



## Reconciling the Issues of Shifting and Permanent Cultivation: An Empirical Study of Mizoram, Eastern Extension of Himalaya, India

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### Abstract

Mizoram is an underdeveloped state where agriculture, dominated by shifting cultivation is the main occupation and a source of income for nearly half of the population. Therefore, this study aimed to examine ‘whether the shifting cultivation is economically viable, or whether permanent cultivation instead has the potential to boost up income and economy of the rural farming community in Mizoram’. To address these questions, a household-level survey was conducted in 2018 based on a case study of 16 villages, comprising two each from eight districts. A purposive random sampling method was applied to select households and a structured questionnaire was developed with questions pertaining to various aspects of shifting and permanent cultivation. Mizoram only has approximately 5% of arable land, of which shifting cultivation accounts for more than 50%. In the past, the output from shifting cultivation was able to feed the farming communities called *Jhumias* but the area, production and productivity of the crops have recently decreased considerably. This is primarily accountable for the increasing food needs and decreasing crop production, as well as climate variability, land ownership rights and lifestyle change. Meanwhile, the production and productivity of crops grown using permanent cultivation are comparatively higher. It is then suggested that land rights for *Jhumias* need to be protected for permanent cultivation. The addition of value by commercializing crops will enhance income and effectively boost the economy.

**Keywords:** *Jhumias*; *Jhumlands*; Mizoram; permanent cultivation; shifting cultivation

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### INTRODUCTION

Shifting cultivation in a complex and multifaceted form has a cyclic nature, in which the land is selected, cleaned, dried, burned and made ready for the cultivation of traditional cereals (Mertz et al., 2009). It commences from December to January with the clearing of forests, February to March for burning, April to May for planting seedlings and ends in September to October with harvesting. In the past, the land is kept fallow for 20 to 25 years but recently,

this time has reduced to 3 to 5 years (Figure 1), due to the higher food demand on the arable land. The practice is known with different names in various places, such as slash-and-burn agriculture, *Jhuming*, rotational bush fallow agriculture and swidden cultivation (Raman, 2001; Sati and Rinawma, 2014). As an adverse land-use system with distinct socio-economic and ecological conditions, shifting cultivation has been evolving since 10,000 BC. It spreads from mountain to low-land ecosystems and from tropical forests to grasslands (Spencer, 1966). Furthermore, shifting

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cultivation is practiced mainly in rainforests of tropical countries of South and Southeast Asia, Central Africa and South America. In these areas, a large tract of secondary forests has been cleared for shifting cultivation (Brown and Lugo, 1990). In the 1980s, approximately 300 to 500 million people were involved in practicing shifting cultivation in Asia (IFAD, IDRC, CIIFAD, ICRAF, 2001). Moreover, approximately 400

million of the population depends on forests for livelihood with the majority practicing shifting cultivation in the forest patches (Cairns and Garrity, 2004). Ramakrishnan (1992) stated that in the developing countries of tropical and subtropical regions, about one billion people which accounts for 22% of the total population depend on shifting cultivation, directly or indirectly.

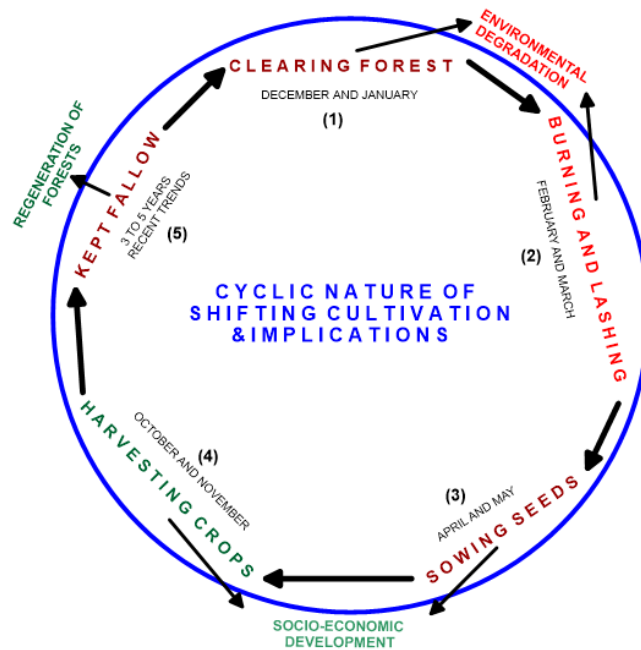


Figure 1. Cyclic nature of shifting cultivation and its implications (Sati, 2019)

Shifting cultivation is the main occupation, the major source of income, as well as the lifestyle and socio-cultural life of the rural marginal farmers namely *Jhumias*. Given that this practice is carried out on arable patches of forestland, the *Jhumias* have dual habitats. They seasonally migrate to *Jhum* plots along with their family members which constitute the working population for about six months and stay till the end of crop harvesting. During the sowing and harvesting seasons, they also celebrate festivals. However, the situation has recently changed as most of the *Jhumlands* have been abandoned, resultantly turning into degraded land. Due to the decline in production and productivity of crops, the area has been decreasing significantly (Garbyal, 1999). Recently, the topsoil damage caused by shifting cultivation was observed, (Lawma, 1991; Lianzela, 1997) due to the declining fallow cycle ranging from 3 to 5 years and a decrease in forest area by 5% from 2011 to 2019. Consequently,

it has become an issue of debate whether shifting cultivation is suitable for economic growth and environmental sustainability (Leblhuber and Vanlalhrauaia, 2012). A new trend observed worldwide is that the area under shifting cultivation has decreased and *Jhumlands* have been replaced by an intensive form of land use such as the cultivation of fruits and vegetables (Spencer, 1966; Mishra, 1981; Raintree, 1987; Turkelboom et al., 1996; Miyakuni, 1999; NEPED and IIRR, 1999; Suraswadi et al., 2000; Chan et al., 2018; Sati, 2019; Schritt et al., 2020).

In India, shifting cultivation is practiced mainly in the south, east and northeast regions (Deb et al., 2013) with approximately 4.37 million ha available land, which involves about 5 million tribal families (Sahu et al., 2005). Among these three regions, shifting cultivation is prominently practiced in Northeast India with approximately 1.98 million ha available arable land, which is 87% of the total area of India under shifting

cultivation (Satpathy et al., 2003). Furthermore, a large tribal population above 620,000 families of the northeast region is dependent on shifting cultivation for subsistence livelihood (Ramakrishnan, 1992). Recently, in southern and eastern states, shifting cultivation areas have been reduced but in the northeastern states, the practice is still one of the most important livelihood options.

Mizoram, a part of Northeast India, has a primitive economy and agriculture has been the main occupation as well as the major source of livelihood. Arable land in Mizoram is only 115,978 ha, which represents 5.5% of the total area, but shifting cultivation dominates the farming system, occupying more than 50% (Pachua, 2009; Sati, 2019). Maithani (2005) observed that approximately 54% of people are engaged in practicing shifting cultivation. Moreover, as of 2000, a total of 58,000 population are involved with the major crops grown being rice, fruits and vegetables.

However, the recent trend is that many fallow *Jhumlands* have been abandoned, the area under shifting cultivation was 68,114 ha (58%) in 1997, but decreased to 19,602 ha (16.9%) in 2017 indicating approximately 71.22% decrease during the two decades (Department of Agriculture, 2017). Due to the low output from the practice, the state government of Mizoram launched a new scheme—New Land Use Policy in 1985. The main objective was to increase the area under permanent agriculture and to grant land rights to *Jhumias* permanently. This led to a sizeable increase in permanent agricultural land as well as a rise in production and productivity. Several studies on the socio-economic and environmental impacts of shifting cultivation in Mizoram have been conducted (Okigbo, 1984; ICAR, 1985; Sachchidananda, 1989; Ramakrishnan, 1992; NEPED and IIRR, 1999; Pachua, 2009; Kumar, 2012). However, no study has been carried out to compare the economic significance of both shifting and permanent cultivation.

## MATERIALS AND METHOD

### Study area

Mizoram is one of the northeastern states of India referred to as the eastern extension of the Himalaya with tremendous diversity in the natural and cultural realms. It forms

international boundaries with Bangladesh in the west and with Myanmar in the east and south, as well as Manipur State in the northeast, Assam State in the north and Tripura State in the northwest. Furthermore, it lies in the south of the Brahmaputra River and forms a biogeographical zone (Stattersfield et al., 1998). Mizoram is also a landlocked state which stretches between 21° 58', 24° 35' N and 92° 15', 93° 29' E covering an area of 21,087 km<sup>2</sup> (Figure 2). The average altitude is 1,000 m, while Phawngpui (Blue Mountain) is the highest peak with 2,157 m above sea level (m asl). It has a total of 11 districts and 26 administrative blocks. However, the population size is very small compared to other states in India, representing approximately 0.09% of the country's total population (Census, 2011). The total population was 0.89 million in 2001 but increased to 1.09 million in 2011 with 23.48% decadal growth, which is noticeably higher than the national average of 17.7%. Approximately 48.5% of the population lives in rural areas, while the major occupation is agriculture. Besides, the rural population is sparsely distributed and the population with a density of 52 persons living per square kilometer, while the literacy rate is about 92% and it ranks second in India.

Mizoram is known as 'land of highlanders', 'nightingale of India' and 'a land of rolling hills'. The economy is dependent on the production of biomass-based agriculture, which is dominated by shifting cultivation. Due to the steep slopes and lack of irrigation facilities, the subsistence crop is rain-fed leading to low production and productivity. Moreover, the crops are consumed locally and domestically. The flood plains and valley fills, make a small proportion of arable land where wet rice cultivation (WRC) is practiced. The WRC was introduced in 1898 to increase income (McCall, 1980). Recently, an adverse impact of shifting cultivation was noticed, such as land degradation, as well as low production and productivity of crops (Sati, 2019).

Mizoram also has a rich biodiversity which makes it a mega-biodiversity hotspot, Champion and Seth (1968) classified its natural vegetation as a tropical evergreen in the lower reaches, with grading semi and montane evergreen on the upper slopes. Additionally, the bamboo population has 27 varieties and occupies over 50% of the forest cover. Shifting cultivation is cyclic in which a large forest area is burnt,

leading to a loss of floral and faunal diversity. The crop diversity is high with 15 to 20 crop species in plots of 1 to 4 ha area (Raman, 2001), while the average annual rainfall is 2400 mm, most of which falls during the southwest monsoon season between June and September. The winter lasting from October to January is a cool dry season with a few rainy days, while

the summer season between February and May is largely hot and dry with occasional thunder showers and pre-monsoon rains from April to May. The temperature sometimes reaches 32°C from April to May and after the occurrence of monsoon rain, it recedes slowly. Meanwhile, the average temperature remains at 9°C during the winter.

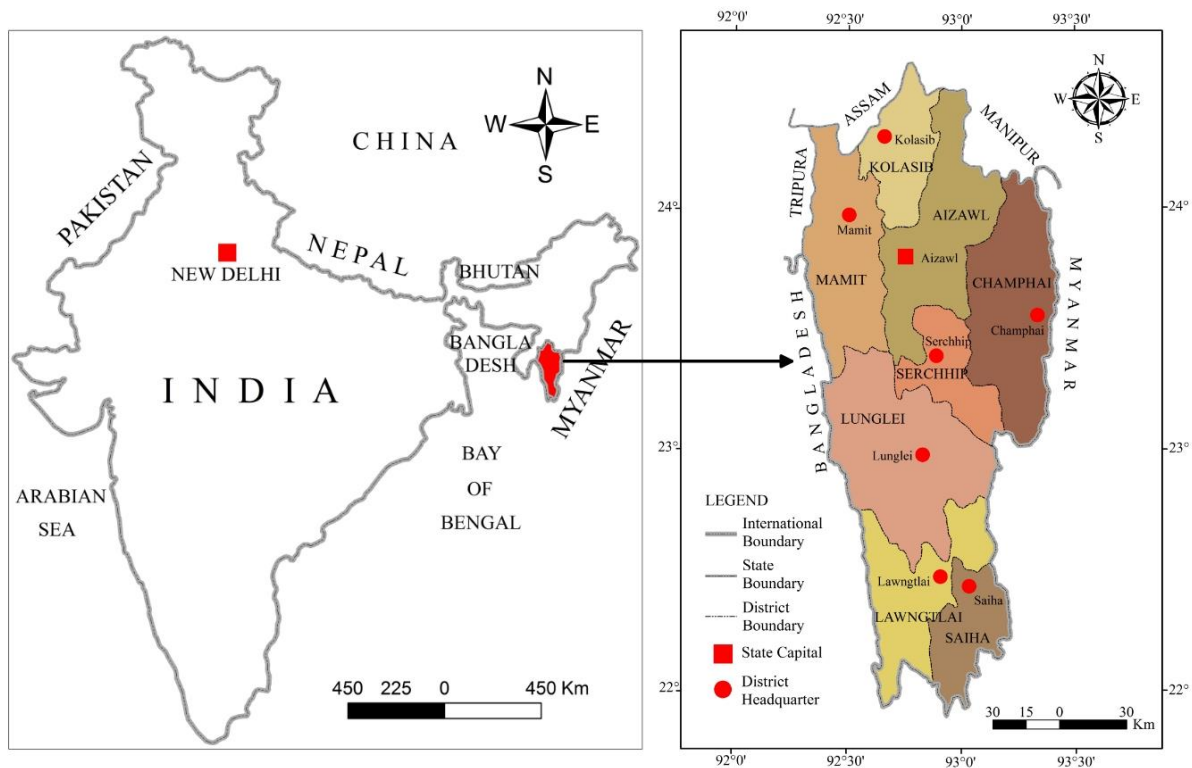


Figure 2. Location map of Mizoram and study villages

### Data collection and survey method

This is an empirical study carried out using the qualitative method, the data were collected through a case study of 16 villages from September to December 2018. The Mizoram State had eight districts in 2018 when this survey was conducted but the number has increased to 11. Two villages were selected from each district and the selection was based on their geographical location, population size, remoteness and altitudes. Furthermore, a household-level survey was conducted using the purposive random sampling method. The old and experienced heads of households engaged in practicing agriculture with a mean age of 62 years were selected to answer the questions. Among the total households, 33.57% were surveyed and the sample size was 815 as shown in Table 1.

A structured questionnaire was constructed and questions were framed on the area and production of the principal crops grown under shifting cultivation in the current year namely 2018 and 2000. These crops include rice, ginger, chilli, mustard, pumpkin, eggplant and cabbage. Similarly, the questions were asked on the area and production of the principal crops grown under permanent agriculture for the same periods. The main crops were rice, ginger, chilli, orange, banana, lemon and oil palm. The main purpose of collecting data from two different years namely 2000 and 2018 was to understand the trends of the area and production of both shifting and permanent cultivation. Moreover, the selection of the old and experienced heads of households for answering questions helped to provide reliable data of the area and production of crops in

2000 as their age was around 40 years during this period and they had substantial knowledge on agriculture. In terms of the principal crops, the same varieties were grown in 2000 and 2018. To facilitate the desired course of action, a local student, possessing a Master of Science degree in Geography with the relevant experience in

gathering data was hired. Spending approximately four months in the villages for data collection enhanced the knowledge of the student in understanding the agricultural system. In addition, the global positioning system was used to collect data pertinent to coordinates latitude, longitude and altitude of the villages.

Table 1. Salient geographical features of study villages

Village	Block	District	East longitude	North latitude	Altitude (m)	Households (2011)	Percentage of total surveyed households
Bukvannei	Bilkhawthlir	Kolasib	92°64'	24°29'	67	107	37.38
Dapchhuah	Reiek	Mamit	92°52'	23°77'	99	230	26.10
Lungzarhtum	Saiha	Saiha	93°03'	22°52'	1,499	171	29.24
N.Mualthuam	Lunglei	Lunglei	92°73'	23°10'	676	272	36.76
Nalzawl	Zawlnuam	Mamit	92°42'	23°86'	89	107	46.72
Neihdawn	Champhai	Champhai	93°21'	23°50'	1,441	116	43.10
Pehlawn	Darlawn	Aizawl	92°92'	23°90'	1,110	147	32.65
R.Vanhne	Lawngtlai	Lawngtlai	92°89'	22°40'	1,018	55	54.54
Siachangkawn	Sangau	Lawngtlai	93°02'	22°59'	1,132	163	30.67
Sialhau	Serchhip	Serchhip	92°92'	23°36'	1,239	111	45.04
Sialsir	E.Lungdar	Serchhip	92°98'	23°17'	1,209	57	70.18
Theiri	Tuipang	Saiha	93°03'	22°36'	1,382	131	36.64
Thiak	Aibawk	Aizawl	92°71'	23°47'	1,032	140	35.71
Thiltlang	Hnahthial	Lunglei	92°92'	23°02'	786	236	21.19
Tualcheng	Champhai	Champhai	93°30'	23°72'	1,502	157	31.21
Zanlawn	North Thingdawl	Kolasib	92°71'	23°98'	708	228	21.93

Source: GPS and household-level survey

### Interpretation of data

The collected data were analyzed using statistical methods, initially, the area of the crops under shifting and permanent cultivation and their production in 2000 and 2018 were calculated at the village level and compared separately. Tin is the measurement of cropland in Mizoram, which was converted into a hectare. The production of crops at the household level was collected in kilograms, followed by the productivity of the crops in  $\text{kg ha}^{-1}$ . Statistical methods such as minimum, maximum, mean value and standard deviation were used to analyze the socio-economic data of the villages. Meanwhile, changes in the area, production and productivity of all the crops between 2000 and 2018 were calculated as well as compared based on shifting and permanent agricultural systems. Personal observation of the case study villages was applied to the interpretation of data.

### RESULTS AND DISCUSSION

The results showed that both the production and productivity of the crops grown under shifting cultivation have decreased. Analysis of the data in the Mizoram State during the last three decades confirmed a 78% reduction. The household survey found that the major drivers attributable to this decrease in the area are the remoteness of *Jhumlands* both from settlements and market, low output from cropping, change in the occupation from farming to the service sector, as well as high climate variability. Additionally, land ownership right is another factor that has affected shifting cultivation largely. The *Jhumlands* are very far from the rural settlements and are allotted to *Jhumias* for a maximum of two years only, hence, they failed to care for land improvement. Furthermore, the *Jhum* cycle has been reduced from a range of 20 to 25 years to 3 to 5 years, which has led to a decrease in yearly crop

production and productivity due to the excessive use of soil. During the interview, approximately 92% of the participants opined that the shifting cultivation was no more viable, hence, they did not want to continue in the practice. Meanwhile, permanent cultivation is practiced in the flood plains, valley fills and is facilitated by the New Land Use Policy. According to the reports, a small proportion of arable land under permanent cultivation increased by 219% more than three times in the case study villages between 2000 and 2018. The comparative study on the area, production and productivity showed that all these three variables have sizeably increased during the last 18 years in comparison to those of shifting cultivation.

### Socio-economic conditions

The socio-economic conditions of the study villages described in Table 2 show that Mizoram has inadequate infrastructural facilities such as transportation and institutions related to agricultural development. The settlements are located remotely and on the top of hills, hence, approximately 40% of the villages are not properly connected to road transport. Furthermore, the population growth rate is high, while the land area remains unchanged thereby increasing the pressure on arable land. The rural areas of Mizoram are facing food insecurity with 37% of the people living below the poverty line and 17% under chronic poverty.

Table 2. Descriptive statistics of social and economic variables

Variable	Minimum	Maximum	Mean	Standard deviation
Population size	333	1,387	743.8	286.3
Sex ratio	858	1,250	1,042.8	111.3
Family size	4	6	4.9	0.502
Total working population (%)	38	80	54.3	11.8
Primary activity (%)	48	100	91.5	12.4
Secondary activity (%)	0	6	1.4	2.3
Tertiary activity (%)	0	37	5.7	8.9
Altitude of villages (m)	67	1,502	936.8	493.8

### Area, production and productivity of principal crops and change under shifting cultivation

The area, production and productivity of the principal crops under shifting cultivation were analyzed and the results are shown in Table 3. Rice was observed as the staple food that requires the largest area for cultivation, hence, the production is also the highest amongst all crops. Ginger is also an important spice from the state, especially for commercial purposes; consequently, its quality and quantity are on a higher side with substantial productivity. Chilli and pumpkin are grown mainly in the rice fields with comparatively more area and production, while the productivity is the lowest. Cabbage is a cash crop grown only in two villages, it has the lowest area, but has substantial production and ranks second in terms of productivity compared to other principal crops. Based on the results, there is no uniformity or consistency with the principal crops grown in all villages. While rice and chilli are grown in 14 villages, the other crops are grown in less than 10 villages.

The analysis showed that the production and productivity of the crops grown under shifting cultivation have a decreasing trend. Apart from ginger which showed a decreasing trend for the area, other crops indicated a substantial increase with the highest found in cabbage and maize. Notably, the production of rice, ginger and chilli have reduced, also, in terms of productivity, all crops have experienced a considerable decrease, except pumpkin. Overall, the productivity of the crops grown under shifting cultivation has declined. The highest decrease in productivity was observed for rice, cabbage and ginger which are the important crops for the livelihood of the rural people.

### Area, production and productivity of principal crops and change under permanent cultivation

The area, production and productivity of the principal crops under permanent cultivation were also analyzed and the results are shown in Table 4. Rice is grown in a substantial area under WRC, specifically, it is grown mainly in valley fills and flood plains in Mizoram. Furthermore,

orange was observed as the cash crop with the highest area, production and productivity. It showed an increasing trend and is becoming a popular crop in Mizoram, presently, it is grown by 9 out of 16 villages. Although bananas and lemon have less area, they have high production and productivity. Banana is grown by 9 villages, while the number of lemon-growing villages is six. Ginger and chilli are crops with less area and production under permanent cultivation. Meanwhile, oil palm plantation started in 2005 in Mizoram, it began initially with a small proportion of area, then, its area and production increased gradually. In the case study villages, oil palm is grown only in 6 villages. In Mizoram, the climatic conditions are conducive for growing orange, banana, lemon and oil palm.

The overall increase in area, production and productivity are substantial under permanent cultivation, indicating significant potential for realizing sustaining livelihoods in Mizoram. The area for rice has decreased slightly, while the production and productivity increased substantially. Ginger is the only crop in Mizoram, of which production and productivity showed a decreasing trend by a wide margin due to the limited market access. Given that ginger is a cash crop, its household consumption is less, therefore, it needs to be marketed. Based on the results, the area, production and productivity of chilli, bananas, lemon and oil palm have increased under permanent cultivation. Although the productivity of orange is the highest, it has decreased between 2000 and 2018.

The analysis discussed in the preceding section shows that the productivity of all crops under shifting cultivation decreased between 2000 and 2018. Aside from the production of rice, ginger and chilli under shifting cultivation also showed a decreasing trend during the same period. In contrast, the area, production and productivity of the crops grown under permanent cultivation increased, except for ginger. The proportion of the area and production under permanent cultivation was comparatively quite less. Based on the status of the *Jhumlands* which has been currently abandoned, fallow land decreased but the area showed an increasing trend. Arable land was highest in Champhai, Serchhip and

Aizawl Districts, where the area under shifting cultivation decreased but slightly increased under permanent cultivation.

Shifting cultivation in Mizoram is a centuries-old practice, a major source of livelihood and a way of life. This practice has been carried out by the *Jhumias* since time immemorial using the traditional method. Based on the secondary data, Mizoram has a primitive economy, where more than 80% of the rural people are dependent on the crops grown under shifting cultivation. However, the area under shifting cultivation continuously decreased due to several driving forces. Sati (2020) stated that approximately 70% of the area under shifting cultivation has decreased in the last 20 years in Mizoram State. Moreover the *Jhumlands* are owned by the village community and the head or leader provides arable land on a tenure basis, for a maximum of 2 years. The *Jhumias* devote a copious amount of their time to preparing the land to grow crops. Given that the crops are rain-fed and grow only during the monsoon season, a maximum of two crops can be grown during the short-land tenure of two years. After completion of this tenure, they have to move to other *Jhumlands*. The decreasing area under shifting cultivation is also due to the depletion of forests. According to a report of the Forest Survey of India (2019), approximately 5% of the forest area decreased from 2011 to 2019 in Mizoram. Furthermore, there was no activity carried out on the regeneration of forests in the fallow *Jhumlands*, leading to high biodiversity loss (Figure 3). The young generation is educated and qualified, therefore, they prefer to work in the tertiary sectors, chiefly because of the associated economic benefits.

Aside from topsoil loss, land degradation and forest depletion, shifting cultivation also causes severe air pollution, particularly during the lashing and burning period from February to March every year, during these two months, dense smog is seen in the atmosphere. In the past, there have been several occasions when airplanes cannot land in the Lengpui Airport due to reduced visibility, ascribed to the presence of smog. Figure 4 shows the environment-polluting smog, once formed over the Mizoram University campus.

Table 3. Area, production and productivity of the principal crops and change under shifting cultivation

Crops	Area (ha)		Production (kg)		Productivity (kg ha <sup>-1</sup> )		Area (%)	Production (%)	Productivity (%)
	2000	2018	2000	2018	2000	2018			
Rice (n = 14)	319.0	345.4	632,330	619,278	1,982	1,793	+8.28	-2.06	-400
Ginger (n = 10)	96.2	92.0	425,254	357,424	4,421	3,885	-4.37	-15.95	-535
Chilli (n = 14)	84.7	115.2	14,321	13,577	169	118	+36.00	-5.20	-52
Orange	-	-	-	-	-	-	-	-	-
Mustard (n = 9)	71.0	106.0	29,049	38,114	409	360	+49.29	+31.21	-53
Banana	-	-	-	-	-	-	-	-	-
Lemon	-	-	-	-	-	-	-	-	-
Pumpkin (n = 9)	69.6	90.0	12,141	16,650	174	185	+29.31	+37.14	+11
Eggplant (n = 10)	50.8	69.4	12,889	20,149	254	290	+36.61	+56.33	-5.3
Oil palm	-	-	-	-	-	-	-	-	-
Maize (n = 3)	20.8	45.6	20,020	29,261	963	642	+119.23	+46.16	-320.8
Cabbage (n = 2)	11.8	26.4	51,568	77,977	4,370	2,954	+123.73	+51.21	-1417

Note: *n* represents the number of villages

Table 4. Area, production and productivity of the principal crops and change under permanent cultivation

Crops	Area (ha)		Production (kg)		Productivity (kg ha <sup>-1</sup> )		Area (%)	Production (%)	Productivity (%)
	2000	2018	2000	2018	2000	2018			
Rice (n = 14)	15.8	15.0	27,130	28,240	1,717	1,883	-5.06	+4.09	+14.10
Ginger (n = 10)	1.6	1.6	7,467	4,033	4,667	2,521	+25.00	-45.99	-45.99
Chilli (n = 14)	1.2	1.3	270	360	225	277	+8.33	+33.33	+33.33
Orange	17.8	33.4	809,850	903,300	45,497	27,045	+87.64	+11.54	-40.56
Mustard (n = 9)	-	-	-	-	-	-	-	-	-
Banana	6.8	26.0	65,600	412,300	9,647	15,858	+282.35	+528.51	+64.37
Lemon	4.0	43.4	21,300	1,402,000	5,325	32,304	+985.00	+6482.16	+506.65
Pumpkin (n = 9)	-	-	-	-	-	-	-	-	-
Eggplant (n = 10)	-	-	-	-	-	-	-	-	-
Oil palm	8.8	61.2	23,000	146,741	2,614	2,398	+595.45	+538.00	+7.58
Maize (n = 3)	-	-	-	-	-	-	-	-	-
Cabbage (n = 2)	-	-	-	-	-	-	-	-	-

Note: *n* represents the number of villages



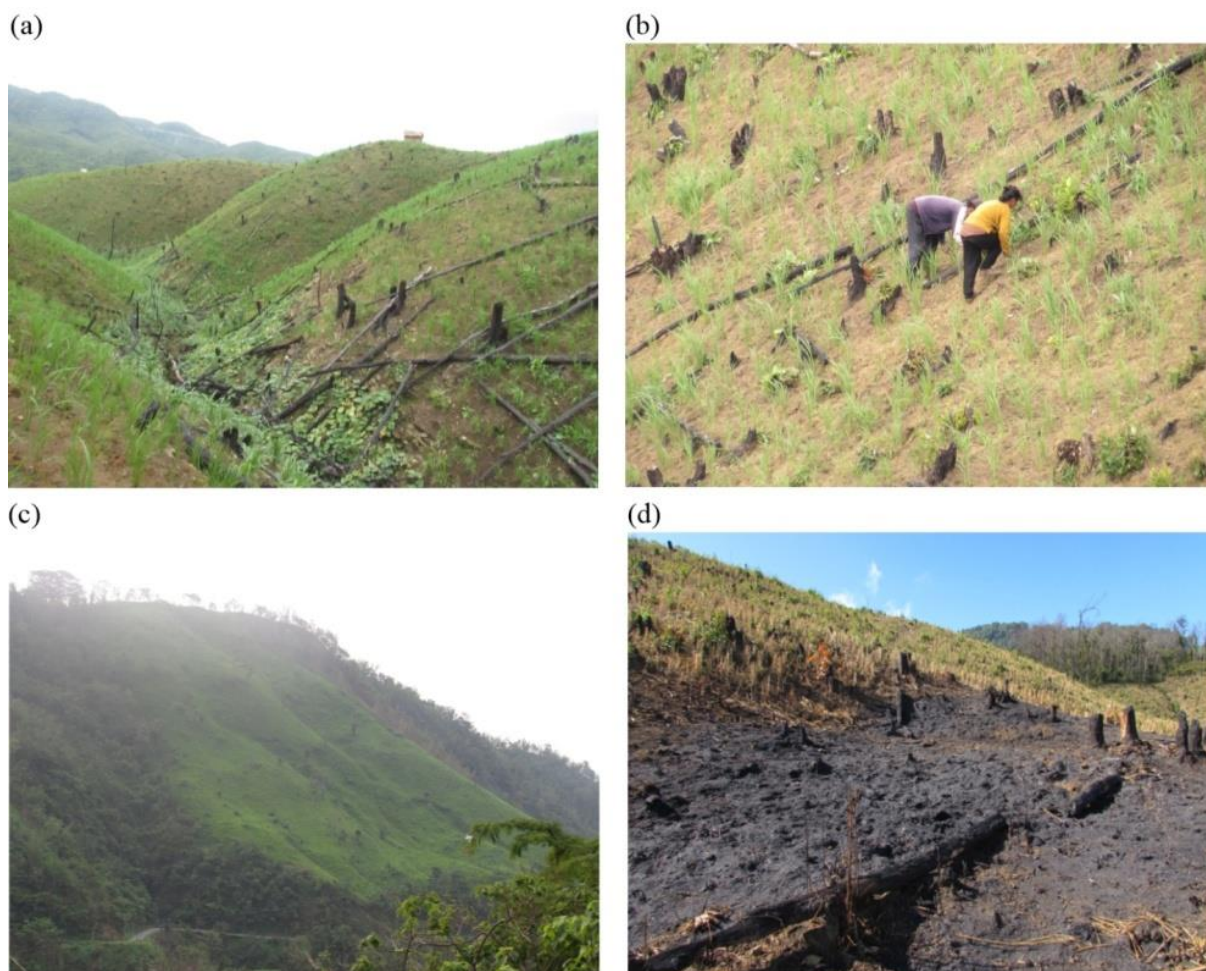


Figure 3. (a) Rice cultivation in degraded *Jhumlands*; (b) the *Jhumias* nourishing rice crop on *Jhumland* slope; (c) abandoned and degraded land due to shifting cultivation and (d) burnt *Jhumland*



Figure 4. Air pollution due to the burning of *Jhumlands*

In comparison, the potential of crops in terms of production and productivity with permanent cultivation is high, particularly under high-climate variability as these crops are irrigated. Among the total arable land under shifting and permanent

agriculture systems, rice is grown in more than 50% area. Permanent cultivation, mainly WRC in the valley fills and flood plains, accounts for a small proportion of arable land, but its production and productivity are comparatively

high. Some other fruits and vegetables, grown under permanent cultivation, such as bananas, orange, pineapple, jackfruits, cabbage, chilli, eggplants and oil palm have high production and productivity. In summary, the landscape with the agro-climate of Mizoram has a high potential for growing various crops under permanent cultivation.

Mizoram State has agro-climatic conditions that are suitable for growing several varieties and cultivars. Rice, vegetables, fruits and spices are extensively grown and sold at the domestic level. An increase in the production and productivity of crops can be achieved when a proportion of arable land is devoted to permanent agriculture. Consequently, the Government of Mizoram launched a program called the New Land Use

Policy in 1985. The main objectives were to promote permanent agriculture by converting shifting cultivation plots into terraced fields (Figure 5) and to enhance the income level of *Jhumias* (Lawma, 1991; Garbyal, 1999). Its mandate was also to increase the production and productivity of the principal crops through permanent agriculture and by terracing the sloppy *Jhumlands* and controlling land degradation (Upadhyaya and Jha, 1997). A new technique, Mizoram Sloping Agriculture Land Technology (MiSALT), based on a multi-season action study has also been adopted in a few districts such as Aizawl, Kolasib, Serchhip and Lunglei (FAO, 2017). The new land tenure system has proved effective in increasing the income of individual farmers (Jha, 1997).

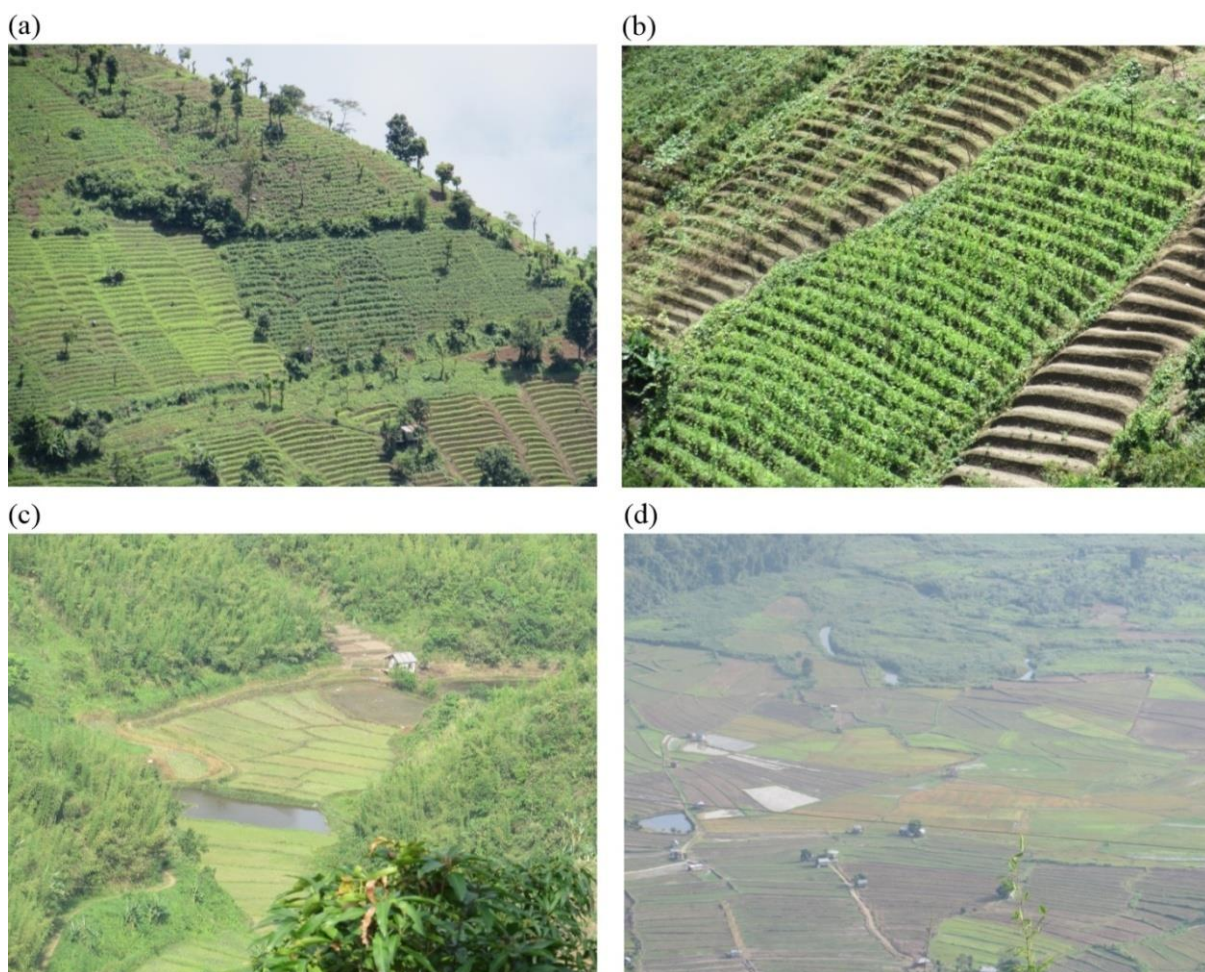


Figure 5. (a) *Jhumlands* converted into terraced cultivation; (b) close-up picture of terraced fields; (c) rice growing in the valley fills; and (d) flood plains where rice grows largely

A large arable land remains abandoned due to the continuous use of shifting cultivation; hence, the New Land Use Policy had the provision

to abolish this wasteful practice. Furthermore, allotting arable land permanently to the *Jhumias* was another objective of the New Land Use



Policy. The valley fills and flood plains have limited arable land but they are very fertile alluvial fans. The large-scale afforestation programs to sustain biodiversity, the selection of suitable crops to cope with climate change and global warming, as well as the provision of market infrastructure for the products growing through permanent cultivation were also promoted under the policy.

The allocation of funds by the government was principally aimed at the implementation of two components of the New Land Use Policy: (1) management, administration and capacity building as well as (2) infrastructural development (Sati, 2020). Consequently, small sloppy *Jhumlands* were converted into terraced fields in the Aizawl District. Some other districts have also followed this policy, after implementation, this scheme continued for 10 years until 1994. After a shift in the ruling party, Mizoram National Front (MNF) came into power and it continued to rule the state for 10 years until 2004. The MNF was not in support of the New Land Use Policy, hence, it was discontinued. Furthermore, in 2005, the INC once again emerged as the elected government and reintroduced the New Land Use Policy, but it failed to materialize. The previous government (INC) distributed cash to the beneficiaries in lieu of converting sloppy *Jhumlands* into terraced fields, but the MNF did not continue this scheme due to a lack of funds. Terracing the steep slope of arable land is a cost-intensive task and the *Jhumias* are poor marginal farmers, who cannot afford a substantial expenditure regarding this purpose. Therefore, the New Land Use Policy has remained ineffective presently, leading to a very minimal change in permanent cultivation.

## CONCLUSIONS

The analysis conducted on shifting and permanent cultivation systems showed that shifting cultivation is no longer viable and unsustainable. Several reasons attributed to this problem include the reduction in the *Jhum* cycle, high soil erosion, forest depletion, high variability in climate, low output from the *Jhumlands* and long-distance from settlements, as well as land tenure and right. Apart from being sustainable, the permanent agriculture system offers multiple benefits. Furthermore, the agro-climatic conditions in Mizoram vary and are

conducive for growing various kinds of crops, such as food grains, fruits and vegetables. The results also showed that the New Land Use Policy is suitable when it is systematically implemented.

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