As the pressure of population increased, the hunters-cum-cultivators of the Neolithic period started clearing of more patches in forests to bring them under cultivation. At the depletion of fertility, the cultivators used to migrate to new tracts to burn and clear forests for sowing of crops. This type of cultivation is termed as 'slash and burn agriculture' or 'shifting cultivation' or 'bush fallow agriculture' or 'swidden agriculture' or 'jhum cultivation'.

Jhum cultivation otherwise called 'Pamlou' in Manipur may be defined as an agricultural system which is characterized by rotation of fields rather than crops, by short period of cropping alternating with long fallow periods and clearing by means of slash and burn. It occupies a distinct place in the tribal economy and contributes a vital part of the socio-economic network of tribal life in Manipur and particularly in Ukhrul district. This practise of raising agricultural crops does not involve cultivation of land using agricultural implements or draught animals or any mechanical power. The inputs are human labour and seeds. Crops raised for a few seasons and area are abandoned once in 2 or 3 years which are affected by serious erosion. The farmers called jhumias, then shift over to other lands and resort to similar practise (but the villages do not shift). Leaching, erosion and loss of fertility takes place rapidly. Land-water system which is basic life supporting factor and a prime mover of socio-economic development has already fallen into the clutches of the law of diminishing returns with reduction of productivity vis-à-vis inputs and gross physical degradation of the system. All this further aggravates the situation and makes the jhumias increasingly poor inspite of his putting much greater labour.

Logically, jhum cultivation is an agricultural problem which creates forest and soil erosion problems, leading to destruction of flora and fauna and finally eco-degradation. The pernicious effect of jhuming has been increasing and have now assumed a devastating proportion. Several hillsides of Manipur have become barren — slopes with rills and gullies without vegetation. The eroded soil from the upper reaches fills up the streams and reservoirs where siltation takes place. Due
to decrease in the water depth in the lakes/reservoirs, life of hydro-electric projects like Loktak Hydro-Electric Project is going to be shortened. Drying of many perennial sources of water also takes place. On the other hand, floods occur more often now than before and quality of environment is being seriously affected. Ecological balance of the whole region is being endangered.

On the other hand, the practise of *jhum* cultivation has been severely attacked by the ecologists, environmentalists and planners as it disturbs the ecosystem causing ecological imbalances. There are, however, some people who support the continuance of *jhuming* with necessary and effective reforms.

Keeping this significant background of *jhum* cultivation in mind, it was decided to study the impact of *jhum* cultivation on the ecosystem of Manipur. Ukhrul district of Manipur is selected for this study because of its mountainous topography, undulating slopes and wet weather conditions that provides ideal conditions for *jhum* cultivation; the predominant tribal population mainly Nagas and Kukis who are the main *jhum* cultivators in Manipur and they have been practising *jhum* for centuries; absence of industries and minimum urbanization, abject of poverty, unemployment, economic exploitation, social deprivation, poor health, illiteracy and lack of infrastructure.

The main objectives of this study is to assess the physical, socio-economic setting and the nature of agriculture practised in Manipur, to examine the nature of *jhum* cultivation, the socio-economic conditions of the sampled *jhumias*, and to assess the impact of *jhum* cultivation on the ecosystem of Ukhrul district, to suggest the measures for sustainable development of this region.

The author has made extensive use of primary data which was drawn from comprehensive survey of five sampled villages, each lying in different tribal development blocks and inhabited by different tribes living in Ukhrul district. From the five sampled villages, about 10 to 100 percent sampling of *jhumia* households was done. Survey was done with the help of questionnaire (survey of different blocks of Ukhrul district, survey of the sampled villages of Ukhrul
district, survey of the sampled *jhumiya* households in Ukhrul district) during 2001 and 2002.

The present work is divided into three parts and spreads over six chapters. It starts with an introduction. Part one examines the physical and socio-economic setting and the nature of agriculture practised in Manipur. In part two, *jhum* cultivation and the socio-economic conditions of the *jhumias* in Ukhrul district has been examined. Part three deals with the crux of the problem to be investigated that is impact of *jhum* cultivation on the ecosystem of Ukhrul district.

Part one spreads over three chapters. In chapter one an attempt is made to study the physical setting of Manipur. Due to hilly nature of the terrain, undulating slopes and wet weather conditions at least for seven months (April to October) provide conditions in which tribals are practising *jhum*. In chapter two an attempt has been made to assess the socio-economic setting of Manipur. Ukhrul district is a land of beautiful mountains interspersed by numerous tribal habitats. Of the total population of this district, nearly 94 per cent comprises of tribal population. These tribals are traditionally bound and they practise primitive agriculture. *Jhum* is a way of life for them. It has deeply embedded in their lifestyle. They practitioners it for their livelihood. Thus, their needs, food habits, self-reliance, folklores, festivals and overall cultural ethos have a say in *jhum*. Chapter three is devoted to study the nature of agriculture in Manipur. The tribals living in the hills have to face difficulties of mountainous terrain, steep slopes (98 per cent of the total area), poor soils, heavy rains, less invigorating climate, mosquito infestations, poor means of transport and communication and a life of isolation. As a result he is compelled to adopt a primitive mode of cultivation that is *jhuming*. In valley regions people adopted advanced type of agricultural practices using tractors, irrigation, HYV of crops, pesticides and insecticides etc. But in the hill regions where *jhum* is practising, no irrigation and modern inputs are used.
Part two spreads over two chapters i.e., chapter four and chapter five. Chapter four deals with jhum cultivation in Ukhrul district. Recent figures for area under jhum is not available. So the figures which are available have been considered. In 1986-87, 99,162 hectares and in 1993-94, 162,547 hectares were under jhum. This shows that Ukhrul district has recorded an increase of 13.95 per cent area under jhum during the last eight years (till 1993-94). The area under secondary forest has decreased by 13.94 per cent. This shows that the amount of increase in area under jhum is the amount of decrease in area under forests. Thus, in 1986-87, 75.00 per cent of the total area was under forest while 21.82 per cent area was under jhum with only 3.13 per cent area under current jhum. But in 1993-94, the area under mixed forest and jhum were 61.06 per cent and 35.77 per cent respectively with 1.86 per cent area under total jhum category has increased, the area under current jhum decreased from 3.13 per cent in 1986-87 to 1.86 per cent in 1993-94.

Slope analysis of the different micro-watersheds showed that 81.58 percent of the total area falls in the very steep slope category, 16.28 per cent falls in the moderately steep to steep slope category and 1.43 per cent lies in the strongly sloping slope category. Inspite of this fact that Ukhrul district is characterized by hilly terrain and very steep slopes where soil erosion intensity is very high, jhuming is still practised and it is a way of life for the tribals. Fifth chapter deals with the socio-economic conditions of jhumias. The results of comprehensive survey of the five sampled villages of Ukhrul district throws light on the following facts:

The land tenurial system differs from Tangkhul Naga inhabited vilalges to Kuki inhabited villages. In Tangkhul Naga inhabited villages the individual jhumias have partially their own rights while in Kuki inhabited villages the headman has a say in all the matters.

Surveys have shown that cropping period is of one year in the Tangkhul Naga inhabited villages and three years in Kuki inhabited villages. Jhum cycle
also differs from one village to another. In Lungphu village, 15 years jhum cycle is still maintaining. In Yeasom village, it is 9-10 years and in Nungbi Khullen village it ranges between 5 to 10 years. Whereas in Kuki inhabited villages, it is of 7 years in Maku Kuki and 5 years in Mongkot Chepu village. Man-land ratio in Tangkhul Naga inhabited villages are 1:0.32 in Yeasom village, 1:0.28 in Lungphu village and 1:0.28 in Nungbi Khullen village. Whereas in Kuki inhabited villages it is 1:0.24 in Maku Kuki and 1:0.16 in Mongkot Chepu village. Again man-jhum land ratio are 1:0.26 in Lungphu, 1:0.25 in Yeasom and 1:0.13 in Nungbi Khullen village. Whereas, in Maku Kuki and Mongkot Chepu, it is 1:0.24 and 1:0.16 respectively. Labour-production ratio in the Tangkhul Naga villages was 1:6000 in Yeasom, 1:4514 in Lungphu and 1:2166 in Nungbi Khullen village while in Kuki inhabited villages it 1:5414 in Maku Kuki and 1:2051 in Mongkot Chepu village. Thus, average labour-production ratio in the Tangkhul Naga inhabited villages is about 1:4227 whereas, in the Kuki inhabited villages it is about 1:3733.

Part three presents the crux of the matter to be investigated. This part comprises of chapter six only. In this chapter an attempt has been made to assess the impact of jhum of the ecosystem of Ukhrul district. In the five sampled villages of Ukhrul district, a total of about 452.51 acres of forest has been lost. Average area of forest lost in these five villages in 90.51 acres. In the whole Ukhrul district where 222 villages are practising jhum, a total of about 20,093 acres or 8,135 hectares of forest is being cut down per year for the purpose of jhum.

In the process of jhuming, 3.7 tonnes of soil materials per hectare was reported to slide down the foot hills. It was also reported that soil erosion from hill slopes (60-70%) under first year, second year, abandoned jhum (first year fallow) and bamboo forest were estimated to be 146.6, 170.2, 30.2, and 8.2 tonnes per hectare per year respectively.
Soil samples were collected from each of the five sampled villages before and after burning and tested to assess the fertility status. More or less same results were observed in all the soil samples that were tested from different jhum sites. pH value of the soil increased slightly in all the sampled soils after burning. Percentage of organic carbon in the soils decreased after burning. The quality of potassium increased substantially after burning. While the amount of phosphorus in Kg. Per hectare is more or less same before and after burning.

In some spots certain trees and shrubs are scarce and may become further rare or even eliminated from the flora of the region e.g. Phoebe hainesiana, Alder, Pinus Kerya and Parkia Javanica etc. are becoming scarce in most of the areas of Ukhrul district. Many parasites and epiphytes also gets depleted or eliminated. Respondents from the five sampled villages reported of disappearance of many wild life from their area and neighbouring areas. The Javan Rhinoceros and Wild Ox of Myanmar known as ‘Santhou’ in Manipuri have vanished from Manipur forever. The Hoolock Gibbon, Stump Tailed Macaque, Slow Loris, Clouded Leopard, Golden Cat, Marbled Cat, Binturong, Spotted Linsang etc. are making precarious existence and all of them are on the verge of extinction. Similar is the case of birds. A number of birds also have become rare and many are probably extinct.

Regularity of rainfall has also been adversely affected by degradation of forest for jhum purpose. As a result floods and droughts are becoming a regular phenomena. Magnitudes of these phenomena are also increasing. Floods which occurred in 2001 and 2002 were among the most hazardous one which affected almost the whole valley districts of the state. Drought, on the other hand, had never been a frequent phenomenon, but very severe drought was experienced in 1999 resulting scarcity of water and drying up of many rivers. Sediments brought down by the rivers have led to the sedimentation on the floor of rivers and Loktak Lake. Due to decrease in the depth of Loktak Lake the life style of the people living in and around the lake has been changing.
Much has been written, much has been told and much hue and cry has been made over the degradation of the ecosystem due to jhuming. Yet, jhuming continues. In the coming years, with higher growth population the demand of food crops will increase. This will intensify jhuming if no alternate measures are undertaken.

Any transformation in jhum should be socially acceptable, economically profitable and ecologically sustainable. Any delay in implementation of better techniques will lead to converting the whole area under jhum into an ecologically slum.