



Shifting cultivation and perspectives of *Jhumias* to climate change: A study in hill districts of Manipur

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ABSTRACT

Shifting or *Jhum* cultivation is affected by a number of socio-economic and climatic factors. The present study attempted to examine the perspectives of the *jhumias* in crop cultivation and their livelihood in the context of the changing socio-climatic situation. The study is based on primary data collected from three *jhum* cultivating hill districts of Manipur state. The study found that early sowing and early harvesting of crops compared to farming in valley areas helped the *jhumias* to fetch a higher price for the crop produced. Cultivation of pea and cabbage gave the highest net return with a B:C ratio of 2.34 and 1.7 respectively. It was found that expenses in crop production were self-financed as none of the *Jhumias* received credit from formal banks even though they possessed bank account. Poor access to agri inputs, pest and disease infestation and high cost of hired labour were the major constraints faced by the *jhumias*. During the last two decades, climate change had caused tangible and physical changes in the resources and assets of the community which includes shortage of potable water, a decrease of forest area, drying up of natural springs and ponds and decrease in number of livestock. For long-term sustenance and conservation of the ecosystem, the conversion of *jhum* to permanent cultivation by adopting a scientific Integrated farming system model and financial empowerment by delivering agri- credit could enable the system to sustain in the adverse climatic aberration.

1. Introduction

North Eastern Hill Region has a unique traditional farming practise called shifting cultivation or *Jhuming*. This practice is undertaken in the remote hilly areas where accessibility to modern farming practices and application of farm equipment's are limited due to the difficult terrain. Manipur is one of the North Eastern states with a total geographical area of 22,32,700 ha. Agriculture has been the primary occupation of the state with 80 per cent of the population depending on agriculture directly or indirectly for their livelihood. Of the total geographical area of the state, hill area occupies 20,08,900 ha accounting for about 90 per cent and the rest 2,23,800 ha is the fertile valley including

wet land. Shifting cultivation or *jhuming* is an indigenous practice of cultivation followed since time immemorial in the hill remote areas of the state. In this system of cultivation, application of farm equipment and machineries are very limited as most of the sites are not suitable due to the sloppy topography. After slash and burning of the forest, crops are grown for a period of 1 or 2 years and then shifted to another field leaving the older field fallow. Multiple cropping is carried out in the *jhum* and accommodate a number of crop species which help in meeting the various food requirement of the farmer's family. Tripathi and Barik, 2003 reported that shifting cultivation is an effective form of landuse where optimum utilization of space is made by cultivating a variety

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of crops in the same plot. Generally, it is practiced in hilly places which are remote, have poor road connectivity and which lacks infrastructure development. Hence, *jhum* farming becomes a compulsion rather than an option to sustain the livelihood for the villagers (Singh *et al.* 2021). Recently, the *jhum* cycle has substantially declined due to increasing population pressure on land. Climate change are also affecting the shifting cultivation in various aspects. Incidence of erratic rainfalls, rise in temperature, dry spell along with incidence of new pest and diseases have affected the cropping pattern thereby immensely affecting the yield and productivity. A study by Thong P *et al.* 2019 reported that only 7% of the respondents were aware of the detrimental effect of *jhum* on the environment. Sati V.P. 2019 revealed that production and yield of the principal crops grown under shifting cultivation has decreased during the last 17 years (2000–2017), whereas, there is a slight increase in area sown. It is also reported that *Jhumias* are growing subsistence cereals and their economic viability is significantly less compared to growing cash crops. Bhuyan R. 2019 revealed that shifting cultivation is closely tied to the cultural identity of the tribal people and its importance lies beyond mere economic concerns.

According to the Wastelands Atlas of India – 2019, during the period 2008-09 to 2015-16, the total current *jhum* area of the state has increase from 296.68 sq. km to 499.96 sq. km with a total increase of 203.28 sq. km. During the year 2015-16, among the hill districts, Churachandpur has the largest current *jhum* areas (143.78 sq. km), followed by Chandel (125.62 sq. km), Ukhrul (84.07 sq. km), Tamenglong (80.8 sq. km) and the least in Senapati (62.85 sq. km). Taking into consideration the large area under shifting cultivation in the state and a number of populations depending on it as a source of livelihood, it is imperative to study the perspective of *Jhumias* to farming and climate change. The present study is an attempt to fill the information gap on cost and return on crop cultivation, credit facilities and to explore the various aspects of shifting cultivation in relation to climate change in the state.

2. Material and Method

The study was based on primary data collected from 100 numbers of *Jhumias* covering three hill districts of Manipur. Of the total 16 districts of the state, three districts namely Noney, Churachandpur and Chandel were selected. From Noney district 33 households were randomly selected from two villages namely Nungtek and Charoi Chagotlong. From Churachandpur 33 households were randomly selected from two villages namely Smolhoi and Songikholui and from Chandel 34 households were randomly selected from Lambung village. Altogether, five villages and 100 *jhumias*

households were selected for the study. The survey and field data were collected during the year 2021-22. Tabular analysis was used to examine the cost and return in farming. Frequency distribution and Garrett ranking technique were used to study the perspectives with respect to climate change and problems faced by the *jhumias*.

3. Result and discussion

Socio economic profile of *jhumias*

Age, family size and education are the primary variables for understanding the profile of the household. The study found that maximum of the *jhumias* (33 per cent) were in the age group of 51 to 60 years and the minimum of 7 per cent were in the age group of 20 to 30 years. The average family size was 6 and have an average 17 years of experience in farming. Maximum of the *jhumias* ie. 39 per cent had middle level of education followed by 31 per cent with primary standard and only 7 per cent were matriculate. Of the total *jhumias*, only 3 per cent are illiterate. Of the total respondents, 24 *jhumias* were members of either Farmers' club or Self-Help Group. With regard to the ICT assets owned, 57 per cent had television, 17 per cent had radio and 53 per cent were having smart mobile phones. It showed that most of the *jhumias* had good ICT asset to improve and update their knowledge. Along with crop cultivation, livestock rearing is also an important activity taken up by the *jhumias*. Of the total 100 respondents, 55 *jhumias* own livestock. Rearing of poultry birds especially backyard poultry is a major livestock rearing enterprise of 37 households. This is followed by rearing of pig (23 households), local cow (11 households) and duck (10 households). Pandey DK *et al.* 2019 revealed that agricultural diversification activities make greater contribution to generate cash incomes for poorer households and it is a key strategy by which people try to make ends meet and improve their well-being in shifting cultivation area of North East India. The examination of the average annual income revealed that maximum of the *jhumias* ie. 46 per cent had income in the range of ₹ 50,000 to ₹75,000 followed by 13 per cent with income ranging from ₹75,000 to ₹1,00,000 respectively.

It was observed that a number of crops are grown in the *jhum* which include rice maize, colocasia, groundnut, cucumber, pumpkin, ash gourd, beans, ladyfinger, potato, brinjal, bitter tomato, chilli, king chilli, ginger, pea, cabbage and mustard. Among these rice, maize, colocasia, pea and cabbage are found to be the major crop grown covering a larger area. Table 1 shows the major crops grown along with the sowing time. Due to difference in altitude and topography, crops were sown or planted much earlier compared to valley areas. Rice which is sown during

June and July in valley areas are sown in the month of March and April in shifting cultivation. Likewise, colocasia and maize are planted in February and March while pea and cabbage are planted during August and September. As sowing is done early, the crops are harvested earlier as compared to valley areas and because of this vegetable like pea, cabbage, beans, *etc* fetch higher prices in the market.

As advance equipment's, machineries and farm tools cannot be used in *jhum* due to undulating and slopy nature of landscape there is huge dependence on farm labour. The cost of cultivation, yield and net return of selected crops grown in *jhum* are shown in table 2. Maximum of the expenses *ie.* 85 per cent is incurred on hiring of farm labour for soil preparation, sowing/ planting, interculture operations, harvesting and threshing. Among the various farming activities, women predominate in selection of seed, planting, weeding and other intercultural operations, while activities like tree cutting, clearing and burning are generally done by men (Punitha *et al.* 2018). The cost of cultivation per

hectare for paddy, colocasia, maize, pea and cabbage were work out to be ₹ 34837, ₹ 25757, ₹ 27111, ₹ 30940 and ₹ 25915 respectively. The average yield obtained per hectare was 1765.11 kg for rice, 1258.49 kg for colocasia, 1231.04 kg for maize, 960.56 kg for pea and 2380 kg for cabbage respectively. Considering the average market price, among the major crop grown, the highest net return per hectare *ie.* ₹ 41505 was obtained in pea, followed by cabbage *ie.* ₹ 18163, colocasia *ie.* ₹ 12312, rice *ie.* ₹ 11638 and the lowest net return (₹ 5955) was obtained in maize. Similarly, the benefit cost ratio of pea was the highest *ie.* 2.34 and it was the least for maize *ie.* 1.22 respectively. The study by Singh *et al* 2003, reported that benefit cost ratio of 1.14, 1.17, 1.55 and 2.54 was obtained from rice, maize, soybean and ginger from *jhum* cultivation in Churachandpur district of Manipur. Rathore *et al.*, 2010 express that incorporation of nitrogen fixing leguminous crops in *Jhum* increase the soil nutrient content thereby increasing the crop yields and ultimately the income.

Table 1: Major crop grown in shifting cultivation and sowing time

Crop	Number of households	Sowing time
Rice	53	March - April
Maize	21	Feb- March
Colocasia	16	Feb- March
Pea	18	August- Sept
Cabbage	20	August- Sept

Table 2. Cost of cultivation, yield and net return in crop production (₹ /ha)

Crop	Cost of cultivation (₹/ Ha)	Yield (Kg/ Ha)	Rate (₹/ Kg)	Gross return (₹/ Ha)	Net return (₹/ Ha)	B:C Ratio
Rice	34837	1765.11	26.33	46475	11638	1.33
Colocasia	25757	1258.49	30.25	38069	12312	1.48
Maize	27111	1231.04	26.86	33066	5955	1.22
Pea	30940	960.56	75.42	72445	41505	2.34
Cabbage	25915	2380	18.52	44078	18163	1.7

Sources of credit of *Jhumias*

Unlike the farmers in the valley areas, borrowing of money was not a regular practice among the *jhumias*. None of the *jhumias* obtained institutional loans or credit from banks and governments agencies. The expenses in crop production were managed by the *jhumias* themselves *ie.* self-finance. It was found that out of the total 100 respondents, only 12 household borrowed money informally. Five of them have borrowed from local money lenders, four from relatives and three from friends (table 3).

The average amount borrowed was ₹ 61500 per household with an average interest rate of 33.96 per cent per annum. Of the total borrowed amount, ₹ 35500 was repaid and the average outstanding amount was ₹ 26000 accounting for 42 per cent of the total amount borrowed.

Constraints faced by the *jhumias* in crop cultivation

Due to undulating terrain, remoteness and poor extension contact the *jhumias* face a number of problems and constraints in crop production. The list of ten major constraints along with the Garrett score are given in table 4. Difficulty in access to agri inputs as and when required was the most important problems (rank 1) with Garrett score of 68.80. Pest and disease infestation is the second important

problem followed by high cost of hired labour, lack of irrigation facilities and poor soil fertility was the fifth important constraints in term of the Garrett score. The other constraints are non-availability of seeds of high yielding varieties, poor yield of crop, poor extension contacts, lack of finance and storage and marketing facilities. As *jhum* farm are located in far interior hilly sites and as no agro-inputs outlet or dealers are located nearby, they have to travel to the nearby town or city to get the inputs which is costly and time consuming. Due to change in the weather and climatic conditions, the incident of pests and diseases increases, affecting the crop yield and production. As shifting cultivation is labour intensive and most of the activities are done manually, there is scarcity of labour and also cost of hiring labour is high which ultimately increased the cost of cultivation. Haokip, D.D 2003 reported that lack of improved varieties, poor technical and financial backup, complex nature of land ownership and lack of proper monitoring system are basic problems of shifting cultivation. As it is highly interrelated with the socio and cultural tradition of the villagers, the strategies for improvisation of agricultural practices through modern technological interventions should be in tune with socio and cultural setting of the local people (Patel *et al.* 2013).

Table 3. Amount borrowed and outstanding due

Total amount borrowed (₹)	738000
Average amount borrowed (₹)	61500
Average interest rate per annum (%)	33.96
Average amount repaid (₹)	35500
Average outstanding amount (₹)	26000
Percentage of outstanding amount	42



Shifting cultivation in Chandel district



Shifting cultivation in Churachandpur district

Table 4. Constraints faced in shifting cultivation

Sl No	Constraints	Garrett Score	Rank
1	Difficulty in access to agri inputs (fertilizers, insecticide, pesticides)	68.80	1
2	Pest and disease infestation	67.98	2
3	High cost of hired labour	56.95	3
4	Lack of irrigation facilities	54.98	4
5	Poor soil fertility	54.73	5
6	Non-availability of seeds of high yielding varieties	54.04	6
7	Poor yield of crop	45.55	7
8	Poor extension contacts	39.56	8
9	Lack of finance	35.8	9
10	Storage and Marketing problems	26.51	10

Perspectives of the *jhumias* on climate change

As shifting cultivation is practiced in a fragile hill ecosystem, climate change had a profound effect on it. The effect of climate change as perceived by the *jhumias* were studied and it was found that increased in temperature was the major aspect of climate change reported by 94 per cent of the respondents while increased unpredictability of weather was found to be second most important aspect. The other aspects of climate change as perceived by the *jhumias* are reduced amount of rainfall reported by 51 per cent followed by mild winter as reported by 29 per cent of the respondents. Climate change also cause tangible and physical changes in the resources and asset of the community. The changes perceived by the *jhumias* during the last 20 years' due to change in climate are shortage of potable water, decrease of forest area, drying up of springs and ponds, scarcity of food and decrease in number of livestock (Table 5).

Table 5. Changes perceived by the *jhumias* during the last 20 years' time due to changes in weather

Sl No	Parameters	Frequency
1	Shortage of potable water	68
2	Decrease of forest area	62
3	Springs and ponds drying up	62
4	Shortage and scarcity of food due to low yield	42
5	Decrease in number of livestock	34

Other than physical and tangible changes, climate change also affects quality of human life. Examination on changes in the life of the *jhumias* due to climate changes indicated that in general the health-related problems has increased, quality of food decrease, there is increase in stress and anxiety, increased pressure to provide food for the family and increase restlessness (table 6). Regarding the nutrition level of food consumed by the *jhumias*, 72 per cent expressed that it is somewhat nutritious, 12 per cent reported that the food they consume are not nutritious, while only 2 per cent reported very nutritious.

Table 6. Changes in human lives due to climate changes

Sl. No.	Parameters	Frequency
1.	Increased health problems	77
2.	Decreased quality of the food	61
3.	Increase stress and anxiety	55
4.	Increased pressure to provide food for the family	27
5.	Increased restlessness	14

To cope up with the effect of climate change, various strategies and steps were taken up by the *jhumias*. As shifting cultivation is rainfed and is dependent on rainfall for proper growth of crops, the strategies taken up when there is less rainfall *ie.* drought like situations were studied and is presented in table 7. It was found that during drought like situations 43 per cent reported that they work as wage labour to earn their livelihood, 32 per cent reported that they change the cropping pattern by growing crops which require less water, 22 per cent reported reduced number of livestock and only 5 per cent reported that they leave the land fallows. Thong P. *et al.* 2022 revealed that *Jhumias* households which fall short to adopt any adaptation strategies to the impacts of climate change were most vulnerable. Exposure to natural hazards was the basic indicator of climate change and the sole dependence on agriculture made the households highly sensitive to climate variability.

Table 7. Strategies taken up by the farmers when there is drought like condition

Sl. No.	Strategies taken up when there is drought like situation	Frequency
1	Go for wage labour work	43
2	Change cropping pattern by growing crops which require less water	32
3	Reduce number of livestock	22
4	Leave land fallow	5

Conclusion and policy implications

For household sustenance and to fulfil the livelihood requirement, the *Jhumias* adopted shifting cultivation especially in the remote and hilly areas of the state. It is a compulsion rather than a choice due to the nature of the topography of the land, location of the farm and uncertain water availability. The *jhumias* had poor level of education with majority of them in primary and middle level standard. Along with crop cultivation, rearing of livestock especially poultry and piggery is being practiced which increase their risk bearing capacity. There is huge dependence on farm labour as the application of farm equipment and machinery are very much limited. For making shifting cultivation sustainable and remunerative, adoption of scientific cultivation practices and use of high yielding seeds and planting material is important. None of the *jhumias* have access to institutional credit though they have bank accounts. Lack of knowledge of bank credit facilities and schemes for

agriculture related loans may be the reason for not availing institutional credit. Local borrowing of money is very limited and is an uncommon practice. Poor access to agri inputs as and when required and pest and disease infestation were the two most important problems faced in shifting cultivation for which institutional support is required to address these problems. Increased temperature and unpredictability of weather had a profound effect on shifting cultivation which affect the cropping pattern. Shortage of water, decrease of forest area and drying up of springs and ponds were the main changes perceived by the *jhumias* during the last two decades. It was also reported that human health problem has increased and quality of food decreased over the years due to climate change. To increase the awareness on banking and credit facilities, financial literacy programme needs to be conducted at village level by involvement of bank officials. Farmers' Clubs, Self Help Groups and Joint Liability Groups should be set up at village level which can take lead role in

approaching financial institutions for availing the farm credit. For the long-term sustenance and conservation of soil and the ecosystem, the conversion of *jhum* to permanent cultivation by adopting suitable Integrated farming system model is desirable.

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