STUDIES ON ECOLOGICAL IMPLICATIONS OF TRADITIONAL AND INNOVATIVE APPROACHES TO SHIFTING CULTIVATION IN MIZORAM

By

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THESIS SUBMITTED IN FULFILMENT OF THE DEGREE OF
DOCTOR OF PHILOSOPHY IN BOTANY

NORTH EASTERN HILL UNIVERSITY
Date.....

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SHILLONG : INDIA

NOVEMBER

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I certify that the thesis entitled "Studies on ecological implications of traditional and innovative approaches to shifting cultivation in Mizoram", submitted by Mr. Tawnenga, M.Sc. for the Degree of Doctor of Philosophy of the North-Eastern Hill University, Shillong, embodies the record of original investigation carried out by him under my supervision. He has been duly registered and the thesis presented is worthy of being considered for the award of the Ph.D. Degree. The work has not been submitted for any Degree of any other University.

Supervisor

SHILLONG

THE 19th NOVEMBER 1990

ACKNOWLEDGEMENTS

I express my heartfelt thanks to Professor R.S. Tripathi for his able guidance and encouragement throughout the course of this study. Through him, I have been introduced to the wonderful world of Ecology and his inspiration is the key to the success of the present research work.

I offer my grateful thanks to Dr. H.N. Pandey, Reader in Ecology, for his valuable suggestions and comments. My grateful thanks are also due to Mr. Uma Shankar, Dr. A.K. Singh and my other research colleagues in Ecology group for their cooperation and help.

I express my sincere thanks to Pu R. Laichhunga and family, Pu Vanlala and family and Pu Nova and family for allowing me to perform field experiments on their jhum fields. I am very thankful to Thantea and Mapuia who helped me a lot in field works.

I am also very thankful to Mr. Laltanpuia, Mr. Rintluanga Pachuau, Mr. R. Lalnunsanga, Mr. R. Zarzosanga and many other friends for various help and cooperation.

The laboratory facilities provided by Professors R.S. Tripathi, R.R. Mishra and Y.S. Chauhan, successive Heads, Department of Botany, North-Eastern Hill University, Shillong, during the tenure of this study are gratefully acknowledged.

I am grateful to Pu Saingenga, Principal, Pachhunga University College, Aizawl, for sparing me to accomplish this task.

I am indebted to my wife Mrs. Lalrinpuii, my mother Mrs. Laikungi and my children - Lalmalsawma, Lalmuanpuii and Lalrinzuala who had to share every ups and downs in the course of this research work.

Financial support received from the University Grants Commission, New Delhi, in form of an award of Teacher's Fellowship is gratefully acknowledged.

Most of all I thank God for granting me courage and strength to undertake and complete this research.

(TAWNENGA)

SHILLONG

THE 19th NOVEMBER 1990

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GENERAL INTRODUCTION

Shifting cultivation as defined by Ruthenberg (1983) is "one of the agricultural systems that involve an alternation between cropping for a few years on selected and cleared plots and a lengthy period when the soil is rested". In shifting cultivation an area of forest is cut, burned and farmed for several years without tilling the soil and then allowed to revert to forest before being cleared again (Uhl, et al. 1983).

Shifting cultivation is frequently referred to as 'slash and burn agriculture' though the term 'Swidden' is preferred by some anthropologists (Exwall, 1955).

Shifting cultivation is differently termed at different places of the world as given below:

Name of the country	Term used
Brazil	Roca
Burma	Taungya
Ghana	Proka
Guedaloupe	Ichli
India	Bewar, Dhya, Dullee, Dippa, Erka, Jhum, Kumri, Panda, Pothu, Podu.
Indonesia and Malaya	Ladang

Name of the country	Term used
Japan, Korea and Taiwan	Karen
Java	Jumah Humah
Laos	Hay
Madasgascar	Tavy
Mexico and Central America	Milpa
Philippines	Hanunoo, Caingin
Rhodesia and Tanzania	Chitemene, Citemene
Thailand	Tam-ray, Rai
Vietnam	Ray
Zaire	Masole

The origin of shifting cultivation could be traced back to the Neolithic period (ca. 7000 B.C.) on the basis of archaeological data (Sharma, 1976). It is regarded as the first step in transition from food gathering to food production.

Shifting cultivation involves only human power. All the agricultural operations are performed manually with only a few traditional and primitive tools. The method of cultivation is marked by the following agricultural operations:

1. Selection of forested land
2. Slashing or clearing the forest vegetation
3. Drying of slashed vegetation

4. Burning of dried vegetation
5. Sowing of seeds
6. Weeding for two to four times
7. Watching and protection
8. Harvesting
9. Threshing and storing
10. Fallowing

One of the basic features of shifting cultivation is the cost-free and effortless regeneration of soil productivity during the fallow period.

Shifting cultivation is a common form of agriculture throughout much of the world (Hauck, 1974). In low land tropics it is practised on many different soil types and by people of widely varying cultures (Nye & Greenland, 1960). Shifting cultivation is principally common in humid and semi-humid climates and in thinly populated savannas.

According to Hauck (1974), nearly 30% of the exploitable soils are under shifting cultivation and responsible for meeting the food requirements of about 8% of the world's population.

It is estimated that about 2.6 million tribal people of India, living in the interior hilly areas practice shifting cultivation (Vidyarthi, 1975). The estimated area covered

by shifting cultivation is about 1.3 million acres, spread over different parts of India. It is wide spread among the hill dwellers of north-eastern India, Bihar, Orissa, Madhya Pradesh, Andhra Pradesh and Karnataka.

In the north-eastern region comprising the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura, shifting cultivation, locally known as 'Jhum' is widely prevalent. This region covers a total geographical area of 25.5 million hectares and forms about 8% of the total geographical area of India.

Forest occupy more than 57% of the geographical area of north-eastern region of India. It is estimated that an area of 19.07 lakh hectares has been affected by 'jhum' and annually 4.69 lakh hectares are under jhum cultivation practiced by 4.43 lakh tribal families. The estimated jhum cycle (the intervening fallow period after which the same forested land is again cultivated), which was nine years in the past decade has been reduced to four years now (Basic Statistics for N.E. Region, 1987).

The socio-cultural life of the tribals of north-eastern states of India is interwoven with the practice of shifting cultivation. The celebration of some of their traditional festivals is linked with different steps involved in jhum

cultivation. House construction and other works are adjusted according to the jhuming operations. Almost all the stages of jhuming are celebrated in the midst of songs and dances along with social and religious rites. They have many songs and folk-tales which deal with different steps of jhuming.

The state of Mizoram, where this study has been carried out covers a total geographical area of 21,087 sq.km. which represents only 0.64% of the country as a whole.

Shifting cultivation is known as 'Lo' in Mizoram. For the purpose of 'Lo', a patch of land is cleared and burned, but this land is generally cultivated for only one year. Very rarely, cropping is done for two successive years on the forest lands cleared for 'Lo'. Such a practice is common only in those areas where the forest vegetation was luxuriant and soil fertility could sustain second year of cropping also.

Each village has its own territory demarcated by rivers, streams and hill ranges. The village territory generally includes considerable forest area. The delienation of the boundary for jhum during each year is the function of the Village Council. By convention, no other villages interfere in the area demaracted for a given village.

The cropping pattern generally followed for 'Lo' in Mizoram is of mixed type. Rice is the main crop grown in the

state. Upland rice of two main varieties locally known as 'buhpui' and 'ţai' are grown. Usually one of these is grown, mixed with maize, cucurbits, colocasia, brassica, chillies, sesamum, brinjals and other vegetables and pulses. Sometimes ginger, cotton and tapioca are also grown. The choice of different crops which are grown mixed with rice in jhum lands depends on the requirements of the family.

The method of allotment of jhum sites to individual family is by lottery system locally called 'Lo pawh' conducted by the Village Council. The area to be cultivated is decided by a cultivator on the basis of the size and working capacity of his family. The area of jhum is measured in terms of amount of rice seed that can be sown in a field and the unit in use for this purpose is 'ţin'. Approximately two and half tinfull of rice seeds can cover one hectare of land.

Slashing or clearing of forested fallow land is done during December-January and burning in the month of March or April. This is followed by sowing of maize, cucurbits, vegetables etc. Rice is sown mostly during the middle of April to the first part of May.

Sometimes for the protection of forests from fire, a fire-line (meikawng) is made by clearing the surrounding area of the jhum plot. Sometimes due to rain or wind burning

may not be proper. In that case, unburnt plant materials are gathered at several places in the jhum plot and are burnt again. The jhum plots which are within the grazing range of domesticated animals, are protected by bamboo or wooden fencing.

A jhum-hut, locally known as 'Thlam' is constructed in a jhum plot after burning operation. Usually, when jhum plot is at far distance, the cultivators used to stay overnight in 'Thlam' during most of the working days.

The practice of jhuming in Mizoram is as old as their history itself. The village harmony was closely linked with jhum which bound them together as occupationally and economically homogeneous community. Their traditional festivals, folk tales and songs are centered around jhuming. Work-partnership between young men and women was very common and highly cherished. Jhum work and jhum land had a sentimental value. In the traditional setting of Mizos, agriculture meant jhuming and jhuming meant a 'way of life' rather than a mere activity leading to food production.

Though social and economic developmental programmes have changed this 'way of life' among the urban population, it still persists to a certain extent among the rural population which accounts for 73.3% of the total population (Basic

Statistics for N.E. Region, 1987). According to available statistics, at present 1,89,000 hectares of land is affected by jhuming and 50,000 families are involved in it. Area under jhuming in a year is 63,000 hectares. The average area of jhum per family is 1.3 hectares and the present jhum cycle is three years (Basic Statistics for N.E. Region, 1987).

Each state of north-eastern region of India has some schemes for the improvement or control of jhuming. A few surveys made on these schemes have revealed that they are of little success (Singh & Singh, 1980). The Indian Council of Agricultural Research for north-eastern hill region is seized of the problems and accordingly, an extensive study programme on the problems of jhum and its possible alternatives was launched at Burnihat and Barapani. Results from these studies gathered so far have indicated the possibility of a silvi-pastoral-horti-agricultural system as a suitable system for hill slopes from conservation and soil productivity point of view. Inclusion of forest, forage and horticultural plants in the system together with the food crops assures the inherent capacity of the system to meet timber, fuel, fodder, money (from horticultural crops) and food requirements of the rural people. Loss of soil fertility which forces the family to shift is also partly taken care in silvi-pastoral-horti-agricultural system.

In Mizoram, for the control of jhuming 'New Land Use Policy' and 'Jhum Control Schemes' have been launched. Under these schemes selected families are encouraged for permanent settlement by providing occupation of their choice. The desired level of help in cash or in kind is rendered by the State Government to such families. It may be too early to give comments on these efforts. But bringing an abrupt end to this 'way of life' which has been so deeply rooted in them may not be easy. Nevertheless, they may be brought under these schemes as they can get immediate financial help to meet their various requirements.

According to Singh (1986), since the system of jhuming has socio-economic links, any sudden change to some other systems may not be possible. He suggested that introduction of high yielding varieties, fertilizer application technology, water storage and application methods and soil conservation practices suitable to the specific condition may bring encouraging results because a change in the earning capacity will also change the outlook. Besides, through demonstrations the cultivators can be convinced about the advantages of leaving top portion of a terrain untouched and terracing the bottom portion of the adjoining more fertile valley land, as recommended by the ICAR (Shifting Cultivation in North-East India, Published by ICAR, 1983). He further suggested that before

these practices are pushed in, extensive programmes and thorough experimentation would be needed to work them out for specific situations.

Keeping in mind the situations mentioned in the foregoing pages, the present study has been undertaken in the state of Mizoram. This study covers the following aspects.

1. Energy budget of shifting cultivation ('Jhum' or 'Lo') during first year and second year of cropping.
2. Plant biomass and net primary productivity of jhum lands during first year and second year of cropping.
3. Edaphic changes during shifting cultivation.

These aspects have been studied in jhum fallows of two different ages, 6 - year old and 20 - year old referred to in the present thesis as young and old jhum fields respectively.

Apart from gaining an insight into various ecological aspects of jhum cultivation in Mizoram, the study also seeks to suggest innovations in the existing system of jhuming in the state. The innovations or alterations tried in this study includes the introduction of second year of cropping hitherto not practiced in Mizoram, application of chemical fertilizers

and farm-yard manure and application of chemical fertilizers plus farm-yard manure and tilling of the soil.

In Mizoram the forest areas cleared and burned for jhum are normally cropped just for one year. The introduction of second year of cropping on the same jhum plot could be helpful in minimizing the encroachment on the forested ecosystem for agricultural purposes and may even retard the process of deforestation which is taking place at an alarming rate. This may even help in lengthening the jhum cycle. The suspected decrease in crop productivity of the jhum land during second year of cropping due to soil fertility loss could be taken care by the application of fertilizers. The data generated on various aspects mentioned above may be useful in formulating the new packages and recommendations in respect of innovative approaches to jhum cultivation in Mizoram.

The 'General Introduction' which sets out the objectives of the thesis, is followed by the 'Review of literature'. Climate, soil and vegetation of the study sites is contained in Chapter II. The experimental data on various aspects mentioned have been presented in Chapters III, IV, and V with introduction, methods and discussion separately. However, the results obtained on various aspects have been briefly discussed in an integrated manner in Chapter VI under 'General Discussion'.

Plate 1 A panoramic view of forested jhum fallows of different ages in Mizoram.

Plate 2 An overview of a jhum field during cropping.

PLATE 1

PLATE 2

Plate 3A 'Thlam' (a jhum hut): front view.

Plate 3B 'Thlam' (a jhum hut): side view.

PLATE 3A

PLATE 3B

Plate 4 A shifting cultivator and his wife in their 'thlam'.

PLATE 4