	0.00	0.00	0.00	1.80	1.25	0.75	0.50	2.50	0.00	4.30	0.00	41.86	58.14	0.00
	1-2 ha	0.00	0.00	0.00	0.00	0.00	1.20	1.13	0.67	0.45	2.25	1.20	4.65	0.00	25.81	48.39	25.81
	2-4 ha	1.00	0.75	0.40	0.13	0.30	1.58	0.60	0.35	0.25	1.20	0.00	3.58	44.13	22.35	33.52	0.00
	4 ha & above	1.50	1.30	0.50	0.10	0.20	2.10	1.15	0.70	0.45	2.30	1.00	7.40	28.38	27.03	31.08	13.51
	Overall	2.50	2.05	0.90	0.23	0.50	3.68	5.80	4.13	2.47	1.65	8.25	2.20	19.93	18.46	29.10	41.39
B. Mizoram :																	
Aizawl	0-1 ha	0.00	-	-	-	-	0.00	-	0.25	2.25	2.50	0.00	2.50	0.00	0.00	100.00	0.00
	1-2 ha	0.00	-	-	-	-	1.35	-	0.13	1.17	1.30	0.00	2.65	0.00	50.94	49.06	0.00
	2-4 ha	0.00	-	-	-	-	1.30	-	0.15	1.35	1.50	0.00	2.80	0.00	46.43	53.57	0.00
	4 ha & above	0.00	-	-	-	-	2.10	-	0.13	1.17	1.30	0.00	3.40	0.00	61.76	38.24	0.00
	Overall	0.00	-	-	-	-	4.75	-	0.66	5.94	6.60	0.00	11.35	0.00	41.85	58.15	0.00
Kalasib	0-1 ha	0.00	-	-	-	-	1.60	-	-	0.50	0.50	0.00	2.10	0.00	76.19	23.81	0.00
	1-2 ha	0.00	-	-	-	-	2.20	-	-	1.45	1.45	0.00	3.65	0.00	60.27	39.73	0.00
	2-4 ha	0.00	-	-	-	-	2.50	-	-	2.25	2.25	0.00	4.75	0.00	52.63	47.37	0.00
	Overall	0.00	-	-	-	-	6.30	-	-	4.20	4.20	0.00	10.50	0.00	60.00	40.00	0.00

Note: There is no sample in the farm size group '4 ha. and above' in Kalasib district of Mizoram.

4.10.2 West Garo Hills district of Meghalaya

In this district net cropped area was 2.50 hectares and it was found in medium and large size of farms. Under terrace cultivation Gross Cropped Area was 3.68 hectares and large and medium farms shared 57.06 and 42.93 per cent respectively. Out of GCA paddy occupied 55.71 per cent followed by potato (24.46%) and vegetables (13.59%). In terrace cultivation was not so extensive in West Garo Hills district of Meghalaya.

In the district 5.80 hectares were put under wet rice cultivation and the highest share was in the large farms followed by marginal (31.03%) and small (20.69%) farms. Horticultural crops like pine apple, orange and vegetables occupied 8.25 hectares out of which pineapple and orange shared the substantial area. Its cultivation was relatively higher at lower level of holdings. The district also started tea cultivation in 2.20 hectares of land. It was found to be started in small and large farms. Including horticultural crops total cropped area in this district was 19.93 hectares and was found to be more in large farms. Out of total cropped hectares terrace and Wet Rice Cultivation shared 18.46 and 29.10 per cent while horticulture and tea cultivation shared 41.39 and 11.04 per cent respectively. Terrace cultivation was more extensive in medium and large farms while cultivation of horticultural crops was extensive in lower holdings. It was found that more than 88 per cent of area was put under terrace, WRC and horticultural crops in the West Garo Hills district of Meghalaya.

4.10.3 Aizwal district of Mizoram

There was no terrace cultivation in Mizoram. Wet Rice Cultivation was done in 4.75 hectares of land and its share was more in large farms. Area under total horticultural crops was 6.60 hectares out of which 5.94 hectares were put under squash and vegetables which were cultivated extensively by the marginal group of farms. In Aizwal district of Mizoram Gross Cropped Area including horticultural crops was relatively lower than Meghalaya. It was 11.35 hectares. In this district the share of area under horticultural crops was higher (58.15%) than the WRC (41.85%). The district did not start tea cultivation.

4.10.4 Kalasib district of Mizoram

In this district also there was no terrace cultivation and WRC was more popular in larger holdings. The farmers used to cultivate only squash and vegetables.

There was no tea cultivation and the Gross Cropped Area was 10.50 hectares out of which 60.00 per cent were under WRC and 40.00 per cent were under horticultural crops. Rice cultivation was practiced more by the marginal and small farmers while horticultural crops were cultivated more by the medium farmers. Farmers of this district did not cultivate tea as plantation crop.

4.11 Cost and Returns from Settled Cultivation

4.11.1 Terrace cultivation in Ri-bhoi district of Meghalaya

Table-4.10 indicates the economics of settled cultivation under terracing. It was found that the farmers could realize a net return of Rs 4532.41 per hectare with an average employment of 93 Man Days and Rs 153.36 as return per Man Day. The average BCR was found to be 1.47. The net return per hectare was higher in small and marginal farms. The costs and returns differed marginally due to subsistence nature of cultivation with the use of technology.

4.11.2 Terrace cultivation in West Garo hills district of Meghalaya:

Terrace cultivation was practiced primarily by medium and large farmers in this district (Table-4.10). The net return per hectare was relatively higher: It was Rs 4752.03 per hectare with the employment of 94 Man Days per hectare and the return per Man Day was found to be Rs 154.52 and the BCR was 1.49. The medium farms were found to be more economic in terms of income and employment and Benefit- Cost ratio. There was no terrace cultivation by the sample farmers in Mizoram.

4.12 Cost and Returns from Settled Cultivation

4.12.1 Wet Rice Cultivation in Ri-bhoi district of Meghalaya:

It was observed in Table-4.11 that the average farmers could not gain more from wet rice cultivation per hectare than terrace cultivation. On an average, the net return per hectare over cost C_2 was found to be Rs 1428.59 with the employment generation of 74.60 Man Days and Rs 125.25 as return per Man Day. The BCR was 1.18. The marginal and small farms were found to gain more in terms of income and employment. These farms were more economically feasible as indicated by high BCR.

4.12.2 Wet Rice Cultivation in West Garo Hills district of Meghalaya:

The economics of cultivation of wet rice in west Garo hills district of Meghalaya indicated that this district was more economic in wet rice cultivation than

Table-4.10
COST AND RETURNS FROM SETTLED CULTIVATION (TERRACE)

State / District	Farm Size Group	Gross return /Ha (Rs)	Total cost at C3 /Ha (Rs)	Net return (ha) (Rs)	Employment Mandays /Ha.	Return /Md (Rs)	BCR
A. Meghalaya :							
Ri-Bhoi	0-1 ha	-	-	-	-	-	-
	1-2 ha	14136.62	9610.56	4526.06	94	150.56	1.47
	2-4 ha	14681.98	9758.05	4923.92	91	161.05	1.50
	4 ha & above	13483.93	9603.00	3880.93	93	144.29	1.40
	Overall	14203.92	9671.51	4532.41	93	153.36	1.47
B. Mizoram :							
West Garo Hills	0-1 ha	-	-	-	-	-	-
	1-2 ha	-	-	-	-	-	-
	2-4 ha	15253.48	9716.31	5537.17	94	162.84	1.57
	4 ha & above	13908.33	9747.04	4161.29	94	148.26	1.43
	Overall	14485.87	9733.84	4752.03	94	154.52	1.49
Aizawl	0-1 ha	-	-	-	-	-	-
	1-2 ha	-	-	-	-	-	-
	2-4 ha	-	-	-	-	-	-
	4 ha & above	-	-	-	-	-	-
	Overall	-	-	-	-	-	-
Kalasib	0-1 ha	-	-	-	-	-	-
	1-2 ha	-	-	-	-	-	-
	2-4 ha	-	-	-	-	-	-
	Overall	-	-	-	-	-	-

Note: There is no sample in the farm size group '4 ha. and above' in Kalasib district of Mizoram.

Ri-bhoi district in terms of income and employment generation (Table-4.11). Net return per hectare was found to be Rs 2002.64 with employment of 96.77 Man Days per hectare. The return per Man Day was Rs 101.68 and the BCR was 1.26. Economics of cultivation of wet rice was more feasible in marginal and small farms. Employment generation was relatively higher in medium and large farms.

4.12.3 Wet Rice Cultivation in Aizwal District of Mizoram:

In Aizwal district wet rice was not cultivated by the marginal farmers. It was found that due to low productivity cultivation of wet rice was not so economic in this district. The average net return per hectare was negative and it was highly negative in large farms. Employment generation was 96.77 Man Days per hectare and BCR was less than one. This indicated that wet rice cultivation was relatively more costly and the marginal farmers did not cultivate wet rice in the district.

4.12.4 Wet Rice Cultivation in Kalasib District of Mizoram

There was not so much difference in wet rice cultivation in this district. Except in the marginal farms net return was negative for wet rice cultivation in all other groups of farms. B-C ratios were less than one and it indicated that cultivation of this crop was not remunerative in this district. The average employment was 73.60 Man days per hectare with Rs 120.13 as return per Man Day (Table-4.11).

4.13 Economics of Settled Cultivation for Horticultural crops

4.13.1 Ri-bhoi district of Meghalaya

Table-4.12 indicated that cultivation of horticultural crops was much profitable in the settled cultivation over the cereal crops. Net returns per hectare were higher in marginal farms with B-C ratio of 1.58. The average net returns per hectare were Rs 8490.21 and generated 152 Man Days of employment per hectare. Return per Man Day varied from Rs 175.57 in large farms to Rs 193.62 in marginal farms.

Table-4.11
COST AND RETURNS FROM SETTLED CULTIVATION (WRC)

State / District	Farm Size Group	Gross return /ha (Rs)	Total cost /ha (Rs)	Net return (ha) (Rs)	Employment Mandays /Ha.	Return /Md (Rs)	BCR
A. Meghalaya :							
Ri-Bhoi	0-1 ha	9641.67	7515.20	2126.47	71.48	134.89	1.28
	1-2 ha	9445.31	7854.04	1591.28	74.13	127.42	1.20
	2-4 ha	9360.00	8025.80	1334.20	75.45	124.06	1.17
	4 ha & above	9165.00	8070.87	1094.13	75.82	120.88	1.14
	Overall	9343.75	7915.16	1428.59	74.60	125.25	1.18
West Garo Hills	0-1 ha	10075.00	7431.24	2643.76	70.92	142.05	1.36
	1-2 ha	9912.50	7877.18	2035.32	74.33	133.35	1.26
	2-4 ha	9831.25	8028.78	1802.47	75.20	130.73	1.22
	4 ha & above	9587.50	8101.41	1486.09	76.32	125.62	1.18
	Overall	9839.66	7837.02	2002.64	96.77	101.68	1.26
B. Mizoram :							
Aizawl	0-1 ha	-	-	-	-	-	-
	1-2 ha	8859.26	9261.28	-402.02	74.52	118.89	0.96
	2-4 ha	8725.00	9531.38	-806.38	74.91	116.47	0.92
	4 ha & above	8450.00	9674.75	-1224.75	75.82	111.45	0.87
	Overall	8641.58	9518.00	-876.42	75.20	114.91	0.91
Kalasib	0-1 ha	9120.31	8558.64	561.67	70.23	129.86	1.07
	1-2 ha	9011.36	9278.82	-267.45	74.18	121.48	0.97
	2-4 ha	8515.00	9487.93	-972.93	75.25	113.16	0.90
	Overall	8842.06	9178.90	-336.83	73.60	120.13	0.96

Note: There is no sample in the farm size group '4 ha. and above' in Kalasib district of Mizoram.

4.13.2 West Garo Hills District of Meghalaya

Relative to Ri-bhoi district settled cultivation of vegetables in this district was less remunerative. Average net returns per hectare were Rs 6160.88 and it varied from Rs 4508.12 to Rs 7362.48 per hectare. It generated 187 Man Days per hectare and the highest employment of 196 Man Days was found in the marginal farms. Returns per Man Day generated were higher than the Ri-bhoi district. It varied from Rs 160.20 to Rs 168.55 in large and small farms respectively. The average B-C ratio was 1.25 and it varied from 1.18 in large farms to 1.30 in marginal farms. This district was found to be more costlier to cultivate vegetables than the Ri-bhoi district of Meghalaya.

4.13.3 Aizwal District of Mizoram

In Aizwal district of Mizoram gross returns from cultivation of horticultural crops were higher than Meghalaya. However, average cost of production was also higher. The average net returns per hectare were Rs 8553.98 and it was the lowest in large farms (Rs 5458.96) and was the highest in the marginal farms (Rs 9194.77). Per hectare generation of employment was 237 Man Days and the average returns per Man Day were Rs 168.23. The B-C ratio varied from 1.17 in large farms to 1.31 in small farms. It was found to be more remunerative in lower holdings.

4.13.4 Kalasib District of Mizoram

Profitability of horticultural crops in settled cultivation in this district was relatively lower than Aizwal district. The average net returns were Rs 5399.52 and it was the highest in the marginal farms. Employment generated was 234 Man Days per hectare and a worker could earn Rs 153.80 per Man Day. It was marginally higher in the marginal farms. The B-C ratio varied from 1.18 in large farms to 1.21 in marginal farms. It was observed that cultivation of horticultural crops in settled cultivation was more profitable over rice and other cereals. Profitability was relatively higher in Meghalaya and the marginal and small farms were more viable through cultivation of horticultural crops.

Table-4.12
COST AND RETURNS FROM SETTLED CULTIVATION (HORTICULTURAL CROPS)

State / District	Farm Size Group	Gross return /ha (Rs)	Total cost /ha (Rs)	Net return /Ha. (Rs)	Employment Mandays /Ha.	Return /Md (Rs)	BCR
A. Meghalaya :							
Ri-Bhoi	0-1 ha	29,687.67	18,848.13	10839.54	153	193.62	1.58
	1-2 ha	28,758.50	19,005.54	9752.96	152	189.20	1.51
	2-4 ha	27,498.75	19,748.38	7750.37	154	178.56	1.39
	4 ha & above	26,335.50	20,104.25	6231.25	150	175.57	1.31
	Overall	27,975.85	19,485.64	8490.21	152	184.05	1.44
West Garo Hills	0-1 ha	32,002.48	24,640.00	7362.48	196	163.28	1.30
	1-2 ha	31,312.62	24,437.03	6875.59	186	168.55	1.28
	2-4 ha	30,152.47	24,667.25	5485.22	183	165.22	1.22
	4 ha & above	29,183.65	24,675.52	4508.12	182	160.20	1.18
	Overall	30,759.39	24,598.51	6160.88	187	164.14	1.25
B. Mizoram :							
Aizawl	0-1 ha	39,985.02	30,790.24	9194.77	241	165.91	1.30
	1-2 ha	40,648.42	30,953.99	9694.43	235	172.80	1.31
	2-4 ha	40,620.28	31,440.32	9179.96	233	174.49	1.29
	4 ha & above	37,626.12	32,167.16	5458.96	234	161.01	1.17
	Overall	39,795.43	31,241.45	8553.98	237	168.23	1.27
Kalasib	0-1 ha	36,540.00	30,208.80	6331.21	234	156.15	1.21
	1-2 ha	35,867.59	30,759.98	5107.61	235	152.52	1.17
	2-4 ha	35,946.67	30,566.07	5380.60	231	155.54	1.18
	Overall	35,990.00	30,590.48	5399.52	234	153.80	1.18

Note: There is no sample in the farm size group '4 ha and above' in Kalasib district of Mizoram.

4.14 Settled cultivation of Tea:

4.14.1 West Garo Hills District of Meghalaya

Tea cultivation was started in West Garo Hills district of Meghalaya as a plantation crop under settled cultivation in the recent years. It was found under small and large farms. The farms sold green leaves and the average net returns per hectare were Rs. 38112.54 and employment generation was 393.18-Man Days per hectare. The average return per Man Day was Rs. 268.14 with the B-C ratio of 1.57 in the district. Cultivation of tea in the marginal holdings was found to be more economic in the district (Table-4.13).

Table-4.13
COST AND RETURNS FROM SETTLED CULTIVATION THROUGH TEA PLANTATION

State / District	Farm Size Group	Gross return / Ha (Rs)	Total cost at C3 /Ha (Rs)	Net return /Ha. (Rs)	Employment Mandays /Ha.	Return /Md (Rs)	BCR
A. Meghalaya :							
Ri-Bhoi	0-1 ha	-	-	-	-	-	-
	1-2 ha	-	-	-	-	-	-
	2-4 ha	-	-	-	-	-	-
	4 ha & above	-	-	-	-	-	-
	Overall	-	-	-	-	-	-
West Garo Hills	0-1 ha	-	-	-	-	-	-
	1-2 ha	102,054.00	65,949.49	36104.51	390.00	261.68	1.55
	2-4 ha	-	-	-	-	-	-
	4 ha & above	109,476.00	68,953.83	40522.17	397.00	275.76	1.59
	Overall	105,427.64	67,315.10	38112.54	393.18	268.14	1.57
B. Mizoram :							
Aizawl	0-1 ha	-	-	-	-	-	-
	1-2 ha	-	-	-	-	-	-
	2-4 ha	-	-	-	-	-	-
	4 ha & above	-	-	-	-	-	-
	Overall	-	-	-	-	-	-
Kalasib	0-1 ha	-	-	-	-	-	-
	1-2 ha	-	-	-	-	-	-
	2-4 ha	-	-	-	-	-	-
	Overall	-	-	-	-	-	-

Note: There is no sample in the farm size group '4 ha. and above' in Kalasib district of Mizoram.

Table-4.14
COMPARISON OF COST AND RETURNS FROM JHUM AND SETTLED CULTIVATION

State / District	Farm Size Group	Gross return /Ha (Rs.)		Total cost at C3 per Ha (Rs.)		Net return per Ha. (Rs.)		Employment Mandays Per Ha		Return per Manday (Rs.)		BCR	
		Jhum	Settled	Jhum	Settled	Jhum	Settled	Jhum	Settled	Jhum	Settled	Jhum	Settled
A. Meghalaya :													
Ri-Bhoi	0-1 ha	6,418.76	19,664.67	5643.60	13,181.66	775.16	6,483.01	79.89	112	80.34	174.94	1.14	1.49
	1-2 ha	6,449.49	14,090.48	5752.70	10,056.67	696.80	4,033.82	80.12	93	80.50	151.05	1.12	1.40
	2-4 ha	6,012.98	16,233.70	5849.86	11,467.80	163.12	4,765.89	79.32	101	75.80	160.85	1.03	1.42
	4 ha & above	5,721.48	13,903.16	5910.59	10,964.41	-189.11	2,938.75	74.58	96	76.71	144.83	0.97	1.27
	Overall	6,203.13	15,395.46	5769.68	11,190.08	433.45	4,205.39	78.62	99	78.90	155.54	1.08	1.38
West Garo Hills	0-1 ha	6,635.57	22,823.53	5435.47	17,436.33	1200.10	5,387.20	79.91	144	83.04	158.89	1.22	1.31
	1-2 ha	6,526.23	44,045.85	5785.91	30,876.41	740.32	13,169.43	80.26	210	81.31	210.02	1.13	1.43
	2-4 ha	5,942.87	19,035.88	5890.59	14,350.70	52.27	4,685.19	79.32	119	74.92	159.54	1.01	1.33
	4 ha & above	5,615.91	30,402.82	5708.23	21,943.13	-92.32	8,459.70	75.54	158	74.34	193.01	0.98	1.39
	Overall	6,327.03	29,908.87	5725.64	21,691.23	601.39	8,217.64	79.45	160	79.64	187.11	1.11	1.38
B. Mizoram :													
Aizawl	0-1 ha	3,694.38	39,985.02	6570.21	30,790.24	-2875.83	9,194.77	78.65	241	46.97	165.91	0.56	1.30
	1-2 ha	3,282.56	24,453.94	6684.15	19,902.98	-3401.59	4,550.96	78.48	153	41.83	159.46	0.49	1.23
	2-4 ha	3,270.63	25,811.76	6761.06	21,268.31	-3490.42	4,543.45	77.22	159	42.35	161.83	0.48	1.21
	4 ha & above	2,754.53	19,605.58	6434.77	18,274.79	-3680.24	1,330.79	74.29	136	37.08	143.96	0.43	1.07
	Overall	3,318.65	26,757.48	6569.14	22,150.14	-3250.49	4,607.34	77.54	169	42.80	158.30	0.51	1.21
Kalasib	0-1 ha	3,747.17	15,648.81	6393.06	13,713.44	-2645.89	1,935.37	78.68	109	47.62	143.27	0.59	1.14
	1-2 ha	3,276.62	19,680.27	6537.63	17,812.43	-3261.01	1,867.85	78.43	138	41.78	142.47	0.50	1.10
	2-4 ha	3,084.28	21,508.95	6538.43	19,472.31	-3454.15	2,036.64	77.54	149	39.78	144.28	0.47	1.10
	Overall	3,433.09	19,701.24	6437.98	17,743.53	-3004.90	1,957.71	78.35	137	43.82	143.49	0.53	1.11

Note: There is no sample in the farm size group '4 ha. and above' in Kalasib district of Mizoram.

4.15 Relative economics of jhum and settled cultivation

Comparative economics of jhum and settled cultivation in Meghalaya and Mizoram indicated that income and employment generated in settled cultivation was higher in settled cultivation in both the states (Table-4.14). Net income was several times higher in settled cultivation over jhum and it was found to be negative in Mizoram in Jhum cultivation. Settled cultivation was more capital intensive but more paying than jhum cultivation. Return per Man Day was much higher than prevailing wage rate in the states. B-C ratio for jhum cultivation was higher for settled cultivation in both the states. However, it was found to be much lower in Mizoram for jhum cultivation. Average economic farm situation was better in Meghalaya than in Mizoram.

Chapter-V

Jhum Cycle in the Hill States of the N. E. Region

5.1 Introduction

Jhumias, in general, shift the plot of land for cultivation of crops in the hills due to loss of soil nutrients and start cultivation in a new plot of land. After few years of time they return to the plot of land where they cultivated at the beginning. This time period is known as jhum cycle due to low population and high availability of land, this cycle was as long as 30 years, which has reduced to 3 – 5 years and the system has been satisfied by settled cultivation to a great extent. Many factors influence the length of the cycle such as education level of the family, availability of cultivable land, competition level, distance to the city, family size, population density etc. In this chapter an attempt has been made to examine the effects of different factors on jhum cycle in Meghalaya and Mizoram. Both functional and tabular analyses have been tried and the tabular analysis will proceed the functional analysis to substantiate the results.

5.2 Jhum cycle with education level

Growing level of education in a family may influence more towards settled cultivation as the Jhum is a traditional way of cultivation and the educated family members are well aware off the ill effects of Jhum cultivation. Table 5.1 indicates that level of education for determination of Jhum cycle was indeterminate in most of the villages of Meghalaya and Mizoram. This was mainly due to consideration of Jhum as a traditional ritual in the social culture of the tribals.

5.3 Jhum cycle with per capita culturable land

Availability of cultivable land also affects the Jhum cycle. If cultivable land is sufficiently available, crop can be rotated less frequently. It was observed from Table 5.2 that per capita culturable land established a positive relationship with Jhum cycle in most of the districts of Meghalaya and Mizoram. The highest average Jhum cycle was found in Garo hills of Meghalaya when per capita culturable land was high. It was quite low in Mizoram.

Table-5.1
JHUM CYCLE WITH EDUCATION LEVEL IN MEGHALAYA

District/village	Education index	Jhum Cycle (years)	Extra length of cycle (years)
Meghalaya			
Ribhoi District			
1. Nongbirthem	1.22	3	0.00
2. Nongbirlum	1.13	4	0.67
3. Taski	1.23	3	0.00
Average	1.19	3.33	-
West Garo Hills Dist.			
1. Chantigre	1.24	8	0.33
2. Sasatgre	1.33	7	0.00
3. Rengsangre	1.48	8	0.33
Average	1.38	7.67	-
Mizoram			
Aizawl District			
1. Zemabawk	1.15	2	0
2. Airfield	1.33	2	0
3. Tuirial	1.40	3	0
Average	1.28	2.33	-
Kalasib Dist.			
1. Nisapui	1.15	4	0.33
2. Sherkhan	1.34	4	0.33
3. Lungdai	1.36	3	0
Average	1.28	3.67	-

Table-5.2**JHUM CYCLE WITH PER CAPITA CULTURABLE LAND**

District/village	Per capita culturable land (ha.)	Jhum Cycle (year)	Extra length of cycle (year)
Meghalaya			
Ribhoi District			
1. Nongbirthem	0.24	3	0.00
2. Nongbirlum	0.23	4	0.67
3. Taski	0.23	3	0.00
Average	0.24	3.33	-
West Garo Hills Dist.			
1. Chantigre	0.30	8	0.33
2. Sasatgre	0.28	7	0.00
3. Rengsangre	0.28	8	0.33
Average	0.29	7.67	-
Mizoram			
Aizawl District			
1. Zemabawk	0.17	2	0
2. Airfield	0.22	2	0
3. Tuirial	0.29	3	0
Average	0.22	2.33	-
Kalasib Dist.			
1. Nisapui	0.26	4	0.33
2. Sherkhan	0.22	4	0.33
3. Lungdai	0.23	3	0
Average	0.21	3.67	-

5.4 Jhum cycle with density of population

Density of population affects the Jhum cycle. High density of population reduces the land-man ratio and puts pressure on land for cultivation. This leads to shorter Jhum cycle. It was observed that relationship between population density and jhum cycle was negatively related in Ribhoi districts of Meghalaya. In other districts of Mizoram and Meghalaya, it was indeterminate. Ribhoi district was thickly populated and developed and practiced settled cultivation more.

Table-5.3
JHUM CYCLE WITH DENSITY OF POPULATION

District/village	Density of population.	Jhum Cycle	Extra length of cycle
Meghalaya			
Ribhoi District			
1. Nongbirthem	78.50	3	0.00
2. Nongbirlum	89.30	4	0.67
3. Taski	72.80	3	0.00
Average	80.20	3.33	-
West Garo Hills Dist.			
1. Chantigre	65.50	8	0.33
2. Sasatgre	73.80	7	0.00
3. Rengsangre	79.50	8	0.33
Average	72.93	7.67	-
Mizoram			
Aizawl District			
1. Zemabawk	63.15	2	0
2. Airfield	51.76	2	0
3. Tuirial	47.92	3	0
Average	54.28	2.33	-
Kalasib Dist.			
1. Nisapui	37.29	4	0.33
2. Sherkhan	43.67	4	0.33
3. Lungdai	49.33	3	0
Average	43.43	3.67	-

5.5 Jhum cycle with level of consumption

Level of consumption is also related with population size. Higher in the population higher is the requirement of food for consumption which will lead to more frequently in use of culturable land. It was found that high consumption level established a negative relationship with jhum cycle in the districts except in West Garo Hills districts of Meghalaya. The jhum cycle was quite low in Aizwal district of Mizoram.

Table-5.4
JHUM CYCLE WITH LEVEL OF CONSUMPTION

District/village	Annual consumption needs per household (quintals)	Jhum Cycle	Extra length of cycle
Meghalaya			
Ribhoi District			
1. Nongbirthem	8.24	3	0.00
2. Nongbirlum	8.36	4	0.67
3. Taski	9.07	3	0.00
Average	8.55	3.33	-
West Garo Hills Dist.			
1. Chantigre	7.93	8	0.33
2. Sasatgre	7.73	7	0.00
3. Rengsangre	7.68	8	0.33
Average	7.78	7.67	-
Mizoram			
Aizawl District			
1. Zemabawk	7.72	2	0
2. Airfield	7.19	2	0
3. Tuirial	6.79	3	0
Average	7.24	2.33	-
Kalasib Dist.			
1. Nisapui	7.44	4	0.33
2. Sherkhan	8.36	4	0.33
3. Lungdai	7.84	3	0
Average	7.88	3.67	-

5.6 Jhum cycle with distance to the city

Near the city cropping pattern differs from mere subsistence to commercial nature for meeting the demand of the city dwellers. In the remote areas from the city,

cropping pattern changes and limits mostly to domestic needs as marketing of highly commercial produces needed for cities. Thus, Jhum cycle may be affected at nearness to city. It was observed from Table 5.5 that in Aizwal and Kalasib districts of Mizoram jhum cycle was the lowest when the distance to the city was low. However, there was a mixed relationship in Meghalaya.

Table-5.5
JHUM CYCLE WITH DISTANCE TO THE CITY

District/village	Distance to the city (km.)	Jhum Cycle (years)	Extra length of cycle (years)
Meghalaya			
Ribhoi District			
1. Nongbirthem	47	3	0.00
2. Nongbirlum	53	4	0.67
3. Taski	55	3	0.00
Average	51.67	3.33	-
West Garo Hills Dist.			
1. Chantigre	29	8	0.33
2. Sasatgre	31	7	0.00
3. Rengsangre	19	8	0.33
Average	26.33	7.67	-
Mizoram			
Aizawl District			
1. Zemabawk	8	2	0
2. Airfield	14	2	0
3. Tuirial	22	3	0
Average	14.67	2.33	-
Kalasib Dist.			
1. Nisapui	38	4	0.33
2. Sherkhan	30	4	0.33
3. Lungdai	23	3	0
Average	30.33	3.67	-

5.7 Jhum cycle with family size

Average family size affects the consumption requirements of food. The total population in the district will be determined by the aggregate of average family size affecting consumption demand. Table 5.6 indicates that small family size was related

with shorter Jhum cycle in Mizoram. It was inconclusive in Meghalaya, more particularly in West Garo hills districts (Table-5.6).

To conform the tabular analysis. the data were subjected to functional analysis in Meghalaya and Mizoram.

Table- 5.6
JHUM CYCLE WITH FAMILY SIZE

District/village	Size of the family (Nos.)	Jhum Cycle	Extra length of cycle
Meghalaya			
Ribhoi District			
1. Nongbirthem	6.30	3	0.00
2. Nongbirlum	6.40	4	0.67
3. Taski	7.00	3	0.00
Average	6.57	3.33	-
West Garo Hills Dist.			
1. Chantigre	6.10	8	0.33
2. Sasatgre	5.90	7	0.00
3. Rengsangre	5.90	8	0.33
Average	5.97	7.67	-
Mizoram			
Aizawl District			
1. Zemabawk	5.80	2	0
2. Airfield	5.40	2	0
3. Tuirial	5.10	3	0
Average	5.43	2.33	-
Kalasib Dist.			
1. Nisapui	5.70	4	0.33
2. Sherkhan	6.40	4	0.33
3. Lungdai	6.00	3	0
Average	6.03	3.67	-

5.8 Factors Affecting Jhum Cycle in Meghalaya

The factors like education level of the family in terms of indices(X_1), Per capita culturable land (X_2) in hectares, family size (X_3) in numbers, population density (X_4) as a ratio, distance to the city(X_5) and consumption level (X_6) as independent

variables were regressed with the length of the jhum cycle (C_j) in years. The following results were obtained.

5.8.1 Ri-Bhoi district

$$C_i = 1.9206 - 0.1441X_1 - 0.3613X_2 + 0.0412 X_5^* + 0.0526X_6$$

$$(0.2533) \quad (0.6294) \quad (1.5042) \quad (0.5963)$$

$$R^2 = 0.11$$

(Figures in parentheses indicate t values)

* Significant at 10% probability level

The length of jhum cycle was affected significantly by the distance to the city with desired sign. This indicated that at nearness to city length of jhum cycle was shorter. Other factors did not effect the jhum cycle significantly. Impact of education was insignificant. The role of other factors like consumption was indecisive. It was observed that the value of multiple determinations was quite low which implied that some other exogenous factors influenced the length of jhum cycle in the district. Due to high multicollinearity the variable like family size and population density were dropped.

5.8.2 West Garo Hills district

$$C_i = 9.4078 - 0.2719X_1^* - 0.07477X_2 - 0.0612 X_5^{**} + 0.0272 X_6$$

$$(1.0668) \quad (0.1966) \quad (4.3082) \quad (0.6025)$$

$$R^2 = 0.43$$

(Figures in parentheses indicate t values)

** Significant at 5% probability level

* Significant at 10% probability level

In West Garo Hill district the variable like education level of the family, per capita culturable land, distance to city and consumption level could explain about 43 per cent of the total variation in the length of jhum cycle. Desired sign was observed for education and distance to the city. Impact of education was higher in explaining jhum cycle in the district. Low coefficient of multiple determination indicated that some other exogenous factors influenced the length of jhum cycle in the district.

5.9 Factors affecting jhum cycle in Mizoram

5.9.1 Aizwal district

$$C_t = 4.3830 + 0.2811 X_1^* + 0.16148 X_2 - 0.0065 X_3 - 0.04461 X_4^{**}$$

$$(0.8295) \quad (0.41184) \quad (0.1092) \quad (3.7086)$$

$$R^2 = 0.5023$$

(Figures in parentheses indicate t values)

** Significant at 5% probability level

* Significant at 10% probability level

In this district about 50.23 per cent of variation in jhum cycle was explained by education level, per capita culturable land, distance to the city and consumption level. It was observed that role of education was positive and significant. It was followed by per capita culturable land. Impact of family size was low and negative. Population density had negative and significant impact on the jhum cycle.

5.9.2 Kalasib district

$$C_t = 7.0351 + 0.0615 X_1 - 0.1290 X_2 + 0.0358 X_3 - 0.0837 X_4^{**}$$

$$(0.3124) \quad (0.3311) \quad (0.8761) \quad (7.9915)$$

$$R^2 = 0.7339$$

(Figures in parentheses indicate t values)

** Significant at 5% probability level

The variable pertaining to Kalasib district could explain about 73.40 per cent of total variation in the length of jhum cycle. It was observed that population density had significant effect on the jhum cycle. The variable like distance to the city and consumption levels were dropped from the model due to high degree of multicollinearity. Except population density other variables did not show desired sign.

The regression analysis indicated that the selected variables could not explain the variation in the length of jhum cycle due to heterogeneity of data and for the influence of other exogenous variables.

Chapter-VI

MEASURES FOR CONTROLLING JHUM CULTIVATION

Jhum is a socially and culturally related traditional farming practice in the hills. It is prevalent where land is sufficient for alternative uses after few years in rotation. The practice is suitable to environment as it affects flora and fauna of the area. Different development departments in Meghalaya and Mizoram are taking initiatives to control jhum cultivation in the States.

6.1 Initiative and strategies for controlling jhum cultivation

It is a primitive practice to sustain the tribals. Different integrated tribal development programs have been initiated, but these programs are not yielding much response due to ignorance of the authorities about the socio economic and agro ecological conditions of shifting cultivation and less involvement of officials to make the people more conscious about the adverse effects of jhum cultivation. In the recent years international Development Agency through India-Canada Environment Facility, a project has been launched in Nagaland known as Nagaland Environment Protection for Economic Development to make Nagaland self sufficient in agro forestry. This project involves rural people for jhum as well as agro forestry under supervision and village team. Gradually jhum is made more stable and profitable and tries to tackle tribal forest conflict.

6.2 The strategies

- through equitable distribution of wasteland among the tribals more income and employment will be generated through development of agro forestry and silvi pasture practices.
- Encouragement of forest based activities through formation of cooperatives
- Forming Village Forest Committee can protect the communities by giving suitable incentives after harvest. This will also encourage increase the employment through different rural schemes.
- Literacy campaign will be launched in the remote areas educating the tribal women and children.

6.3 Jhum control measures in Meghalaya in different plan periods

Table- 6. 1 shows the measures undertaken by Meghalaya and Mizoram in controlling Jhum cultivation and its target and achievement in different plan periods.

Table - 6.1

Jhum Control Measures Undertaken by the Soil and Water Conservation Department, Government of Meghalaya in Meghalaya State.

Name of the Scheme	Fifth five year plan		Sixth five year plan		Seventh five year plan		Eighth five year plan		Ninth five year plan		Tenth five year plan.		Total
	Physical Target	Achievement	Physical Target	Achievement	Physical Target	Achievement	Physical Target	Achievement	Physical Target	Achievement	Physical Target	Achievement	
1.(a). Terracing	N.A.	1953.42 Ha (39.34)	N.A.	780.00 Ha (15.71)	N.A.	902.86 Ha (18.18)	1350.00 Ha	1002.37 Ha (20.18)	800.00 Ha	327.17 Ha (6.59)	557.10 Ha	Nil	4965.82 Ha
(b) Improved Shifting Cultivation	-	N.A.	-	N.A.	-	-	-	-	3125.00 Ha	-	-	-	-
2 Reclamation of Valley Bottom Land.	-	1628.79 Ha (74.76)	-	204.00 Ha (9.36)	-	50.33 Ha (2.11)	150.00 Ha	208.25 Ha (9.56)	300.00 Ha	87.45 Ha (4.01)	613.02 Ha	-	2178.82 Ha
3. Follow up Programme.	-	1237.38 Ha (27.79)	-	1144.99 Ha (25.72)	-	1127.93 Ha (25.54)	1400.00 Ha	941.72 Ha (21.15)	3000.00 Ha	-	1169.12 Ha	-	4452.02 Ha
4. Afforestation	-	1570.79 Ha (62.01)	-	719.63 Ha (28.41)	-	-	-	16.00 Ha (0.63)	4000.00 Ha	185.67 Ha (7.33)	173.11 Ha	41.08 Ha (1.62)	2533.17 Ha
5 Water conservation & Distribution works/Irrigation	-	1756.33 Ha -33.04	-	1056.56 Ha -19.88	-	881.93 Ha -16.59	1250.00 Ha	1511.74 Ha -28.44	909.00 Ha	108.64 Ha -2.05	557.10 Ha	-	5315.22 Ha
6 Camp & Camp Equipment.	-	113 Nos (32.66)	-	37 Nos (10.69)	-	120 Nos (34.68)	75 Nos	74 Nos (21.39)	80 Nos.	2 Nos. (0.58)	27 Nos.	-	346 Nos.
7. Dwelling Houses	-	1665 Nos	-	-	-	-	-	-	-	-	-	-	1665 Nos
8. Drinking Water.	-	62 Nos (26.38)	-	32 Nos (13.62)	-	88 Nos (37.45)	35 Nos	48 Nos (20.42)	80 Nos.	5 Nos. (2.13)	40 Nos.	-	235 Nos
9. Link Roads	-	-	-	180.83 Km. (33.97)	-	50.42 Km. (9.47)	30 Km.	50.07 Km. (9.41)	30.00 Km.	5 Km. (0.94)	8.8 Km.	-	532.27 Km.
10 (a) Horticultural Crop Development Works	-	245.95 Km (46.21)	-	1392.01 Ha (19.93)	-	1214.00 Ha (17.38)	700 Ha	2276.30 Ha (32.60)	3500.00 Ha	1655.42 Ha (23.71)	1446.44 Ha	445.25 Ha (6.38)	6982.98 Ha
11. Nursery.	-	-	-	-	-	-	-	-	-	-	9000000 Nos.	660813 Nos	660813 Nos

Note: Figures within parentheses indicate percentages to total.

6.3.1 Terracing

Terracing was considered as a measure to control jhum in the state. During Fifth to Tenth Five Year Plans, 4965.82 hectares were achieved under terracing. Achievement was quite low in the state. It was 39.34 per cent in the Fifth Five Year Plan and decreased to 6.59 per cent in Tenth Five Year Plan. Physical target varied from 557.10 hectares in Tenth Five Year Plan to 1250.00 hectares in Eighth Five Year Plan.

6.3.2 Improved Shifting Cultivation

There is no sufficient data in this regard.

6.3.3 Reclamation of valley bottom land

During Fifth to Tenth Five Year Plans 2178.82 hectares of valley land were reclaimed and out of this the highest achievement (74.76 per cent) was observed during Fifth Five Year Plan and it was the lowest in Seventh Five Year Plan period. The achievement exceeded the target during Eighth Five Year Plan period while achievement was far below the target during Ninth Five Year Plan.

6.3.4 Follow up Program

Under the follow up program 4452.02 hectares were achieved during Fifth to Tenth plan period. Achievement was the highest (27.79%) during the Fifth plan and declined to 21.15 per cent during Tenth plan. Achievement of physical target was upto the extent of 67.27 per cent during Eighth Five Year plan

6.3.5 Afforestation

Afforestation program in Meghalaya was not so encouraging. During Fifth Five Year plan it achieved 1570.79 hectares under afforestation and it declined to mere 41.08 hectares which shared 62.01 and 1.62 per cent of total achievement respectively. The physical target was quite high (4000.00 ha) during Ninth Five Year plan out of which achievement was only 7.33 per cent. In the state 2533.17 hectares were put under afforestation by the Department of Soil and water conservation.

6.3.6 Water Conservation and distribution Works

Under this measure 5315.22 hectares were achieved in the state. Highest achievement of this measure was in the Fifth Five Year plan (33.04%) and the lowest achievement was in the Ninth Five Year Plan (2.05%). During the Eighth Five Year Plan

it exceeded the target. Out of all the measures adopted by the Govt of Meghalaya, this measure gained importance in the state.

6.3.7 Camp and Camp Equipment

Number of camps was also organized in the jhum areas for encouraging settled cultivation so that the farmers need not shift their farmstead. In Fifth Five Year Plan about 113 such camps were provided by the Department. In subsequent plan periods it was found to decline faster.

6.3.8 Dwelling House and Drinking Water

Permanent settlement was also encouraged by the Department of Soil Conservation and it constructed dwelling houses. It was observed that during Fifth Five Year Plan 1665 numbers of dwelling houses were constructed by the Department. However, this measure was not followed in the subsequent years.

Similarly, 235 drinking water points were established by the Department in the jhum areas for settlement. It was higher in the Fifth, Seventh and Eighth Five Year Plans. It was quite negligible in the Tenth Five Year Plan period.

6.3.9 Link Roads

A link road in the jhuming areas was also encouraged for permanent settlement. It was observed that from Fifth to Ninth Five Year Plan 532.27 kms of link roads were constructed in the state. Achievement was higher in the Sixth Five Year Plan and which was about 33.97 per cent of total. It declined very fast in the subsequent plan periods. In the Tenth Five Year Plan there was no construction of link roads in the state.

6.3.10 Development of Horticultural Cash Crops

Department of Soil and Water Conservation of Meghalaya put a continuous effort to develop horticulture in the jhum land as a controlling measure. During Fifth to Tenth Plan period 6982.98 hectares of land were converted to horticultural crops. Out of total area 43.21 per cent were put during fifth Five Year plan which declined in the Sixth and Seventh Plan periods and was found to increase again in the Eighth and Ninth Plan periods. During the Tenth Five Year Plan development of horticultural cash crops in the jhum area was quite negligible. It was observed that out of all the measures the Department put more emphasis on development of horticultural cash crops in the jhum areas as control measures of jhum.

6.3.11 Development of Nursery

This measure was adopted by the department in the recent years. During Tenth Five Year Plan about 9 lakhs such nurseries were targeted and 660813 numbers of nurseries (73.42 %) were established in the state.

Thus it was seen that the Department of Soil and Water Conservation in Meghalaya followed different control measures for jhum cultivation. Out of all the measures terracing, water conservation, link roads, area converted to horticultural cash crops and nursery bed preparations were more emphasized by the Department in the state.

6.4 Acceptance of jhum in Meghalaya

In 2006, Government of Meghalaya agreed to search alternative ways to integrate soil and water conservation measures instead of suppressing shifting cultivation. The Shillong declaration of 2004 was extensively declared and development has taken place both at state and central levels. Recommendations have been advocated in the important policy meetings and in reports, including the Farmers' Commission Reports on the North East India with an initiative with participatory forestry. The MoEF has also setup a task force on rehabilitation of Shifting Cultivation fallows. The state Govt of Nagaland has trained Govt extension staff in participatory mapping and the Govt of Tripura is also looking for opportunities to initiate shifting cultivation development projects.

Measures to be undertaken

National Forest commission had advised to the recommendations of ICIMOD to increase the security of land tenure for shifting cultivation for both agricultural and fallow phases. This is possible through reconsidering the classification of shifting cultivation areas and categorizing them as agricultural land with adaptive forest management in the fallow period. The commission also asked for strengthening and capacitating customary institutions for improved local level governance, management of tribals, community based local resources, and tenurial access and control. It needs a sound credit policy suited to a region of common property regime and shifting cultivation. The Commission also accepted ICIMOD recommendations of propagating medicinal plants and bamboo which are the most versatile crops of the region.

There is need of better regulation. Farmers should be allowed to clear fallows during the cropping phase and the timber trade should be regulated. Common

property regimes should be strengthened so that capture of land and improved fallows by elites is discouraged.

6.5 Jhum Control Measures in Mizoram

6.5.1 Watershed Development Program implemented by Department of Agriculture

Department of Agriculture, Government of Mizoram implemented watershed development programs under central scheme. Such scheme was Wasteland Development Programs (IWDP), National Watershed Development Project for Rainfed Areas (NWDPRRA).

6.5.2 Watershed Development Project in Shifting Cultivation Areas (WDPSCA)

This program was launched in 1994-95 in the seven north eastern states and continued upto tenth plan. The broad objectives of the schemes are as follows.

- i. to protect and develop the hill slopes of jhum areas through soil and water conservation measures on watershed basis and to reduce further land degradation process
- ii. to encourage and assist the jhumia families to develop jhum land for productive use with improved cultivation and suitable package of practices leading to settled cultivation practices
- iii. to improve the socioeconomic status of jhumia families through household/land activities
- iv. to mitigate the ill effects of shifting cultivation by introducing appropriate land use and water management as per capability and approved technologies.

Agriculture Department of Mizoram has so far completed 33 projects covering an area of 65774 hectares with the expenditures of Rs 2185.87 lakhs. During the Eighth and Ninth plan period 2877 numbers of drainage line structures, 3991 numbers of water harvesting structures, 36440 numbers of field bunds have been executed.

6.6 Control of Shifting Cultivation

During 2002-03 a separate fund of Rs 480.00 lakhs were earmarked for controlling shifting cultivation in the state. The fund was spent in the project under different components like Administrative Cost (project management), Agricultural Extension and Training, development Component (natural resource management),

Production System (production of Crops) Land Use Incentive and Rehabilitation (Community Organisation). Under the Development component total area of 213 ha of potential area has been developed for terraced cultivation. Besides these, a total length of 63 kms of Potential Area connectivity (Agril link road) has been constructed at different locations wherever necessary. under the component of Household Production System 450 numbers of families was also assisted.

Demonstration on commercial crops and vegetable crops were also conducted in areas of 200 ha and 500 ha respectively under the component of Land Use Incentive. Agro Forestry and Drainage Line treatment like construction brushwood checkdam, water harvesting structure/ dam and Gabion structure were also done under the scheme.

During 2004-05 a fund of Rs 350.00 lakhs was earmarked to be spent under different components. Under Development Component a total area of 49 hectares of potential area was developed for WRC and 39 hectares of hill side slopes was constructed for terrace cultivation. Besides, a total length of 11 kms of Potential Area connectivity (Agril Link Roads) was constructed at different locations.

Under the component of land Use incentive demonstration on commercial and vegetable crops were conducted in 1200 and 500 hectares respectively. Agro forestry and Drainage line treatment like construction of brushwood checkdam, loose bolder checkdam, waterharvesting structure/ dam and Gabian structure was done under the scheme.

During 2005-06 Rs 550.00 lakhs were earmarked. In this year under Development component 320 hectares of potential area for WRC, terraces of hill slopes, has been developed for cultivation during the year. Besides, a total length of 15 kms of Potential Area connectivity (Agril. Link Road) have been constructed at different locations.

Construction of rain water harvesting structure, individual and community has been developed with physical outlay of 214 Nos during this year. About 200 hectares for cultivation of medicinal and aromatic plants will be converted as an alternative to jhuming and 1000 hectare for innovative management practices of Integrated Nutrient

Management respectively. Drainage Line treatment of Upper, Middle and Lower reaches of Gabian structure has to be done under the scheme.

6.7 Mizoram Intodelhna Project

Mizoram Intodelhna project (MIP) funded by the Government of India for the year 2002-03 was launched from March 2002. The main purpose of MIP is the upliftment of rural poor especially the shifting cultivators. Its main concern is attainment of self sufficiency, food security and better livelihood for the cultivators as a whole. This project introduced by the Government of Mizoram is practically known as "Project for self sufficiency in Mizoram".

Government of Mizoram introduced Mizoram Intodelh Project with an allocation of total fund of Rs 2000.00 lakhs. Under the component of Assistance to individual farmers for Land Development, 9366 numbers of families were assisted @Rs 4000.00 per family. Training, Awareness campaign, workshop etc were also conducted at the level of state, district and PIA level. During 2002-03 the following program components were implemented in different style.

- i. Land development in low land area and terraces in the upland areas
- ii. Development of piggery for diversification of farming system

6.8 Supervision of works in the field

Supervision of field was done by the project officers(MIP) and Assisstant Project Officers(MIP) covering all selected villages under overall control of the Deputy Commissioner who is also the Chairman of the District Level Monitoring Cell (DLMC) and District Level Project Committee(DLPC).

6.9 Monitoring and evaluation

A comprehensive monitoring system has been designed for MIP creating a separate cell at village, district and state level.

During 2003-04, Rs 2000.00 lakhs were allocated for this project. The project was continued for 2004-05 and Rs 2000.00 were allocated in this project.

Chapter-VII

CONCLUSION, SUGGESTION AND POLICY IMPLICATIONS

7.1 Reasons for not being able to make much headway in tackling the problem of shifting cultivation by the government,

1. As part of Jhum control schemes in land development programme due to nature of landscape, more areas were covered in dry terracing for rainfed farming as compared to that of wet terracing. The Jhumias are not used to dry farming in terraces.
2. Terraced farming has more weeds problems than Jhumed farming, which led farmers to leave terraced farming.
3. Most of the Jhum crops grow better in Jhum fields than in terraced fields, which may be due to the presence of ashes through Jhum burning which make the Jhumias prefer Jhuming.
4. As part of Jhum control schemes in cash and horticultural crops development programme, introduction of Para Rubber and Coffee is not acceptable to the Jhumias because they are new crops to them and highly technical.
5. In case of afforestation programme, no legal document/undertakings were taken/executed at the time of implementing the programme, which led them to freely operate the crops and afterward convert the area into Jhuming.
6. Most of the schemes /programmes of the government cannot reach to each and every village specially to those in far-flung areas even to those where Jhuming is their only means of living. This is due to non-availability of fund.
7. Most of the Nokmas or Headman of the most affected interior villages are allergic to such government schemes fearing that the govt. will ultimately take away their A'khing land.
8. Some areas even if they are highly affected are not easily assessable for implementation of schemes.
9. Though the Jhumias have the interest for wet terraced farming, lack of such lands suitable for wet terracing also binding them to Juming.

10. Lack of market outlet to dispose of the produce of cash and horticultural crops.
11. To many specially to those who still have their traditional faith and religion. Jhuming is their part of life. Whether they get the return from Jhuming or not it has become traditional habit to go for Jhuming every year.
12. To those who are "Songsarek" (man who holds to traditional faith and religion) Jhuming has interrelation to his socio-cultural and religious life, which keeps him bound to Jhuming.
13. Most of the Jhumias are socio-economically very poor. Some may have certain bright ideas for undertaking certain entrepreneurship in place of Jhuming. but can not come-up.
14. Most of the Jhumias do not allow their children to go school. Lack of education blinded them to see and understand the evil effect of Jhuming.
15. Inactiveness of Jhum control coordination committee either in state or in districts.
16. Lack of intensive evaluation of strategies in tackling the problem of Jhuming.
17. Prevailing Land Tenure System.

7.2 Few strategies in addressing the problems of shifting cultivators:

1. Improvement and stabilizing the market outlet to dispose of any cash and horticultural crops production and banning or discouraging the import policy of any kind of locally available crops produce.
2. Involving the matured and well-experienced Jhumias in programme planning in grass-root level.
3. Building trust and confidence between Jhumias and the Government.
4. Introduction of certain easily acceptable, effective and viable entrepreneurship and providing certain incentives.
5. Organizing effective awareness and motivation campaign departmentally or through NGOs and schools.
6. Reviving Jhum Control Co-ordination Committee in the district / state.
7. Encouraging Jhumias to form Self Help Groups (SGH), Cooperative Societies etc. to look into their own problems and to tackle them by themselves.

8. Introduction of certain selected fast growing forest species into Jhum fields, which are easily acceptable, viable and can replenish the soil within short spell of period.
9. Providing support price by the Government to any cash and horticultural crops produced to elevate their interest to such plantation as alternative to Jhuming.
10. Introduction of literacy campaign in most affected villages and inclusion of subject topic in Jhuming in education and making it compulsory in middle classes (Upper Primary).

7.3 Suggestions for Modification of existing Govt. programmes/ schemes:

1. Existing Government programmes / schemes should first be thoroughly reviewed through wide range interaction from wide range of people.
2. Jhumias themselves should be involved both in programme planning and implementation.
3. Subsidy schemes should be abolished rather follow-up programmes should be strengthen.
4. Garos Land Tenure System may be modified allowing Govt. to acquire land for implementing suitable, effective and viable schemes for their own benefit without seeking for "Nokmas" consent.
5. The programmes / schemes should be attractive and to their choice and taste and easily adoptable.
6. Representative of "Nokmas" to be a member of District Jhum Control Co-ordination Committee to enable them to address their grievances.
7. In afforestation programmes, fruit crops of acceptable species and even varieties should be allowed and introduced.
8. Special programmes / schemes may be introduced to acquire lands along the rivers / streams about 50 mt. from the bank and declaring them protected areas with legal prohibition not to disturb such declared areas.
9. Introduction of certain legal undertakings from the Jhumias not to mis-use / abandon the programmes / schemes implemented in their favour.
10. Time to time, the impact of the programme / schemes should be reviewed.

7.4. Conclusion:

It was however, concluded from the study that jhum cultivation in the hills is a continuous socio-economic process linked up with religion of the tribals. Jhum cycle is effected due to paucity of land and high population growth, but the system of jhum farming has not been abolished after so much of government efforts. Religious rites with seasonal festivals and worships are prevalent in the hills with jhum cultivation. Such festivals cannot be substituted to retrieve jhum. However, quality of life of jhumias can be improved through various measures like improvement of land tenure, use of common property resources, market development, encouragement of small entrepreneurship, food and health care facilities, good communications etc.

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