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Agrarian Structure and Transformation in Mizoram, North East India

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Abstract: Shifting Cultivation also known as Juhum cultivation has been livelihood options for tribal in North East India from the very first time that their existence is known. Shifting Cultivation is extensively practiced in the states of North Eastern region. Although it has been practiced widely it is understoodand categorised as one of the major challengesfor the development of tribal people in India. Henceforth, certain state governments have come up with a number of jhum control programmes to wean people away from the so called ecologically destructive practice of shifting cultivation and move towards settled cultivation. In the process of implementing these programmes there is a need to understand how far the switchover from shifting to settled cultivation happened and change the agrarian structure of the tribal. The present paper addresses these research questions with the help of field a survey using a pre-tested structured household interview schedule in two Mizo villages in Mizoram. The switch over from shifting cultivation to settled cultivation results in improvement of the living conditions of tribal households. Increase in the size of land holding, farm diversification and emergence of mono cropping have all resulted in enhancing the annual household income of the tribal.

Key Words: Jhum Cultivation, Shifting Cultivation, Agrarian Transformation, Agrarian structure, Mizoram

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I. INTRODUCTION

The present study attempts to assess the impact of transformation from shifting cultivation to settled agriculture on agrarian structure in Mizoram of North East India.

Shifting cultivation also known as Jhum or Swidden agriculture has been viewed as one of the challenges to tribal development in India over many decades. According to the tenth five year plan, shifting cultivation has remained as one of the unresolved issues of planning for tribal development in India.

Historically, the word agriculture has been used synonymously with the word farming. It is often associated with images of a farmer and his family planting harvesting crops and rearing animals. Historical evidence suggests that domesticating animals and cultivating land to produce food, fiber, and shelter allowed humans to proliferate. This marked a revolutionary change in human societies from food gathering to food production. In fact the origin of shifting cultivation could be traced back to as far back as the Neolithic period between the years 1300 to 3000 B.C[i]. Sharma (1976) believes that the system of shifting cultivation to have originated in the Neolithic Period around 7000 BC[ii].

Shifting cultivation is accepted as an early stage of agricultural evolution which is practiced in different parts of the world across different culture[iii]. About 36 Million Square Kilometers of land or about 30 percent of the world's exploitable soils are under shifting cultivation. They produce bulk of food for more than 250 million people or about 8 percent of the world population. Shifting Cultivation is not only practiced in India, but it is widely persistent among the indigenous communities, particularly in Africa, Latin America and parts of Asia. Tribal communities and hill people from time immemorial have practiced shifting Cultivation in India. About 10 million hectare of tribal land stretched across 16 states is estimated to be under Shifting Cultivation in India. It is also widely practiced in the hill regions of North Eastern States of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura.

Although Jhum is one of the oldest systems of agriculture, it has been under attack in recent times. In spite of its pivotal role in the culture and livelihood of tribal societies, shifting cultivation is often perceived as threat to the forests ecological system and it has been often associated with large-scale deforestation. As shifting cultivation is always attended through clearing and burning of forests which destroys forest and the environment around uscauses calamities like flood, drought, soil erosion[ivv] and more recently the Global Warming[vi]. In the

meantime Majumdar, (1976) observed that Shifting Cultivation is still regarded by the villagers as a sure method of producing food crops[vii]. Despite all the shortcomings, jhuming cannot be stopped completely as the lifestyle and cultural ethos of the tribal people is closely governed by jhuming operations. This has led to major debates in the policy making arenas on the continuance of shifting cultivation as a viable mode of agriculture. The government and some initiatives always try to protect environment and forests' resources by rejecting and opposing the practice of shifting cultivation. While introducing jhum, suggested changes and prepared policies should be socially acceptable, economically viable and environmentally sustainable[viii]. The government cannot provide a replacement therefore shifting cultivation is still declared as the main source of livelihood even though it destroys forests ecology. The people who practice it cannot be blamed because it is their means of livelihood. In the meantimeZabid (1993) concludes that shifting cultivation is not a stumbling block in the development of ecosystem in North Eastern India provided that it is practised on limited areas with long jhum cycles. Shifting Cultivation is a means of subsistence therefore it cannot be given up rapidly. He suggested that the existing jhuming has to be reset at higher levels but without disturbing the ecological balance and future technology must be in the interest of the traditional people and local environment to ensure on overall eco-development. Therefore the issue of shifting cultivation is an endless debate.[ix]

There are two views on shifting cultivation which has been categorised in the '*ecological implication'* and '*Socio Economic implication'* that advocate about the impact of shifting cultivation. The *Outsider's View* which is similarto *ecological implication* has its origin in the late 19th and early 20th century criticizes shifting cultivation on grounds that it dries up the springs of the hills, causes soil erosion, destroys valuable forests and adversely affects rainfall and deprives people of benefits of forest produce.

On the other hand the '*Socio Economic implication'* also believed shifting cultivation as a major source of livelihood and a way of life to the people[xxi]. Therefore it is very important to control and improve shifting cultivation to protect ecology and crop productivity. On the other hand the 'insider's view' recognize the relationship between natural resources and social relations. It supports the view that resources are cultural assessment, where actual objects are frequently translated into cultural envision by obtaining of materials from the environment and their alteration and circulation through social relations and by giving the material a value which will indicate how important it is to obtain it, circulate it or alter it. In such a system, environmental weight is interceded through social relations.[xii]

An overview of Shifting Cultivation in Mizoram

Mizos have been agriculturists from the beginning of the 18th century when they made their western trek to the present Mizo hills. They know only the form of farming known as shifting cultivation which forms the major activity of the Mizo economic life even today[xiiixiv].Jhuming locally known as 'Tlangramloneih' is the only occupation and has a close link to their culture and tradition. It is the way of life and almost all the activities of the Mizos revolve around it. This can be seen from the very fact that the three main festivals of the Mizos such as ChapcharKut, Mimkut and Pawl kut are closely related with Jhum operations.

As per the statistical handbook of Mizoram 2010 Mizoram covers an area of 21,081 Sq. Km and located between 21 58' and 24' 35' North latitude and 92' 15' East and 93' 29' East longitudes.About 90.68% of the State's total geographical area is covered under forests. Currently the total crop area in Mizoram is 132,634,000 hectare which is 6.28% of the total area of Mizoram.

As per the 2011 census, out of the total population of Mizoram 55.76% of the total workers are engaged in agricultural activities. More than 60% of the population depends upon agriculture and allied sector. About 32 % of the cultivated area is under Jhum cultivation. Only 31.60 % of the demand for rice could be met within the State.From the total population 44.36% i.e. 4,86,705 were workers and the rest 6,10,501 (52.83%) were non-workers and 47.17% of the total workers are engaged in agricultural activities.

In Mizoram, the livelihood base of majority of the population is cultivation especially shifting cultivation. Out of 2,22,853 households in Mizoram, the jhum cultivators comprise of 58,751 household (26.36%) and households practicing wet rice cultivation are 12,314 households (5.52%).A predominant majority of the populations are depending on cultivation for their livelihood all over the districts of Mizoram. Lunglei District has 78,292 working population and have the highest growth in number of cultivator as compared to 2001 census which constitute 45,439 (58.03%) and 13.61% agricultural labourer out of the total working population[xv].

The area under jhum cultivation has declined from 24,706 hectare during 2012-13 to 22,633 hectares during 2013-2014 which account for about 8.40% reduction. The reduction in jhum cultivation area is believed mainly due to the implementation of New Land Use Programme (NLUP), RKVY, Oil Palm Development Programme and Sugarcane Cultivation Programme. The share of shifting cultivation in net sown area was calculated about 24706 hectare which constitute 47.24 % during 2012-2013 but it has gone down to 22633

hectare which is only 43.28% in 2013-2014. Due to the increase in population the fallow period which is Jhum cycle under shifting cultivation has been decreased from 20-25 years to 2-3 years recently which becomes more intensive and frequent.[xvi]

In Mizoram the crops grown are mixed while the principal crop is paddy. Other crops are maize, cucumber, beans, arum, ginger mustard, sesame and cotton. Some pulses like cowpea, rice beans and French beans are cultivated under shifting cultivation (AISM 2007).[xvii]

II. METHODOLOGY

A sound methodology is vital for any research; it is the heartbeat of research whether educational or scientific, which would lead the researcher to achieve the objectives. The present study is a cross sectional in nature and the design is a mixed method design and alsouses both qualitative and quantitative methods of data collection. Though Qualitative as well as quantitative data are used for realizing the objectives of the study, greater weightage is assigned to quantitative data. The population of the present study constitutes all the households depending upon agriculture in rural Mizoram. The unit of the study is households. The study uses multi stage sampling procedure to select district, villages and households. Lunglei district was chosen purposively as both the shifting cultivation as well as settled agriculture is practiced. In Lunglei district, four villages were chosen purposefully based on their nature of cultivation and based on their distance from the Lunglei headquarters classified as far and near.In each of the villages, households were proportionately selected using systematic random sampling method. Structured household interview schedule was used to collect quantitative data among the sample households to understand the link between agrarian transformation and tribal development. Participatory method i.e. Participatory Rural Appraisal (PRA) was used to understand the field setting. The quantitative primary data collected through field survey were processed with computer packages of Microsoft Excel and SPSS. Simple statistical methods of averages, percentages, ratios and proportions are used to analyze quantitative data. For hypothesis testing, Karl Pearson's product moment correlation coefficients and 't' test are used.

III. AGRARIAN STRUCTURE

Agrarian Structure and Transformation is presented into six major sections viz., Nature of land possession, Pattern of land possession, Ownership of livestock, Cropping pattern, Tools used in cultivation, Input use and Perception on ecological consequences of shifting cultivation.

3.1. Nature of Land Possession

Land constitutes the chief basis of productive activity in the rural society and an important asset for human survival and represents natural capital.[xviii] The nature of land possession has been analyzed in terms of five sets of indicators viz., number of plots possessed, area of land holding, distributions of land, duration of land holding and source of land. The following subsections discuss the results of analysis of variation in the pattern of land possession between the shifting cultivators and settled agriculturists. (See table 1)

3.1.1. Number of Plots Possessed

In an earlier study on shifting cultivation, the number of plots was considered as an indicator of agrarian structure and transformation[xixxx]. Modes of land possession were categorized as land under Land Settlement Certificate (LSC), Periodic Land Pass (PLP), Common land and Temporary Pass (TP). In the pattern of land distribution across the different modes of land possession (ownership) there is significant difference between the shifting cultivators and settled agriculturists. On the whole, more than one half of the land is reportedly under periodic land pass (56%), which is followed by the land under LSC (23%), Common land (20%), and least under temporary pass (0.5%) which is by and large similar among the settled cultivators exceptthat there is no land under temporary pass (TP). On the other hand most of the land with shifting cultivators is under common land (54%), which is followed by PLP (34%), LSC (11%), and TP (2%).

On the whole, the average number of plots of land possessed by respondent households is 1.5. The average number of plots of land possessed by the shifting cultivator households (1.6) is significantly greater than that of the settled agriculturalist households (1.4). Settled cultivators significantly have more plots under PLP and LSC while the plot under common land is greater with shifting cultivators.

3.1.2. Area of Land Holding

The area of land possessed by the respondent households is measured in terms of Acres and analyzed for differences in pattern and variation in size. The average area of land held by the settled cultivators is significantly greater than that of the shifting cultivators. It is clear that the switchover from shifting to settled

cultivation results in increase in the size of land holding. The average area of land possessed by both the shifting cultivators' households and the settled agriculturalists' households in the present study is 6 acres. The settled agriculturalists (6.4 Acres) possessed significantly greater area of land than the shifting cultivators (5.1 Acres).

The pattern of distribution of area of land as a whole is periodic land pass (56%), land settlement certificate (23%), common land (20.3%) and temporary pass (0.5%). The pattern of land distribution of land across these four categories among the settled cultivators is similar to the overall pattern and no land is under TP. However, the pattern of land distribution among the shifting cultivators is different. The Common Land is the largest (57%) followed by PLP (29%) and LSC (14%).

3.1.3. Duration of Land Holding

The major feature of shifting cultivation is that its temporary and cyclical nature. Hence, duration of land holding is considered for assessing transformation. The number of holding land in years was assessed for different modes of possession (ownership) PLP,LSC, Common land and TP.

The pattern of duration of land holding across the modes follows the pattern of Periodic Land Pass (PLP), Land Settlement Certificate (LSC), Common land (CL) and Temporary Pass (TP) on the whole. The pattern of land possession across these four modes by the settled cultivators is similar to that of the overall pattern.

The duration of Land holding under PLP and LSC is significantly greater among the settled agriculturalists as compared to the shifting cultivators.On the other hand, the duration of cultivation of common land is significantly greater for shifting cultivators as compared to settled cultivators.

Table 1 Pattern of Land Possession: No. of Plots, Area and Duration

Sl. No	Indicator	Type of Cultivation				Total N = 282		't'
		Shifting n = 75		Settled n = 207				
		Mean	S.D	Mean	S.D	Mean	S.D	
I	**Number of Plots of Land Possessed**							
	Periodic Land Pass(PLP)	0.5 (33.9)	0.6	0.9 (65.3)	0.7	0.8 (56.2)	0.7	4.3**
	Land Settlement Certificate (LSC)	0.2 (10.7)	0.4	0.4 **(27.9)**	0.7	0.3 (23.0)	0.6	2.7**
	Common Land (CL)	0.9 (53.7)	0.3	0.1 (6.7)	0.3	0.3 (20.3)	0.5	17.8**
	Temporary Pass (TP)	0.0 (1.7)	0.2	0.0 (0.0)	0.0	0.0 (0.5)	0.1	1.7
	Number of Plots	1.6 (100)	0.6	1.4 (100)	0.7	1.5 (100)	0.7	2.0*
II	**Area of Land Possessed (***Area in Tins***)**							
	Periodic Land Pass(PLP)	1.5 (28.6)	1.9	3.6 (56.9)	3.4	3.1 (50.4)	3.2	5.2**
	Land Settlement Certificate (LSC)	0.7 (14.4)	2.0	2.6 (40.5)	5.5	2.1 (34.5)	4.9	2.8**
	Common Land (CL)	2.9 (57.0)	1.8	0.2 (2.6)	0.6	0.9 (14.8)	1.6	19.8**
	Temporary Pass (TP)	0.0 (0.0)	0.0	0.0 (0.0)	0.0	0.0 (0.0)	0.0	NA
	Area of Land Possessed	5.1 (100)	2.8	6.4 (100)	6.0	6.1 (100)	5.3	2.4*
III	**Duration of Land Possessed (***in years***)**							
	Periodic Land Pass(PLP)	6.2	8.6	9.9	10.1	8.9	9.9	2.8**
	Land Settlement Certificate (LSC)	2.4	5.9	4.9	10.4	4.2	9.4	1.9*

	Common Land (CL)	1.1	1.4	0.1	0.3	0.4	0.9	10.2*
	Temporary Pass (TP)	0.0	0.0	0.0	0.0	0.0	0.0	NA

Source: Computed Figures in parentheses are percentages ** P < 0.01 * P < 0.05

3.1.4 Source of Land Holding

One important indicator studies for assessing the transformation in the agrarian structure in the wake of transition from shifting cultivation to settled agriculture is that of source of land. This is to know whether the privatization of land ownership results in transfer of ownership. An open ended question was how the respondent got the land. The source of land possessed by respondents across the different modes viz., Periodic Land Pass (PLP), Land Settlement Certificate (LSC), Common land and Temporary Pass.

The results indicate that there are two major sources of landholding or ownership viz., allotment by village council and purchase. Land under common land and TP held by both the shifting cultivators and settled cultivators were allotted by the village councils. The proportion of the respondents got land allotment by the village council is significantly greater among the settled cultivators (22%) as compared to the shifting cultivators who got land from village council (7%). This clearly shows the emergence of market for rural land in the wake of land settlement. On the contrary, the proportion of the respondents who purchased land with LSC is slightly greater among the shifting cultivators (11%) as compared to those of settled cultivators (9%).

Table 2 Source of Land

Sl.No		Type of Cultivation		Total N=282
		Shifting n = 75	Settled n =207	
I	**Land Settlement Certificate (LSC)**			
	No Land Possessed	62 (82.7)	143 (69.1)	205 (72.7)
	Village Council	5 (6.7)	46 (22.2)	51 (18.1)
	Purchased	8 (10.7)	18 (8.7)	26 (9.2)
II	**Periodic Land Pass (PLP)**			
	No Land Possessed	40 (53.3)	48 (23.2)	88 (31.2)
	Village Council	28 (37.3)	143 (69.1)	171 (60.6)
	Purchased	7 (9.3)	16 (7.7)	23 (8.2)
III	**Temporary Pass (TP)**			
	No Land Possessed	74 (98.7)	207 (100)	281 (99.6)
	Village Council	1 (1.3)	0 (0.0)	1 (0.4)
IV	**Common Land (CL)**			
	No Land Possessed	9 (12.0)	188 (90.8)	197 (69.9)
	Village Council	66 (88.0)	19 (9.2)	85 (30.1)

Source: Computed Figures in parentheses are percentages

3.1.5. Pattern of Land Distribution

The size of land in the present study has been classified according to the classification of the Ministry of Rural Development Classification. The households have been divided into three class viz., Marginal (Below 2 acres), Small (2-5 Acres), and Medium (5-10 Acres) on the basis of the total area possessed by them.

As seen in the earlier section, the size of land holding increases with land settlement. The settled cultivators own slightly greater size of land holding as compared to the shifting cultivators. This overall increase in the size of land holding seems to be accompanied by increase in the inequality in the distribution of land where the area of land owned by the shifting cultivators is lower than that among the settled cultivators.

As transition from shifting cultivation to settled agriculture takes place, two major trends are emerging. There seems to be operation of centripetal and centrifugal tendencies in the agrarian transformation due to the transition from shifting to settled cultivation. The first trend is embourgeoisement whereby the medium farmers are becoming large farmers. The proportion of large farmers among the settled cultivators (12%) is greater than that among the shifting cultivators (4%). Similarly, the proportion of area under large holdings under shifting cultivators (11%) was significantly lower than that among the settled cultivators (35%).

The second trend is similar to that of proletarianization. In the context of Mizoram, though the cultivators are not becoming laborers and depeasantization is not taking place, the small farmers are becoming marginal farmers and the proportion of number of households increases while the area under small size of landholding class decrease.

Table 3 Pattern of Distribution of Land across Size of Land Holding Classes

Sl.No	Size of Land Holding	Type of Cultivation				Total N = 282	
		Shiftingn = 75		Settledn = 207			
		Number	Acres	Number	Acres	Number	Acres
1	Marginal(Below 2 Acres)	11 (14.7)	21 (5.5)	35 (16.9)	68 (5.1)	46 (16.3)	89 (5.2)
2	Small(2 - 5 Acres)	40 (53.3)	169.5 (44.1)	110 (53.1)	470 (35.5)	150 (53.2)	640 (37.5)
3	Medium(5 - 10 Acres)	21 (28.0)	150 (39.0)	38 (18.4)	318 (24.0)	59 (20.9)	468 (27.4)
4	Large(10 Acres and Above)	3 (4.0)	44 (11.4)	24 (11.6)	467 (35.3)	27 (9.6)	511 (29.9)
	Mean Size of Land Holding	5.1 ± 2.8	385 (100)	6.4 ± 6.0	1323 (100)	6.1 ± 5.3	1708 (100)
	Sample Gini coefficient	0.271279		0.397311		0.372066	

Source: Computed Figures in parentheses are percentages Mean ± SD

3.2. Ownership of Livestock

Livestock ownership is another indicator of agrarian structural transformation probed in this study. Livestock rearing is one of the sources of livelihood in tribal communities from time immemorial. Livestock can be construed as one of the forms of capital or livelihood assets viz., natural capital and plays a vital role in sustaining the wellbeing of households in rural and tribal areas.

In the context of Mizoram, it was customary for the Mizos to rear only pigs and cow rearing was unknown[xxi]. In an earlier study Lalengzama and Kanagaraj (2013) found the emergence of cow rearing practice among the settled cultivators and observed significant increase in value of livestock owned as result of switch over to settled cultivation from shifting cultivation.

The livestock owned among the shifting and settled agriculturalists in the present study comprises of six types viz., Pigs, Cow, Poultry, Fish, Goat and Horse. There is significant difference in the total value of livestock owned between the shifting cultivators and settled agriculturists. It is clear that as the farmers switch over to settled cultivation from shifting cultivation there is no change in the livestock owned by them. This finding is contradictory to the finding of earlier study by Lalengzama and Kanagaraj (2013). The observation in the field shows that the rearing of cows has emerged among the shifting cultivators also.

As a whole, the pattern of the value of livestock owned in the present study shows that the share of Pig (55%) contributed the highest which is followed by Cow (28%), Poultry (14%), Fish (2%), Goat (1%) and Horse (0.2%) which is similar to that of the settled cultivators.

Cattle rearing have emerged among both the settled cultivators and the shifting cultivators mainly because it is one of the trades selected under NLUP. The settled cultivation and livestock rearing are interdependent as the bi-products of cultivation are useful to feed the livestock. Moreover in return, livestock rearing helps in weeding and they also supply organic manure for the cultivation.

Table 4. Pattern of Livestock Ownership

Sl. No	Livestock	Type of Cultivation				Total N = 282		't'
		Shiftingn = 75		Settled n =207				
		Mean	S.D	Mean	S.D	Mean	S.D	
1	Pigs	6453 (62.0)	17284	6420 (52.8)	11801	6429 (55.0)	13445	0.02
2	Cow	1600 (15.4)	11745	3865 (31.8)	35315	3262 (27.9)	30848	0.54
3	Poultry	2277 (21.9)	8818	1469 (12.1)	3203	1684 (14.4)	5303	1.13
4	Fish	0 (0.0)	0	290 (2.4)	2591	213 (1.8)	2222	0.97
5	Goat	16 (0.2)	139	121 (1.0)	776	93 (0.8)	670	1.16
6	Horse	67 (0.6)	577	0 (0.0)	0	18 (0.2)	298	1.67
7	Total Value	10413 (100)	22170	12164 (100)	39406	11699 (100)	35615	0.36

Source: Computed Figures in parentheses are percentages ** P < 0.01 * P < 0.05 (value in Rupees)

3.3. Cropping Pattern

To probe into the changes in the cropping pattern the crops cultivated are divided into four categories viz., cereals, pulses and oilseeds, vegetable and fruits. This classification was used in earlier studies conducted in Mizoram (seeLalengzama and Kanagaraj 2013; Zaitinvawra and Kangaraj 2008). The fruits cultivated by the respondents are Pineapple, Orange, Banana, and Passion fruit, lemon, wild orange (*Hatkora)* and Mango. Major crops under Vegetable are Mustard, Cabbage, Beans, Cauliflower and Pumpkin, Brinjal. Cereals cultivated among the respondents are Rice and Corn. Coffee, Broom, Bitter Bean and Teak are the tree Crops cultivated by the households. Oil Palm is a new crop introduced few years back cultivated among the respondents, Cultivation of Pulses is almost absent among the farmers studied.

The differential patterns of cropping across the shifting and settled cultivators in the present study has been probed in terms of number of crops cultivated by farmers, number of farmers cultivating different crops, purpose of cropping and area under cropping.

3.3.1 Number of Farmers Cultivating Different Crops

Number of farmers cultivating the different types of crops viz., Fruits, Vegetables, Cereals, Tree Crops, Oil Seeds and Pulses is the first indicator of cropping pattern.

On the whole, the majority of the respondent households cultivate fruits (67%) which are followed by the proportion of farmers cultivating Tree Crops (46%), Vegetables (45%), Cereals (32%) and Oil Seeds (12%) which is similar to the cropping pattern of the settled cultivators. A different pattern of cropping could be observed among the shifting cultivators where Cereals (96%) and Vegetables (91%) are cultivated by most of the farmers which followed by those who cultivate Fruits (39%), Tree Crops (17%), Oil Seeds (1%) and Pulses (1%).

The proportions of farmers cultivating commercial crops such as fruits, tree crops and oil seeds are significantly greater among the settled agriculturalists as compared to those of the shifting cultivators. On the other hand the crop meant for subsistence i.e. cereals are cultivated by a greater proportion of the shifting cultivators (96%) than the settled agriculturalists (27%). However, the proportion of farmers cultivating the vegetables is more among the shifting cultivators (91%) as compared to the settled agriculturalists (3%). The results of analysis of number of farmers cultivating different crops clearly show that the shift from subsistence to commercialization has happened in the context of the present study too as already reported.

Table 5. Cropping Pattern: No. of Farmers

Sl. No	Crops	Type of Cultivation				Total N = 282		't'
		Shiftingn = 75		Settledn = 207				
		Number	Percent	Number	Percent	Number	Percent	
1	Fruits	29	39	160	77	189	67	6.52**
2	Vegetables	68	91	62	30	130	46	10.68**
3	Cereals	72	96	55	27	127	45	13.1**
4	Tree Crops	13	17	78	38	91	32	3.28**
5	Oil seeds	1	1	33	16	34	12	3.38**
6	Pulses	1	1	1	0	2	1	0.75

Source: Computed Figures in parentheses are percentages ** P < 0.01 * P < 0.05

3.3.2. Number of Crops Cultivated

In earlier studies on shifting cultivation, significantly greater number of crops cultivated by shifting cultivators over the settled cultivators was reported in a study made by Lalengzama and Kanagaraj(2014); Zaitinvawra and Kangaraj(2008).

The number of crops cultivated is greater among the shifting cultivators (8.3) as compared to the settled agriculturalists (3.3). However, this difference in the number of crops cultivated between the shifting cultivators and settled agriculturists are not statistically significant. This result is contrary to the observation made in the earlier studies on agrarian transform in Mizoram.

The cropping pattern of the shifting cultivation shows that the proportion of number of crops per farmer is the highest on vegetables (70.2 %.) which is followed by the share of Cereals (1.7) and Fruits (0.5), Pulses (0.01) and Tree Crops (0.2) while Oil Seed is absent. The settled agriculturalist had a different pattern where the proportion of crops per farmer is the highest in Fruits (44.4%) which is followed by Vegetables (0.8), Tree Crops (0.5), Cereals (0.4), and Oil Seed (0.2) while Pulses are absent. The field observation of the present research indicates that the number of farmers cultivating the Oil Palm trees is increasing since 2008 as there is government support for cultivation under NLUP.

Significantly greater number of fruits, tree crops, and oil seeds are cultivated among the settled cultivators as compared to those among the shifting cultivators. On the other hand, the number of vegetables, cereals, and pulses are significantly cultivated in greater number among the shifting cultivators as compared to those of settled cultivators.

Table 6. Cropping Pattern: Number of Crops per Farmer

Sl. No	Crops	Type of Cultivation				Total N = 282		't'
		Shiftingn = 75		Settledn =207				
		Mean	S.D	Mean	S.D	Mean	S.D	
1	Vegetables	5.8 (70.2)	3.0	0.8 (24.5)	1.7	2.2 (46.2)	3.1	17.34**
2	Fruits	0.5 (6.6)	0.8	1.5 (44.4)	1.2	1.2 (26.4)	1.2	6.34**
3	Cereals	1.7 (20.7)	0.6	0.4 (10.6)	0.6	0.7 (15.4)	0.9	16.4**
4	Tree Crops	0.2 (2.2)	0.4	0.5 (15.5)	0.8	0.4 (9.2)	0.7	6.00**
5	Oil Seeds	0.0 (0.2)	0.1	0.2 (4.8)	0.4	0.1 (2.6)	0.3	3.55**
6	Pulses	0.01 (0.2)	0.12	0.00 (0.1)	0.07	0.01 (0.2)	0.08	3.38**
7	Number of Crops	8.3 (100)	0.84	3.3 (100)	0.8	4.7 (100)	1.0	0.75

Source: Computed Figures in parentheses are percentages ** P < 0.01 * P < 0.05

3.3.3. Area under Different Crops

The measurement of area is difficult in the context of Mizoram because the farmers do lack the knowledge and in the hilly topography of land further complicates the measurement.The area of cropping in the present study is measured in acres which are presented across the classification of crops in the previous sub section viz., Fruits, Vegetables, Cereals, Tree Crops, Oil Seeds and Pulses.

There is no significant difference in the gross cropped area under cultivation between the shifting cultivators and settled cultivators. The gross cropped area among both the type of cultivator households is calculated to be 5 acres. The settled cultivators had significantly greater area under cultivation of fruits, tree crops and oil seeds while the shifting cultivators have significantly greater area under cultivation of cereals, and vegetables.

Crop diversity was assessed in terms of Simpson's Index of Diversity (SID). The crop diversity index value is significantly greater among the shifting cultivators (0.5) as compared to settled cultivators (0.3).

On the whole, the pattern of cropping in terms of area shows that the proportion of area under Fruits (43%) is the largest area followed by Cereals (21%), Vegetables (15%), Tree Crops (14%), Oil Seeds (6%), and Pulses (0.4%). This overall cropping pattern is similar to that of the settled cultivators while that of the shifting cultivators is different. Among the shifting cultivators, the greatest share of area under cultivation is held by the share of area under cereals (49%) which is followed by Vegetables (27%), Fruits (17%), and tree crops (6%).

Table 7: Cropping Pattern: Area under Cultivation(Area in Acres)

Sl. No		Type of Cultivation				Total N = 282		't'
		Shiftingn = 75		Settledn = 207				
		Mean	S.D	Mean	S.D	Mean	S.D	
1	Fruits	0.8 (16.5)	1.3	2.7 (52.9)	2.9	2.2 (43.2)	2.7	5.29**
2	Cereals	2.5	1.1	0.6	1.2	1.1	1.4	12.22**
		(49.4)		(11.3)		(21.4)		
3	Vegetables	1.4	0.8	0.5	0.9	0.7	1.0	7.21**
		(27.4)		(9.9)		(14.6)		
4	Tree Crops	0.3	0.7	0.9	1.5	0.7	1.3	3.28**
		(5.7)		(17.2)		(14.2)		
5	Oil Seeds	0.0	0.2	0.4	1.3	0.3	1.1	2.69**
		(0.5)		(8.4)		(6.3)		
6	Pulses	0.0	0.2	0.0	0.2	0.0	0.2	0.42
		(0.5)		(0.3)		(0.4)		
7	Gross Cropped Area	5.0 (100)	2.1	5.0 (100)	3.5	5.0 (100)	3.2	0.01
8	Crop Diversity Index	0.5	0.2	0.3	0.3	0.4	0.25	5.67**

Source: Computed **** P < 0.01** *** P < 0.05**

3.3.4. Purpose of Cropping

Earlier studies on transition from shifting to settled cultivation showed significant qualitative transformation from subsistence to commercialization in the Mizoram context. Closer observation in the field shows that it is a matter of attitude and motivation rather than the crops themselves can be classified as commercial and subsistence. To probe further, the respondents were asked to state purpose of their cultivation of different crops. There are three purposes identified. They are for household consumption, for market and both for household consumption and market across the categories of crops such as vegetables, fruits and cereals.

The results of analysis of the purposes reveal that greater proportion of the settled cultivators is producing crops for sale in the market while a greater proportion of shifting cultivators produce for both market and household consumption. Thus the idea of the production for market has entered into the minds of the shifting cultivators also.

Table 8 Cropping Pattern: Purpose of Cropping

Sl.No	Crop/ Purpose	Type of Cultivation		Total N=282
		Shiftingn = 75	Settledn =207	
I	**Vegetables**			
	Household Consumption	16 (21.3)	11 (5.3)	27 (9.6)
	Market Sales	7 (9.3)	37 (17.9)	44 (15.6)
	Both for Household and Market	45 (60.0)	14 (6.8)	59 (20.9)
II	**Fruits**			
	Market Sales	28 (37.3)	159 (76.8)	187 (66.3)
	Both for Household and Market	0 (0.0)	1 (0.5)	1 (0.4)
III	**Cereals**			
	Household Consumption	19 (25.3)	21 (10.1)	40 (14.2)
	Market Sales	1 (1.3)	5 (2.4)	6 (2.1)
	Both for Household and Market	52 (69.3)	29 (14.0)	81 (28.7)

Source: Computed **Figures in parentheses are percentages**

3.4. Tools Used in Cultivation

Tools and its uses form technology which is necessitated for economic development especially in agriculture. Studies on tool use and its implementation among the Mizos is also studied by the Thangchungnunga (1997), Lalengzama (2011), Lalengzama and Kanagaraj (2013).

The tools used by the respondent households in farming in the present study are classified into four types such as Forest clearance tools, Weeding tools, Harvesting tools and Irrigation tools. Forest clearance tools mainly include Chempui, Hreipui and Chemsei. Land Preparation tools mainly include *Thirtiang, suahdur* (spade), Power tiller and Tractor. Weeding tools includes *Chemkawm, Chemsei, Tuthlawh* and Mechanical weeding machine. Harvesting tools includes *Dawrawn, Em, favah, Empai, Paikawng and ThlamEm* which are mainly for carrying. Irrigation tool is almost absent and one Diesel Water Pump set was observed.

4.4.1. Number of Farmers Using Agricultural Tools

The proportion of respondents employing tools in the present study is presented across classification of tools viz., Forest clearance tools, Weeding tools, harvesting tools and Irrigation tools.

On the whole, land preparation tool (76.9%) is used by the largest number of cultivators in the present study which is followed by Forest clearance tools (62.2%), Harvesting tools (59.4%) and Weeding tools (47.8%). The switchover from shifting cultivation to settled agriculture resulted in the decrease of forest clearing tools and increase in land preparation tools.

The number of farmers employing Land preparation tool is almost the same between both the farmers but the settled agriculturalist (78%) employ which is more than the shifting cultivators (75%). Surprisingly, forest clearance tools are also almost the same but higher among settled agriculturalist (63.6%) as compared to shifting cultivators (61.3%). As different crops needs specific harvesting tool, harvesting tools is more employed by the shifting cultivators (68%) more than the settled cultivators (63.6%) as crop diversity is more among the shifting cultivators. Weeding tool is employed by both the farmers where settled agriculturalist (48.3) is slightly more than the shifting cultivators (47.7).

Table 9: Pattern of Tools Used in Cultivation: No. of Farmers Using

Sl. No	Tool	Type of Cultivation				Total N = 282	
		Shiftingn = 75		Settledn = 207			
		Number	Percent	Number	Percent	Number	Percent
1	Chempui	74	98.7	204	98.6	278	98.6
2	Hreipui	59	78.7	169	81.6	228	80.9
3	Chemsei	5	6.7	22	10.6	27	9.6
4	Thirtiang	58	77.3	162	78.3	220	78.0
5	Suahdur	55	73.3	162	78.3	217	77.0
6	Chemkawm	71	94.7	196	94.7	267	94.7
7	Tuthlawh	67	89.3	179	86.5	246	87.2
8	Dawrawn	57	76.0	132	63.8	189	67.0
9	Em	45	60.0	114	55.1	159	56.4
10	Favah	61	81.3	126	60.9	187	66.3
11	Empai	44	58.7	88	42.5	132	46.8
12	Paikawng	66	88.0	155	74.9	221	78.4
13	ThlamEm	33	44.0	91	44.0	124	44.0
14	Diesel Water Pump	0	0.0	1	0.5	1	0.4
15	Electric Water Pump	0	0.0	2	1.0	2	0.7
16	Power Tiller	0	0.0	0	0.0	0	0.0
17	Tractor	0	0.0	0	0.0	0	0.0
18	Mechanical Weeder	0	0.0	3	1.4	3	1.1
19	Drip Irrigation	0	0.0	0	0.0	0	0.0
20	Sprinkler Irrigation	0	0.0	0	0.0	0	0.0
	Type of Tools						
I	Forest Clearance Tools	46	61.3	132	63.6	178	62.6
II	Land Preparation Tools	57	75.3	162	78.3	219	76.9
III	Weeding Tools	36	47.7	100	48.3	136	47.8
IV	Harvesting Tools	51	68.0	118	56.8	169	59.4
V	Irrigation Tools	0	0.0	2	0.7	2	0.53

Source: Computed **Figures in parentheses are percentages**

3.4.2. Number of Tools Used by the Cultivators

The lack of agricultural tools is a major problem in Lunglei district which clearly shows lower development in agriculture as compared to other districts. There are 13 tools used by the shifting cultivators and 16 tools used by the settled agriculturalist in the present study area. The number of tools owned in the present study is presented across the classification of tools made in the previous sub section viz., Forest clearance tools, Weeding tools, harvesting tools and Irrigation tools.

Moreover the tools owned are more among the settled agriculturalists except in harvesting tools. This is mainly due to existence of mono cropping among the settled agriculturalist which requires lesser types but more number of tools. Employment of machine like tractor, power tiller, mechanical weeding machines are almost absent but settled agriculturalists started using it but were still very few due to financial constrain.

The pattern of number of tools is different among both the shifting and settled cultivators. The shifting cultivators use forest clearance tools (4.2) as the highest followed by the weeding tools (4.0), Land preparation tools (1.9), harvesting tools (1.1) and irrigating tools are absent. In the meantime a different pattern is seen among the settled agriculture where the proportion of use of forest clearance tool (3.9) is the highest followed by land preparation tool (2.1), weeding tools (1.0), harvesting tools (0.9) and irrigating tools are absent.

Table 10. Pattern of Tools Used in Cultivation: Number of Tools Used

Sl. No	Tool	Type of Cultivation				Total N=282	
		Shiftingn = 75		Settledn =207			
		Mean	S.D	Mean	S.D	Mean	S.D
1	Chempui	2.9	1.2	2.8	1.5	2.8	1.4
2	Hreipui	1.2	0.9	1.0	0.7	1.1	0.7
3	Chemsei	0.1	0.4	0.1	0.5	0.1	0.5
4	Thirtiang	1.1	0.9	1.1	1.0	1.1	0.9
5	Suahdur	0.9	0.6	0.9	0.6	0.9	0.6
6	Chemkawm	2.1	1.1	2.1	1.0	2.1	1.1
7	Tuthlawh	1.8	1.0	1.7	1.1	1.7	1.1
8	Dawrawn	1.1	1.0	0.8	0.9	0.9	0.9
9	Em	0.9	1.1	0.9	1.1	0.9	1.1
10	Favah	2.1	1.3	1.5	1.6	1.6	1.5
11	Empai	0.6	0.6	0.5	0.7	0.5	0.6
12	Paikawng	1.2	0.7	1.0	0.8	1.1	0.8
13	ThlamEm	0.5	0.6	0.5	0.6	0.5	0.6
14	Diesel Water Pump	0.0	0.0	0.0	0.1	0.0	0.1
15	Electric Water Pump	0.0	0.0	0.0	0.1	0.0	0.1
16	Power Tiller	0.0	0.0	0.0	0.0	0.0	0.0
17	Tractor	0.0	0.0	0.0	0.0	0.0	0.0
18	Mechanical Weeder	0.0	0.0	0.0	0.1	0.0	0.1
19	Drip Irrigation	0.0	0.0	0.0	0.0	0.0	0.0
20	Sprinkler Irrigation	0.0	0.0	0.0	0.0	0.0	0.0
I	Forest Clearance Tools	4.2	0.9	3.9	0.9	1.3	0.9
II	Land Preparation Tools	1.9	0.7	2.1	0.7	1	0.7
III	Weeding Tools	4.0	0.7	1.0	0.7	1	0.7
IV	Harvesting Tools	1.1	0.9	0.9	0.9	0.9	0.9
V	Irrigation Tools	0.0	0.9	0.0	0.9	0	0.9

Source: Computed

3.5. Input Use

Many Economists believe that the level of productivity, production and income of the cultivator is determined by pattern of inputs used in cultivation. Input use has a series of impact on agriculture and agricultural production declined primarily due to reduced inputs and credit supplies especially in settled agriculture.[xxii]

The input use among the respondent households in the present study is analyzed in terms of use of Seeds, Human Labor, Animal Labor, Machinery, Manure, Pesticide and Irrigation.

3.5.1. Seeds

Seed is a primary input. The seeds used by the respondents in the present study are mainly categorized into Local Seeds and High Yielding Variety Seeds (HYV).

The Local seeds (2.2) are used more frequently than the HYV (0.8) seeds among both the type of cultivators. The frequency of use of local seeds is significantly higher among the shifting cultivators (2.5) as compared to the settled agriculturalist (2) which is mainly because of the unavailability of HYV seeds and lack of technical knowhow to cultivate High Yielding Variety Seeds. The use of High Yielding Variety Seeds is comparatively more among the settled agriculturalists (0.9) as compared to shifting cultivators (0.5) which are mainly from the supply of government and from the market. The same finding was observed in Aizawl district of Mizoram by Lalengzama (2011). In the process of switchover, the mizo farmers change the type of crops from local to Hybrid seeds which they believe as more productive and easy to look after which is strongly emphasized by the government departments especially agriculture department and horticulture department in their own areas.

3.5.2. Human labor

Human labor is an inevitable input in cultivation and Human labor among the respondent households in the present study is categorized into male hired labour, female hired labor, male family labor and female family labor.

There no significant change in the frequency as well as pattern of human labor use. Contrary to reports in the increase in the human labor use due to transition from shifting cultivation to settled cultivation, there is no significant difference in the frequency of use of male hired labor, female hired labor, male and female family labor. On the whole, the male hired labor use was greatest which is followed by the female labor use, use of female family labor, and male family labor. The same pattern could be observed across the shifting cultivators and settled cultivators.

3.5.3. Animal Labor

Animal labor use in agriculture is a major feature of settled cultivation in India. Animals especially bulls and buffaloes are used in agricultural operations such as ploughing, threshing and transportation of harvest and inputs.

Employment of animal labor is absent among both the shifting cultivators and the settled agriculturalists in the present study area. This is mainly because the area of land holding in the area of study is small and the terrain is slope which restricts the use of animal labor to some extent.

3.5.4. Employment of Machines

Use of machines in agriculture is a modern phenomenon which is believed to enhance production and reduce the cost of production. The employment of machinery by the respondents in the present study is categorized into owned and hired. The results of analysis of data shows that the employment of machinery is absent among the shifting cultivators but a few among the settled agriculturalists have started using it. This shows that the employment of machinery emerges among the settled agriculturalists in southern Mizoram.

3.5.5. Manure

Timely access to fertilizer emerges as one of the most forceful determinants of yields and their consistency (Arslan.et.al. (2015). Commercial certified organic agriculture has spread to over 130 countries worldwide and demand for organic pesticides is driven by belief that organic pesticides are more healthy, tasty, and environmentally friendly than conventional products (Lotter, 2008). Hence, the manure used by respondents in the present study has been categorized into Organic Manure, Chemical Fertilizers (major ones viz., NPK) and Chemical Fertilizers (Minor).

There is no difference in the pattern of manure use between the shifting cultivators and settled cultivators, the latter significantly use the organic and chemical fertilizers in greater frequency as compared to the former type of farmers. On the whole, use of Organic fertilizers (0.4) as an input among the respondents is the highest which is followed by Chemical Fertilizers (NPK) (0.2) and Chemical Fertilizers (Minor) (0.2). Use of organic fertilizer is significantly higher among the settled agriculturalist (0.5) as compared to the shifting cultivators (0.2). The use of NPK Chemical Fertilizers and Minor Chemical Fertilizers are also higher among the settled agriculturalist which indicated that sedentary form of cultivation requires more input in terms of manure.

One very promising finding is the use organic manure (0.4) is the highest among all the fertilizers and even the government of India allocated Rs 100 crores with a view to develop commercial organic farming in the North Eastern Region (GOI, 2015).

3.5.6. Pesticides

Pesticide use in Agriculture is practiced in India for centuries but use of the poisonous chemical pesticide is a modern trend fuelled by agricultural extension agencies. The pesticide used by respondent households in the present study is categorized into organic pesticides and chemical pesticides.

In the pattern and frequency of use of pesticides there is no significant difference between the shifting and settled cultivators. Both organic and chemical pesticides are used rarely. On the whole, both the farmers used Organic pesticides (0.5) and chemical pesticides (0.5) equally. The data might show low rate of input in terms of pesticides among the farmers it is indicative of the fact that use of pesticides has no much effect and contribution in agrarian transformation in Mizoram.

3.5.7. Irrigation

Production in settled agriculture depends heavily on irrigation. There are some who argued that high levels of irrigation and mechanization have ensured high incomes from the cultivation[xxiii]. The inputs use in irrigation in the present study has been categorized into dependence on rainfall, rain water harvesting and water from river.

In the pattern and frequency of use of various sources of irrigation viz., rainfall, rain water harvesting, and river water are not significantly different between the shifting and settled cultivators. Both of them mostly depend on rail fall and use rarely practice the rain water harvesting or using river water. The dependence on rainfall (2.9) is still the highest among both the farmers followed by rain water harvesting (0.1) and water from river (0.1). Although some rain water harvesting mechanism was introduced among the settled agriculturalist, the process of agrarian transformation in Mizoram lack improvement in irrigation which is vital for the development of agriculture especially sedentary form.

Table 11. Pattern of Input Use in Cultivation: Frequency of Use

Sl. No.	Input	Type of Cultivation				Total N=282		't'
		Shiftingn = 75		Settled n =207				
		Mean	S.D	Mean	S.D	Mean	S.D	
I	**Seed**							
	Local Seeds	2.5	0.7	2.0	0.9	2.2	0.9	4.0**
	High Yielding Seeds	0.5	0.7	0.9	0.9	0.8	0.9	-3.5**
II	**Human Labour**							
	Male Hired Labour	1.4	0.8	1.4	0.8	1.4	0.8	0.4
	Female Hired Labour	0.9	0.5	0.8	0.5	0.8	0.5	0.3
	Female Family Labour	0.7	0.6	0.5	0.5	0.6	0.5	1.7
	Male Family Labour	0.7	0.6	0.5	0.5	0.6	0.5	1.8
III	**Animal Labour**							
	Owned Animal Labour	0.0	0.0	0.0	0.0	0.0	0.0	NA
	Hired Animal Labour	0.0	0.0	0.0	0.0	0.0	0.0	NA
IV	**Machinery**							
	Owned Machinery	0.0	0.0	0.1	0.4	0.0	0.3	-1.3
	Hired Machinery	0.0	0.0	0.0	0.1	0.0	0.1	-0.9
V	**Manure**							
	Organic Manure(Specify)	0.2	0.4	0.5	0.8	0.4	0.7	-2.9**
	Chemical Fertilizers(NPK)	0.1	0.3	0.2	0.4	0.2	0.4	-1.7
	Chemical Fertilizers(Minor)	0.1	0.3	0.2	0.5	0.2	0.4	-2.0*
VI	**Pesticide**							
	Organic Pesticides	0.2	0.4	0.3	0.5	0.3	0.5	-1.6
	Chemical Pesticides	0.2	0.5	0.3	0.5	0.3	0.5	-1.0
VII	**Irrigation**							
	Dependence on Rainfall	2.9	0.4	2.9	0.6	2.9	0.5	1.0
	Rainwater Harvesting	0.1	0.3	0.1	0.4	0.1	0.4	-1.2
	River Water	0.1	0.2	0.1	0.4	0.1	0.4	-0.8

Source: Computed **** P < 0.01** *** P < 0.05**

IV. Agrarian Structure and Transformation

In the previous sections, the Agrarian transformation due to the transition from shifting cultivation to settled agriculture has been probed in terms of five interrelated aspects of agrarian structure viz., nature of land possession, ownership of livestock, cropping pattern, tools use, and input use. One important question that arises here is that how these aspects are related to each other. To answer this question, Karl Pearson's coefficient of correlation coefficients have been worked out.

4.1. Distance to Head Quarters and Agrarian Transformation

The Distance of the villages to the District Headquarters has been reported as an important determinant of social change, transformation and development. The villages located in the proximity to the district

headquarters are expected to have better infrastructure, amenities, facilities and thus better forward and backward linkages. Better access to resources and services is expected to contribute to greater level of development and socio economic transformation. The question here is that whether this proposition is true in respect of agrarian transformation in Mizoram.

Distance of the village to district headquarters has significant negative effect on the type of cultivation (-0.21). The distant villages have lesser proportion of settled cultivators as compared to that of the proximate villages.

The distant villages have greater area of land under common land as compared to that of proximate villages. On the other hand, the proximate villages have greater area under LSC.The distance of villages to district headquarters has negative impact on duration of land possessed by households under LSC(-0.15), while having no significant effect on the duration of land possessed by households under common land(0.00). However, it has positive relationship with duration of land possessed by households under PLP (0.24). Interestingly, the households in distant villages have greater duration of land possessed under PLP as compared to those in the proximate villages. On the other hand, the households in the proximate villages have greater duration of land under LSC.

The distance of the villages to district headquarters has no significant positive effect on the livestock ownership (0.01) of households and gross cropped area (-0.10) under cultivation. However, it has significant positive effect on the crop diversity (0.22). It is clear that the crop diversity is greater among the households in the distant villages as compared to the households in the proximate villages.

The distance of the villages to district headquarters has significant negative effect on the respondents perceived ecological consequences (-0.30) of shifting cultivation. The respondents in the proximate villages perceive greater extent of ecological consequences of shifting cultivation as compared to those in the distant villages.

The distance of the villages to district headquarters has significant positive effect of the frequency of local seeds use(0.28), use of chemical fertilizers NPK(0.18), and use of chemical fertilizers Minor(0.20). On the other hand, it has significant negative effects on the frequency of use of HYV seeds (-0.28) and organic manure (-0.19). It is clear that the cultivator households in the distant villages more frequently use local seeds, major (NPK) and minor chemical fertilizers. On the contrary, the households in the proximate villages use more frequently HYV seeds and organic manure as compared to those in the distant villages.

4.2. Type of Cultivation and Agrarian Transformation

The proportions of settled cultivators are more in the village near to the headquarters. The type of cultivation is having positive relationship with the area of land possessed. The computed t ratio value 0.17 shows that the area of land possession is more among the settled cultivator household.

The type of cultivation of household also has significant relationship with the duration of land holdingunder PLP (0.17) and LSC (0.12). Land possession for agriculture occurs earlier among the household near to the district headquarters and among the settled cultivators. In the mean time the duration of land holding on common land (-0.52) declines significantly among the settled cultivators.

Type of cultivation of the household also has significant negative relationship with the crop diversity index (-0.32) where the diversity of crop decrease among the settled cultivators.

The type of cultivation of household also has significant relationship with the input use. The use of local seeds declines among the settled cultivators while the use of HYV and organic manure increases significantly.

4.3. Number of Plots Possessed and Agrarian Transformation

The number of plot possessed by the cultivators is an important determinant of level of agrarian transformation and the number of plot is expected to increase as the agrarian transformation takes place from shifting cultivation to settled agriculture. The number of plot possessed increase among the settled cultivators while it decreases among the cultivators in distant village.

The area of land under LSC and common land possessed by the cultivators increases with the increase in number of land possessed by cultivators. Similarly the area and size of land holding also increases significantly.

The duration of land holding under LSC is more among the household who possessed more number of plots. On the other hand the duration of land holding under PLP decreases among the household who possessed more number of plot.

When the number of land possession increase the gross cropped area (0.65) increases but the diversity of crops (-0.03) is not increased.

The transformation in the input use of the cultivators shows that the use of local seeds decline (-0.16) while the use of HYV (0.16) and organic manure (0.14) increases significantly when the number of plot possessed increases.

4.4.Area of Land Possessed and Agrarian Transformation

Area of land possession is an important indicator of the level of agrarian transformation in the present study and the area of land possession is expected to increase when the cultivators transformed to settled cultivation from shifting cultivation. The area of land possessed is more among the household in proximate area and also greater among the settled cultivators.

The area of land possessed under LSC is significantly related with the area of land possessed (0.81) and size of land holding (0.56). This clearly indicated that the area and size of land possessed is greater among the cultivator households who owned land under LSC.

The household owning land under LSC (0.80) have greater duration of land holding under LSC while the duration of land holding under PLP (-0.16) is less. The gross cropped area also has a significant relationship with the area of land possessed. It is natural that the household with more area of land possessed have greater cropping area.

The household who owns land under LSC use greater HYV (0.16)and organic manure (0.14) and use of local seeds declined among them.

The household who owns common land (0.52) are having larger area of land holding (0.15) and the gross cropped area (0.12) and crop diversity (0.31) also increased. The use of local seed (0.20) is more among the household who owns common land. In the meantime the use of HYV seed and organic manure declines among the household who owns common land.

4.5. Cropping Pattern and Agrarian Transformation

The gross cropped area increases among the household who have greater number and area of plot possessed. The cropping pattern is more diversified (0.26) among the household who has a greater gross cropping area.

When the cropping area increased the use of HYV seed (0.16) and chemical fertilizers (0.16) also increases. The use of local seed, organic manure and minor chemical fertilizer are not related to cropping area.
Crops are more diversified among the household in the distant village and among the shifting cultivators household. Diversity of crops increased when the cropping area increased. Increase in crop diversity let to greater use of local seed (0.12) and decrease in use of chemical fertilizer NPK (-0.18).

4.6. Input Use and Agrarian Transformation

Input use is believed to have effects on the rate of production in agriculture. The present study holds that use of local seed is higher among the households in distant villages and among the shifting cultivator households where use of HYV seed significantly declined among households who use more local seeds.

Table 13 Agrarian Transformation: Zero Order Correlation Matrix

Variable	Indicator	Var01	Var02	Var03	Var04	Var05	Var06	Var07
Var01	Number of Plots	1	0.30**	0.20**	0.20**	0.45**	0.54**	-0.31**
Var02	Area of Land Possessed with LSC	0.30**	1	-0.11*	-0.10	0.81**	0.56**	0.03
Var03	Area of Land Possessed with PLP	0.20**	-0.11*	1	-0.30**	0.41**	0.40**	-0.09
Var04	Area of Common Land Possessed	0.20**	-0.10	-0.30**	1	0.03	0.16**	-0.31**
Var05	Area of Land Possessed	0.45**	0.81**	0.41**	0.03	1	0.79**	-0.11**
Var06	Size of Land Holding	0.54**	0.56**	0.40**	0.16**	0.79**	1	-0.21**
Var07	Crop Diversity Index	-0.31**	0.03	-0.09	-0.31**	*-0.11**	-0.21**	1

Source: Computed **** P < 0.01** *** P < 0.05**

V. CONCLUSION

The present study aimed at assessing the impact of agrarian transformation from shifting cultivation to settled agriculture on agrarian structure in Mizoram. The social structural base of the respondents in the present study shows that there is no significant difference among the shifting cultivators and settled agriculturalists in demographic, familial, social and socio economic structure.The respondents were usually male and head of their family. Most of the respondents were literate but with low educational qualification as Primary level are majority.The respondents usually belong to *Lusei* and *Paite* tribe and Baptist Church of Mizoram form the largest denomination among the respondents. The respondents belong to a stable nuclear type of family where shifting cultivators are comparatively greater in the size of family. The socio economic category shows that more than half of the respondents belong to BPL (Poor) and AAY (Very Poor).

In the wake of transformation from shifting cultivation to settled agriculturethe area and number of land possessed increase and there seems to be operation of centripetal and centrifugal tendencies in the agrarian transformation due to the transition from shifting to settled cultivation.But as the transformation is still in transition there is no much difference in the cropping area under both the shifting cultivators and settled agriculturalist. Rearing of cow emerged due to NLUP but the agrarian transformations in Mizoram have not persuaded the farmers towards animalhusbandry.

Cropping pattern in the process of transformation shows movement towards subsistence cultivation to commercial agriculture. Even the crops cultivated in some of the jhum land are commercial crops.The number of crops cultivated also declined andmono cropping is observed among both the shifting cultivators and settled agriculture. Moreover the crops cultivated are usually cash crops such as fruits, tree crops, vegetables etc.In terms of the tool used for cultivation the switchover from shifting cultivation to settled agriculture resulted in the decrease of forest clearing tools and increase in land preparation tools. Weeding and harvesting tools are usually used based on the necessity as different crops needs different tools.

Input use also changes in the wake of transformation. The use of High Yielding Variety Seeds increased and use of local seeds decline in the process of transformation. Male labourer is employed more among the settled agriculturalist while male and female family labour was more employed among the shifting cultivation. Use of animal labour is still almost absent among both the farmerswhich are mainly due to the topography of Mizoram. Although the use of machine could be observed since a decade especially in northern parts of Mizoram,the use of machines started emerginglater as the economy of the southerner are relatively lowwhich is also among few settled agriculturalists. As sedentary form of cultivation requires more input in terms of manure the settled cultivators use more manure and fertilizers. But the pattern is same among both the shifting and settled cultivatorsand one promising finding is that the use of Organic fertilizers as an input is the highest which is followed by Chemical Fertilizers (NPK) and Chemical Fertilizers (Minor).In the mean time both organic and chemical Pesticides are rarely used. For irrigation the farmers mainly depends on rainfall and few of them depends on river. Irrigation is rarely used as the topography of Mizoram do not support if not mechanized.

The process of transformation has been accelerated by government of Mizoram with the financial support from the governments of India for the last three decades. Yet the transformation from shifting cultivation to settled agriculture has to be accomplished. The tribal people have lost hope with their traditional system of livelihood and have faith in modern settled agriculture. Yet there are number of topographical, financial, technical and infrastructural constraints that prevent them from becoming settled cultivators. As the transformation is in still in the process the agrarian structure also experience changes and future research will confirm the direction of change.

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