ECONOMICS OF JHUM CULTIVATION

A CASE STUDY OF OUTPUT, MARKETED SURPLUS AND EMPLOYMENT IN MEGHALAYA

A Dissertation

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CERTIFICATE

Certified that Ms. Mayashree Borah has worked under my supervision and guidance on a research topic entitled, "Economics of Jhum Cultivation - A Case Study of Output, Marketed Surplus and Employment in Meghalaya" for the degree of Master of Philosophy in Economics, North-Eastern Hill University, Shillong. The work embodies the record of original investigations and no part of it has been submitted for any other degree of other universities. The dissertation in my opinion, is worthy of awarding the said degree.

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C O N T E N T S

A C K N O W L E D G E M E N T S

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Chapter I

Introduction

1.a Jhum or Shifting cultivation is a mode of cultivation prevalent in some parts of the world, mainly in the humid tropics of South East Asia, Africa and Latin America. In India it is mostly practised in the hilly areas of the North Eastern Region, Andhra Pradesh, Orissa and in some pockets of the states of Madhya Pradesh and Bihar. On the basis of archaeological data the origin of shifting cultivation could be traced back to the neolithic period dated to 7000 B.C. It represents a distinct stage in the economic and technological development of a society. According to the study of civilization and development, it is regarded as one of the earliest stages of development of agriculture in the evolution of human society.

According to C. Clark "any continuing agricultural system in which impermanent clearences are cropped for shorter period in years than than they are followed", constitutes shifting cultivation.

According to this practice, small patches of forest land are cleared by felling the trees and burning them. Then the area thus cleared is used for cultivation and plantation of crops. A plot of land is cultivated only for a certain period of time because with the cultivation of the same plot and in the absence of the use of artificial fertilizers, the

natural fertility of the soil tends to decline. So a plot having been cultivated for a specific time period is to be abandoned and a new and different plot of land has to be chosen for cultivation, letting the previous plot recoup its fertility naturally. Before long, however, the same problem of decline of fertility arises in the new plot and again the farmers are required to move to a different plot. This process is continued and a time comes when the farmers return to the original spot. This time gap between leaving of the first plot of land and coming back to it again is called the 'jhum cycle'. The length of this cycle depends on the land-man ratio. Thus, given the availability of the cultivable land, the size of the population at a given period of time determines the length of the jhum cycle. In jhum cultivation besides land, the major inputs are seeds, organic manure and manpower. Seed is obtained from the previous year's stock. Manure is generated in the compost pit within the village itself from the crop residues and animal dung, the by-products of agriculture and animal husbandry. At the village level, the upper limit of the supply of manpower is determined by the population size. Tools and implements used for various agricultural operations are very simple and primitive, which are made usually within the village itself and are owned individually.

The people working in jhum may not engage themselves in any other occupation. The food crops may be the main crops of jhum cultivation and the reason is that there is a belief that the food production is basically labour intensive, requiring large inputs of manpower and thus allowing little time for other activities. Shifting cultivation is known under different names in different areas in accordance with its mode of operation. In English it is named as slash and burn method of cultivation or long-fallow cultivation, swidden cultivation or shifting cultivation. In a U.N.E.S.C.O. publication, it has been observed that the terms shifting cultivation and slash and burn cultivation, while describing cultivation techniques, has acquired disparaging connotations. Instead, the term Sswidden specifies a farming technology as well as a life-style based on a particular adaptation to forest and hilly environments. Hence the latter term is preferred. However as the term shifting cultivation is more widely known, the same will be used in this dissertation. Shifting cultivation has been defined as "... an agricultural system or economy which is characterised by rotation of fields rather than the rotation of crops by preliminary clearings such as fire, absence of draught animals and of manuring, use of human labour only, employment of the dibble stick or hoe, short periods of soil occupancy alternating with long fallow periods."

A graphic description of jhumming is given by the Dhebar Commission: "It consists of clearing the forest slopes, burning the fallen trees and bushes, and dibbling or broadcasting the seed in the ash-covered soil. The rest is left to nature ... The fertility of the soil is soon lost and some of it is washed away in the heavy rain. Cultivators then shift to other clearings and then the cycle continues in rotation."

One of the remarkable features of shifting cultivation is its universality. Primitive peoples evolving from the status of simple food gatherers responded to the challenge of the forests in the same way.

Shifting cultivation is done on the hill slopes which are not too steep. The altitude of such areas generally lies below 6,000 feet above the sea level. But there are instances of the Both people in northern Sikkim practising jhumming upto 10,000 feet.

In the operation of shifting cultivation the following stages are found to be invariably followed in all the areas:

1. Selection of the forested area for cultivation;
2. felling of trees and cutting down the bushes;
3. burning the dried forest into ashes;
4. Clearing the area of the logs left unburnt;

5. dibbling and sowing seeds;
6. weeding;
7. watching and protecting the crops against wild animals and birds;
8. harvesting;
9. thrashing and storing; and
10. fallowing.

Besides the above operations, the jhumias observe some traditional and religious ceremonies with the operations. Particular mention may be made of the worship and sacrifice before sowing seeds and the festivals observed after harvesting is completed. This has made shifting cultivation a way of life of the people practising it. However, it is seen that the tribals converted to Christianity in the North East usually do not perform the above mentioned rituals.

The tropical rainy regions, with approximately a mean temperature of at least 18.3°C and a minimum of 24 inches of rainfall per annum have been found to be favourable for shifting cultivation. Besides the tropical areas, the system of shifting cultivation is practised in parts of Korea in Temperate Asia. Clark and Haswell (1966 : 33) wrote that it persisted in Europe in the middle ages and was found in remote parts of Sweden until 1920. The Ruropeans in Brazil and the English settlers of the seventeenth century in Virginia of the U.S.A. practised shifting

cultivation till the middle of the last century (Gourou 1961 : 25).

1.b Shifting Cultivation in Meghalaya

Shifting cultivation is popularly known as "jhumming" or "jhum cultivation" in the North Eastern Region of India. But different tribes living in different areas of the region name it differently. Among the Khasis of the state of Meghalaya it is known as 'Lyngkha-lum' or 'shyrti'. As in the other states of the North East India, jhumming is the most popular way of cultivation in Meghalaya also. It is considered by some as a way of life of most of the rural people of Meghalaya. However, there was a time when agriculture was considered as a way of life for all the Indians.

The state of Meghalaya has a land surface of 22,500 sq. km. predominated by mountainous terrain with narrow valleys. It contains the agro-climatic conditions suitable for jhumming. However jhumming has great detrimental effects on the soil, vegetation and water resources of the state. Recognising this very important problem in the state, the Government took up schemes to control jhum and to rehabilitate the jhumias in other forms of agriculture or occupation. This was stated in 1974-75, and the physical achievements under the scheme for the period from 1974-75 upto 1986-87 are as follows:

Jhum Control Scheme	From 1974-75 upto 1980-81	From 1981-82 upto 1986-87	Total
1) Number of families benefitted	3449 Nos.	856 Nos.	4305 Nos.
2) Terracing	5044 hec.	821 hec.	5865 hec.
3) Reclamation	740 hec.	35 hec.	775 hec.
4) Afforestation	6657 hec.	-	6657 hec.
5) Irrigation	2615 hec.	1557 hec.	4172 hec.
6) Camps and Camp Equipments	195 Nos. + 4 units	88 Nos. + 34 units	321 Nos.
7) Drinking water	103 Nos. + 4 units	57 Nos.	164 Nos.
8) Dwelling houses	1665 Nos.	-	1665 Nos.
9) Link road	178.4 km.	119.48 km.	297.88 km.

Based on the performance of the schemes from 1974-75 to 1980-81, the number of families dependent on jhumming during the year 1974-75 has been estimated at 70,000 families, when the actual census figure of families dependent on jhum in 1981 is 51,720. Hence in 1974-75, about 35% of the total population was dependent on jhum. The percentage came down to about 20% in 1981. Thus there was a general decrease of about 15% in about 8 years time due to the efforts made by the Government of Meghalaya through the Soil Conservation Department of the State.

In 1986, total net area sown was 1,95,000 hectares. According to the 33rd round of national sample survey conducted

in 1981 we find that 64,130 hectares of land was under shifting cultivation which thus accounted 32.88% of the total cultivated area. As against this, 53,272 hectares of land was under settled cultivation which accounted for 27.31% of the total net area sown. As against these two categories some households practised both jhum and settled cultivation and a total of 77,590 hectares of land was under semi jhum and semi permanent cultivation. Thus, the mixed farming accounted for 39.78% of the total net area sown. According to 1981 census total population of Meghalaya was 13,35,819 which consisted of 25,5,936 households.

Except the reserved forest areas and protected forest areas, which constitute 8.48% of the total forest area, the rest of the forest area classified as community forests or private forests are subjected to this practice of shifting cultivation. The length of the jhum cycle was as high as 18 to 20 years in the Khasi Hills in the past. But now as the population has increased considerably, the length of the cycle has been reduced to 3 to 5 years, and it has come down even to 2 to 3 years in some areas.

The following may be the demerits of this phenomenon of reduced jhum cycles :

a) On a priori consideration, both production and productivity may tend to fall if yield raising inputs are not used.

b) Reduced jhum cycle represents the impact of increased population pressure on land that leads to worsening land-man ratio. The increasing scarcity of land may lead to more extensive exploitation of forest land for purposes of cultivation which will lead to increased deforestation leading to environmental problems and soil erosion.

c) It hampers investment in land improvement programmes. If any piece of land under cultivation is to be abandoned in due course, the cultivator cannot be motivated to undertake investment of land augmenting type. This will act as a stumbling block in agricultural development.

d) As land becomes scarer and scarer due to rapid population growth, agricultural unemployment both open and disguised emerges.

1.d Importance of Jhumming in the State of Meghalaya

Jhumming is a primitive mode of cultivation compared to that of the settled cultivation which is practised in most of the parts of the world. Some persons opine that jhumming is practised only in economically backward areas. A wide spread view is that jhumming is the major cause of deforestation especially in the tribal hill areas. Deforestation in its turn leads to reduced rainfall thereby affecting the stable ecological balance.

Actually, one should consider two aspects of the problem :

a) social aspect and b) individual aspect.

From the social point of view, it is the social cost and benefit that counts. But for the individuals self interest is predominant. As far as social costs and benefits are concerned, jhumming may be considered harmful. But the individual farmer may find it attractive because this type of cultivation yields the food for his subsistence and day to day needs without much financial and capital investment. Besides land, family labour and seeds are the only other inputs in this type of cultivation. As this mode of cultivation is relatively labour intensive, it provides seemingly more opportunities for the absorption of the entire family labour even though the employment may in real terms be only partial, at least in certain cases. But it is satisfying to the subsistence farmers that there is no apparent unemployment. The fallacy here is that if five persons are doing the work of two, three can be released to enjoy leisure or to work elsewhere and thus earn an extra income for themselves and the household as a whole would decidedly be better-off if this is really the case.

The problem of jhum has been discussed ad infinitum in the context of the North-East and some studies on jhum have

also been conducted, but hardly any of these studies have analysed the problem rigorously in a scientific manner in so far as the economic aspects like productivity, employment and marketed surplus generated by this type of cultivation are concerned. We, therefore, propose to focus attention on the following questions :

a) Is the average productivity under jhum more than in settled cultivation ?

b) Is the income per hectare from jhum more than that from the settled cultivation ? It is probable that the income and productivity differentials of the two modes of cultivation are inconsistent provided that the low productivity mode of cultivation concentrates on the high value crops. In view of the fact that the conversion of jhum lands into permanent mode of cultivation generally needs immense investment both in terms of fixed and working capital, the earning differentials of the two modes of cultivation are of immense significance. The individual households may be induced and motivated to adopt settled cultivation only if the requisite investment involved in the conversion is warranted and justified by the returns. If the earning differentials are meagre, then the decision of the individual households to persist with the jhumming even when an alternative is available cannot be termed irrational on economic grounds howsoever harmful the jhumming may be ecologically or in terms of the social costs involved in

it. But this is precisely the question which has not been faced by the policy makers and the planners.

c) Employment is another important aspect of the problem. Does jhum require more labour per unit of cultivation than that required by the permanent cultivation ?

The rural economy of Meghalaya is not diversified. The cultivation happens to be the single largest sector of the economy both in terms of output produced and employment generated. If the conversion of jhum lands into the settled mode of cultivation is likely to result in displacement of labour, the alternative will not be economically feasible unless alternative avenues of work with wage levels at least as high as one gets from jhum are made available. If the alternative mode of cultivation is less labour absorptive, either the cultivated area has to be increased commensurately or non-agricultural jobs will have to be created.

d) One of the popular beliefs is that the jhumming is by and large a subsistence mode of cultivation. If this view is correct, then the marketed surplus will not exist in jhum. Besides if the subsistence level of cultivation of jhum is due solely to the jhumming, then the settled cultivation, all other things being equal should be characterised by significantly high levels of marketed surplus. Hence the question whether jhum generates greater marketable surpluses than the permanent

cultivation becomes important.

Such aspects have not been touched by the different investigators so far. At least we do not know any study which has investigated these aspects of the problem in a meaningful way.

II. Objectives

For getting answers to the above questions, the following objectives are set for the proposed study :

(a) To make a comparative study of the given three aspects of the settled and shifting cultivation.

(b) To trace the socio-economic aspects of jhumming.

III. Hypotheses

The following hypotheses are proposed for testing in this study :

(a) The productivity under the jhum is lower than in the settled cultivation.

(b) The jhum cultivation is more labour-intensive and less capital-intensive than the settled cultivation.

(c) The jhum generates greater surplus than the permanent cultivation.

Chapter II

Review of Literature

A lot has been written on shifting cultivation by different people. But, so far as our knowledge goes practically no study has been made on the economic aspects of Employment, Output and Marketed surplus leaving jhum more as an anthropological and sociological area of study.

Dr. B.D. Sharma has written an interesting article on jhum cultivation entitled, "Shifting cultivators and their development" which very completely reviews the existing literature. He has analysed such aspects as what shifting cultivation is, what its origin was, what its methods of growing crops happen to be and where it is prevalent. The study throws interesting light on jhum - its problems and prospects.

He has discussed both the merits and demerits of jhuming. He thinks that in this type of cultivation there is intensive resource utilization. This however, is not the case with respect to the degree of utilization of the land resources. In fact, this mode of cultivation is a special form of extensive cultivation which is relatively more land than capital or labour intensive in form. This mode is feasible only when land-man ratio is highly favourable./ Once the population pressures emerge in the economy, jhumming becomes inappropriate in the resource

base of the economy. Jhumming is, however, highly compatible with the social structure and the customs of the jhumias. Consequently, the attempts of the agricultural department to remove and replace it with the settled cultivation have not been very successful.

With the rising population pressures, the land-man ratio falls and the jhumias try to supplement their incomes by exchanging minor forest produce, other natural products of forests like horns and skins of wild animals etc. in the nearby markets, as income from jhum tends to fall short of their requirements. This may lead to a structural change in the rural economy.

However, he fails to note that forestry will play this supplementary role provided that (a) the jhumias continue to enjoy unconstraint rights to the forests and their produce as in the past; and (b) sufficient forest cover still remains, increasing deforestation of jhumming under increasing population pressure notwithstanding. The premises that underlie Dr. Sharma's argument are of questionable validity both on logical and empirical grounds.

He has suggested certain measures to make the jhumias leave jhuming and go in for permanent cultivation. These measures should be such as can change base of community by.

providing them more agricultural land. Hill areas should be cut, into terraces in order to facilitate terraced cultivation. Terraces tend to be eroded over a certain period of time under the onslaught of heavy rainfall which the North-Eastern Region is endowed with. So this cannot be a once for all affair. Then, the conversion of jhum into terraced fields on a continuing manner will need heavy doses of investment of both labour and capital which will be economically viable if and only if the yields of such converted fields is raised substantially above the level of the yields of jhum. Mere terracing may not suffice for this. An alternative high value crop mix will have to be identified and/or the yield augmenting inputs like water, fertilizers, improved seed varieties, etc. will have to be used on an ever rising scale. These measures will further enhance the investment needs, especially in the working capital. The individual farmers, at least the majority of them if not all, have neither the resource base nor the incentives and motivation for it. The multinational corporations and the big industrialists seldom bother for the environmental pollution with all its attendant heavy social costs. Compared to these entrepreneurs, the economic base and social enlightenment of the subsistence tribal farmers engaged in jhum should not be expected to be strong.

Although his is an excellent and elaborate analysis of shifting cultivation yet he has not even touched the above three aspects which are of interest to an economist. He, for instance has practically said nothing about employment, yield, output and marketed surplus, the aspects in which we are interested.

The North-Eastern Council's publication on shifting cultivation in the North Eastern Region deals with the ill effects of shifting cultivation, measures taken to replace it with the settled cultivation and to what extent the North Eastern Council has been successful in this attempt.

B. Dutta Ray's edited book entitled, "Agriculture in the Hills - A Case Study of Meghalaya", contains a number of papers written by different scholars on the agricultural problems of the state. A brief analysis of these papers are given below.

Dr. D.N. Borthakur portrays a picture of the current status of agriculture in Meghalaya. He shows the gross area of land under cultivation and the important crops grown in Meghalaya. He has also described the problems of agriculture in the State. About 41% of the net area sown is under the shifting cultivation. According to him there exists a yawning gap between the agricultural research available technologies and the agricultural problems of the state.

A.K. Sharma also discusses the problems of agricultural development of Meghalaya.

J.P. Singh compares agricultural production with the production of non-agricultural goods. For the production of any commodity we need land, labour, capital and technology, similarly for the production of agricultural goods also we need these factors which are scarce in Meghalaya. He suggests that the land should be classified into various categories according to its various uses, and restrictions should be put on the use of agricultural land for the non-agricultural purposes.

According to L.S. Gassah, agricultural productivity is low in Meghalaya due to the inadequacy of the means of communication, irrigation, transport and marketing.

D.N. Majumdar opines that population in Meghalaya is rising rapidly, consequently the land-man ratio has been falling which has been leading to the cultivation of the fallow land, adoption of intensive cultivation and ultimately to the imparting of the grains. If, however, intensive cultivation leads to the adoption of the settled cultivation, this should be welcome. Even otherwise, the more intensive use of a scarce resource should be welcomed. Planners have not been able to make the jhumias take up permanent cultivation because there is a big communication gap between the planners and the cultivators.

M.C. Goswami contradicts Dr. Elwin's view that the shifting cultivation is a permanent way of life of the jhumias. He cites the example of some Meghalayans who have realised that the jhumming is socially harmful and therefore, they have migrated to the plains for engaging themselves in the wet cultivation. He highlights the point that if the jhumias forever pursue the traditional way of cultivation, it will lead them nowhere except to irreducible poverty.

B.K. Mishra and P.S. Ramakrishnan's paper on "Energy Flow through a Village Ecosystem with Slash and Burn Agriculture in North-Eastern India", deals with the pattern of energy flow through four major sub-systems (jhum, valley, animal and domestic) of a typical Khasi village ecosystem characterised by the slash and burn agriculture.

The paper of P.S. Ramakrishnan, O.P. Toky, B.K. Mishra and K.G. Saxena, entitled "Slash and Burn Agriculture in North Eastern India", states that, as the jhum cycle has shortened from 20-30 years to 4-5 years, it has caused deterioration in the local environment. They suggest to restrict the cultivation of cereals and encourage horticulture and other perennial crops.

A.K. Gangwar and P.S. Ramakrishnan's paper "Jhum Cultivation - Controversy and Future Prospects," gives a detailed picture of what the jhum cultivation is. They have

not condemned this ancient practice of agriculture as has been done by some others. They opine that, provided the jhum-cycle is longer than ten years, the jhum system is as efficient as the modern method of cultivation.

The paper of P.S. Swamy and K.S. Rao, entitled "Socio-Economic Analysis of Agricultural Systems and Options for Eco-Development in North-East India - A Case Study from Meghalaya", suggests that jhum is the traditional and more popular form of agriculture. Therefore, considerable importance has to be given to it in the development and economic planning of the region. It has given a detailed picture of the different modifications of the jhumming at different elevations. They have also highlighted the differential levels of output in jhumming at different elevations having different jhum-cycles.

The book "A Comparative Study of Crop Production Under Shifting and Terrace Cultivation - A Case Study in Garo Hills, Meghalaya", by D. Borah and N.R. Goswami, gives a detailed comparative analysis of shifting and terrace cultivation. A broad definition of shifting cultivation, and a comparative account of yield of crops per acre (especially paddy) in the two types of cultivation - namely terrace and shifting cultivation has been given. In terrace cultivation the yield of paddy per acre is 2.77 quintals, which in shifting cultivation paddy yield per acre is 2.04 quintals.

At another seminar on the "Review and Re-Appraisal on Shifting Cultivation in North East India", held on 13-14 May 1988 by the North-East India Council for Social Science Research, many papers were presented by several scholars. These papers dealt with the problems of jhumming in the North East India and the ways and means to resolve some of the problems that this mode of cultivation poses. We examine some of these papers in the ensuing paragraphs.

Malabika Das Gupta discusses the problems of rehabilitation of jhumias in Tripura in her paper entitled "Rehabilitating Jhumias on Rubber Plantations - An Assessment of the Tripura Experiment". She opines that the commercial viability of rubber plantation had already been established in Tripura. Therefore, rubber plantations were considered to be an attractive alternative to jhum. It was decided to resettle those whom she calls landless jhumias in rubber plantations. But who these landless jhumias are? These are those persons who do not own the lands on which they work and who get wages for the services rendered to the owners of the land. Thus, they are really landless agricultural labourers. This resettlement programme is, at best, designed to withdraw the supply of labour of the resettled person to the owner jhumias. The benefits if any of resettlement accrue to the jhumias who may hire the labour of persons other than those settled in this fashion and who are willing to sell it.

Thus, the very design of the project does not seem to us to address itself to the real problems of jhum cultivation. Its failure is, therefore, inbuilt in the design itself. However, she fails to take cognisance of this aspect.

The paper entitled "Integrated Approaches as Alternative to Shifting Cultivation" by R.P. Awasthi, R.N. Gupta, R.N. Verma, S.K. Gangwar, M.D. Singh, B.K. Mandal and A. Varma, dwells on the research findings by the scientists of the I.C.A.R. on the important land use-systems.

B.N. Reddy and N.V. Rao presented an interesting paper on "Shifting Cultivation : Attitudes, Constraints and Approaches", wherein they have studied four villages of West Garo Hills District. The respondents of these villages have favourable attitude towards shifting cultivation, but they are not averse to Modern Agricultural Practices. They have suggested that instead of highlighting the adverse effects of shifting cultivation and looking for alternatives improving the positive aspects of shifting cultivation and conserving the resources within the system will be rewarding in the long run.

P.C. Bhattacharjee in his paper "Impact of Jhumming on Wildlife of the North-Eastern Region" says that the North Eastern region of India is the key constituent of the South

East Asian forest complex and it is the second largest forest complex to hold rich biological diversity. But a systematic onslaught in the form of habitat destruction, has threatened the very fabric of the survival of the wild life and the ecosystem in the region. He says that to protect the wild life of the region certain drastic measures are needed, but he has not suggested what these measures should be.

The paper entitled "Shifting Cultivation or Jhumming Practice in Meghalaya" by P.R. Mawthoh, Director of Soil Conservation, Meghalaya; highlights the disadvantages of shifting cultivation in Meghalaya and the measures taken by the Soil Conservation Department through schemes like the jhum control scheme and rehabilitation of jhumias scheme. The scheme comprises of components like, provision of developed permanent cultivation land wet or dry (terracing, reclamation) at 2 hectares per family; provision of irrigation facilities to the developed lands whereever feasible; supply of inputs like seeds and plants, manures and fertilizers and cultivation cost as follow-up programme; provision of cash/horticultural crop cultivation at 1 hectare per family, provision of drinking water supply; construction of link roads.

The schemes have proved successful to a certain extent because in 1974-75 35% of the total population was dependent on

jhum cultivation, whereas it came down to about 20% in 1981. Thus there was a general decrease of about 15% in about 8 years time.

P.C. Goswami in his paper "Control of Shifting Cultivation in North-East India - Certain Basic Issues", states that is not possible to abolish jhumming in the near future not at least for another 50 to 100 years; and so what is needed is a better understanding of the existing farming system in order to identify the key bottlenecks and to reform and modify it. He says that the existing situation of shifting cultivation in North East India calls for schemes of afforestation, horticulture, poultry, etc. Simultaneously efforts should be made to reclaim and improve valley land in the tribal areas to extend settled cultivation thereby decreasing the number of people practising shifting cultivation. If this can be done, the jhum-cycle will be longer and the natural process of regeneration will be rapid. He also suggests that setting up of some organisations for the upliftment of the tribal society at the village level with full right of these organisations on village land to ensure peroper management of village land may improve the existing pattern of jhum cultivation. All this should be done without disturbing the socio-economic life of the tribal village people. He says that although industrialisation may appear to be a viable alternative to shifting cultivation, it will

actually do more harm than good. This is because industrialisation will not lead to abandonment of shifting cultivation, as large number of people would still continue to practise it. Large scale industrialisation on the hill slopes may encourage deforestation, soil erosion and enhance ecological imblance. He therefore says "it is not possible to prescribe any remedial measures outside the village surroundings by prescribing certain new forms of economic activities without adequate thoughts and study".

Chapter III

Data Source and Methodology

In order to verify the previously stated hypotheses, data has been generated from Arodanga village (25°50'N Lat., 91°15'E Long.) in West Khasi Hills district of Meghalaya. We have made a purposive selection of the West Khasi Hills district, because this district has been the field of investigation of various socio-economic aspects under different projects, especially under the aegis of the Himalayan Eco-Development Project. Within the district we have chosen this village for our study, the District Agricultural Officer of West Khasi Hills also concurs with our view. Aradonga is a highly appropriate village for a comparative study of jhum and settled cultivation. Both the forms of the cultivation are prevalent there. Since both the modes of cultivation are practised in the same village, the economic characteristics like the yield per acre, employment per acre, income per acre etc. are not likely to be affected by the differential agro-climatic conditions which might have been the case if we were to select two or more villages each practising either jhum or settled cultivation. Other socio-economic factors such as the general level of development, degree of remoteness, extent of diversification of economic structures, levels of literacy, etc. upon which generally depends the nature and the level of agricultural development of a village would have also been different. These differential features would have made it difficult to attribute the differential features to the mode

of cultivation alone. The choice of this particular village has freed our results from such complexities.

The village does not have any peculiarity in her geographical conditions of soil, rain and climate, and they are very much uniform.

Then the village is neither too remote nor is it too near to the roadhead. It is neither an urban village nor is it primitive one that may be completely untouched by the winds of change. It is more or less an average unit and hence it portrays the average conditions of the farmers and agriculture of the majority of the villages in Meghalaya. We can here recapitulate Marshall's definition of the Representative Firm. He says that a representative firm is one that actually exists, having its average share of internal and external economies. It is one that is neither too young and therefore immature, nor too old and tottering. Nor has it any special advantages over other firms in regard to the situation or goodwill. Hence, says Marshall, "A representative firm is that particular sort of average firm, at which we need to look in order to see how far the economies, internal and external of production on a large scale have extended generally in the industry and country in question. We cannot see this by looking at one or two firms taken at random, but we can see it fairly well be reflecting, after a broad survey of firms, whether in private or joint

stock management, that represents to the best of our judgement this particular average." In our view, the purposively selected village is endowed with such properties.

In the surveyed village, there are altogether 53 households. We conducted a census survey, and could get the information we wanted from 50 of these households. The three non respondents could not be contacted. Thus our survey is more or less a census survey. Therefore, the questions relating to the sampling and its design are not relevant. Out of the 50 families, 36 practise jhumming and the remaining 14 are settled cultivators. The surveyed households taken together will constitute a small sample. According to Yule and Kendall, a sample consisting of items more than 50 may be defined as large, whereas, according to Garret a sample of 30 or more items can be defined as large. So, the sub-samples of jhumias and the settled cultivators considered spearately will furnish us only small samples as per Yule's norm. If, however, we accept Garret's definition, the sampled jhumias will constitute a large sample. The sample size need not detain us far toolong at this stage as the precision of estimates, according to Yule and Kendall, is independent of the sample size.

The questionnaire that had been canvassed is included in the appendix. We had tested it first in Smit, a village

near Shillong, and requisite modifications were introduced for covering the gaps that emerged from testing.

Methodology

Since we have accepted Yule's definition, the sample of 50 households consisting of both jhumias and settled cultivators may be defined as a small sample. The sub-samples of 36 jhumias and 14 settled cultivators are also therefore small. So it is only the small sampling test statistics which will be applicable to our study. We have used t-test for evaluating the statistical significance of the differences between the estimated parameters. This has been supplemented by other sample statistics wherever necessary.

Ungrouped univariate distribution has been used for estimating sample means and variances as the sample size is small. As the output of various goods is measured in different units and the prices of these goods differ a lot, we have converted physical quantities into money terms as follows:

$$M_i = Q_i \times P_i \qquad (1)$$

where M_i is the total money value of product i, Q_i is the total physical quantity of the ith good, and P_i is the prevailing price per unit of output.

Then, the land holdings owned differ in size from household to household. Land holding is not only the most

important factor input of the agricultural production processes, it is also the single most important and the largest productive asset possessed by the cultivating households. Then, the holding size may be the chief determinant of the level of output, and hence the household income. Due to the size variability of the holding between the households, absolute output and income, employment, etc. may not be comparable. The substantial variation of output/income between holdings of different sizes may lead to the problem of heteroscedasticity which may necessitate the use of special estimation procedures especially in regression analysis. Hence, we have converted absolute output, employment and marketed surplus into output, employment and marketed surplus per holding/area cultivated to render them comparable. It is from these figures that the weighted averages have been calculated:

$$\bar{E}_1 = \frac{\sum_{i=1}^{n} E_{i1}}{N_1} \qquad (2)$$

where E_1 is the employment per operational holding under jhum, E_{i1} is the total employment on ith operational holding under jhum and $N_1 = 36$ is the total number of holdings under jhum.

$$\bar{E}_2 = \frac{\sum_{i=1}^{n} E_{i2}}{N_2} \qquad (3)$$

where $\bar{E}_2$ is the employment per operational holding under settled cultivation, E_{i2} is the total employment on ith operational holding under settled cultivation and $N_2 = 14$ is the total number of holdings under the settled cultivation

$$\bar{E} = \frac{\xi E_{i1} + \xi E_{i2}}{N_1 + N_2} \qquad (4)$$

$$= \frac{\xi E_{i1} + \xi E_{i2}}{N_1 + N_2} = \frac{N_1 \bar{E}_1 + N_2 \bar{E}_2}{N_1 + N_2}$$

Similarly,

$$\bar{e}_1 = \frac{\xi E_{i1}}{\xi l_{i1}} \qquad (5)$$

where $\bar{e}_1$ is the employment per acre under jhum and l_{i1} is land area of the ith operational holding under jhum.

$$\bar{e}_2 = \frac{\xi E_{i2}}{\xi l_{i2}} \qquad (6)$$

where $\bar{e}_2$ is the employment per acre under settled cultivation and l_{i2} is land area of ith operational holding under settled cultivation

$$\bar{e} = \frac{\xi E_{i1} + \xi E_{i2}}{\xi l_{i1} + \xi l_{i2}}$$

$$= \frac{l_i \bar{e}_1 + l_2 \bar{e}_2}{l_1 + l_2} \qquad (7)$$

Similar averages have also been calculated for ouput and marketed surplus seprately as well as jointly for jhum and settled cultivation.

In order to estimate the regression and inter-correlations between different sets of variables under study, we have constructed nine bi-variate grouped distribution tables wherefrom we have calculated the coefficients of correlation r as follows :

$$r = \frac{\Sigma uv/N - \bar{u}\bar{v}}{\sigma u \quad \sigma u} \tag{8}$$

where u and v denote the values of the given variables after the change in the units of measurement and after the shifting of the origin. The grouping of the raw data is supposed to minimise the variance within the class and maximise the same between the classes or the groups. But the effect of grouping on the variate values is to be incorporated in the calculations. Therefore, we have not used the usual Karl Pearson product-moment formula. We have used rather its modified form as exemplified by equation (8). Similarly, the regression parameters have been calculated as follows :

Parameter 'b' has been calculated from

$$b = r \frac{\sigma y}{\sigma x} \tag{9}$$

and 'a' has been calculated from

$$a = \bar{Y} - b\bar{x} \tag{10}$$

where $\bar{x} = A + c\bar{u}$

$\bar{y} = B + c'\bar{v}$

In order to make a comparative study of the variables associated with the shifting and settled cultivation, we have considered shifting and settled as sub-samples, denoting sub-sample of shifting cultivation by 1 and sub-sample of settled cultivation by 2. So 1 and 2 as subscripts have been used for these 2 sub-samples and the combination of the two is shown without subscript.

We have tested the significance of the differences between the means of the variables by the two sub-samples as well as the significance of the differences between the sub-sample means and the means of the combined samples of jhum and settled cultivation.

To test the significance of the differences between means of the sub-samples 1 and 2, we have used the following formula for t-test.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{x}} \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}} \qquad (11)$$

To test the significance of the differences between sub-sample means and the mean of the combined samples we have used the following formula for t :

$$|t_1| = |(\bar{X}_1 - \bar{X})| \frac{\sqrt{N}}{S} \quad (12)$$

$$|t_2| = |(\bar{X}_2 - \bar{X})| \frac{\sqrt{N}}{S} \quad (13)$$

where $\bar{X}_1$ is the mean of the first sub-sample, $\bar{X}_2$ is the mean of the second sub-sample, $\bar{X}$ is the mean of the two sub-samples taken together and S is the standard deviation.

Chapter IV

Empirical Findings

Economic structure of India in general, and that of the relatively less developed regional economies in particular dominated by the agricultural sector. Agriculture is, by and large, a rural industry and the rural India is real India. In 1981, 525 million out of 685 million Indians resided in 5.7 lakh villages, which constituted 77% of the total population. The largest proportion of the gross domestic product and the greatest share of the total employment are accounted by this sector. Out of these 525 million rural people, 253 million belong to the rural labour force, majority of whom are absorbed in agriculture. In fact, about 69% of the total work-force is employed in the rural sector of the Indian economy. In 1971, agriculture accounted for 49.2% of the total net domestic product, but the agriculture's share in net domestic product has tended to decline with the result that in 1985 its production has come down to 32.6% of the total. This decline notwithstanding agriculture still accounts for roughly one-third of the net national domestic product. Thus, agriculture happens to be the mainstay of almost the entire population in the rural segments of the national and regional economies. This predominant place of agriculture reflects the lopsided economic structure due to inadequate diversification of the rural economy. Besides, the disproportionately large population base of the rural economy paves the way for the absorption of the dominant proportion of the ever increasing

size of the labour force at extremely low wage rates in agriculture. Consequently, most of the poor and those living below the poverty line reside in the rural areas. In 1977-78, according to the Planning Commission estimates, 51.2% of the rural population lived below the poverty line. This percentage has, however, come down to 40% in 1984-85.

Agricultural development, like industrial development, needs technological upgradation of the production processes. It is the technological transformation which lies at the base of economic growth. The better and more efficient techniques make factor inputs capable of producing more output with a given quantity of inputs or the given output may be produced by a smaller quantity of the inputs. Such results normally reflect the changing levels of factor productivities or their reciprocals defined as input coefficients. In case of agriculture, land and labour are the most dominant factor inputs, whose productivities can also be raised by investment in new technology associated with the use of land augmenting inputs like water, fertilizers, pesticides, H.Y.V. seeds, diesel/electricity, and investment in general programmes of land improvements like bunding, fencing, terracing etc.. The investment of this type in agriculture has already yielded remarkable results in the form of Green Revolution that has materialised in some of the regions of the country.

However, the tribal economies of North East India are afflicted by a rather different problem. Jhumming happens to be the most prevalent type of cultivation, and this is supposed to represent a backward and obsolete technology. Settled cultivation is assumed to be associated with the better technology than the one associated with the jhum. This has atleast been the basic premise on which the programmes of the controlling and the gradual eliminating of the jhum have been based. This study seeks to test the empirical validity of such hypotheses.

In this study, we deal with the differences between employment, output/income from land and productivity of labour - between the jhum and settled cultivation. This study has been designed mainly to examine two inter-related hypotheses :-

1) Settled cultivation is more labour absorptive both in absolute terms as well as on per unit of land cultivated basis than the jhum.

2) Settled cultivation is capable of producing greater output, both in absolute terms and on per unit of cultivated land basis than the jhum.

Assumptions and Adjustment of Data :

Differential employment implications of the jhumming and settled cultivation cannot be examined with the raw-data. So we have standardised the data relating to employment in

order to avoid arriving at erroneous inferences. This is necessary due to the differences between family size, holding size, and the probable existence of disguised unemployment in the jhum cultivation which is based mainly on family labour. Disguised unemployment is postulated to be the dominant feature of the subsistence economies in general and subsistence agriculture in particular. Besides, it is mainly a trait of family labour.[1] Jhum cultivation is generally carried on in those areas which are economically backward but whose factor endowments are generally dominated by the high land-man ratio. However, ever increasing population through time tends to alter this initially favourable resource endowment. Population pressures and the consequent decline in land-man ratio generally lead to a reduction in the jhum cycle. Due to lack of other employment avenues, larger and larger numbers have to be absorbed in cultivation even though they may fail to get full-time employment or even economically meaningful partial employment which leads to the disguised unemployment. Small holding size, non-commercialized and self-reliant cultivation almost verging on subsistence levels happen to be some of the characteristics of the jhum. Hence, the possibility of the presence of the disguised unemployment in jhum cannot be ruled out. For examining this possibility, data have been adjusted by the number of hours and the number of days worked by the given number of persons on the farm holdings.

Disguised Unemployment

From our questionnaire, we know the number of hours for which each member of the households works on the farm and the number of days of the week for which the farm workers of the households work on the holdings. Number of hours worked daily are first converted into the number of hours worked in a week, which are then converted into the number of hours worked in a month. This is multiplied by 12 to get the total man-hours worked in a year. Then, we assume that one-man day consists of eight hours and one week consists of six man-days. Practically all the farm households have reported that they work six days in a week though the daily number of hours worked vary from household to household. Each household keeps Sunday as an off-day. These norms are then used to obtain the standardised number of persons who get employment on the given holdings during the period of one year. The difference between the standardised number of persons employed and the number of persons who actually work on the individual farms then furnish us estimates of the disguised unemployment.

The results show that in all 61 persons in agriculture taken as a whole are disguisedly employed and the respective shares of jhum and settled cultivation in disguised unemployment are 33 and 28 respectively. Thus, the incidence of disguised unemployment appear to be higher in jhum than in settled

cultivation. The holdings under the jhum are 2.5 times more than the holdings under the settled cultivation. Therefore, for a rigorous evaluation of the hypotheses these figures have been converted into the averages.

The disguised unemployment per acre in agriculture taken as a whole in the village is 1.22 men per annum, while the disguised unemployment in jhum is only 0.917 men per acre. In the settled cultivation the number of disguisedly unemployed persons per acre is as high as 2, which exceeds the disguised unemployment in jhum as well as the agriculture taken as a whole. Thus, the inference drawn from the comparison of absolute figures is reversed.

The difference of disguised unemployment between the jhum cultivation and agriculture as a whole is not significant, t-value being as low as 1.25. As against this, the difference of the disguised unemployment between the settled cultivation and agriculture as a whole is statistically significant, t-value being 2.013. Therefore, the average incidence of disguised unemployment on jhum and settled cultivation must also differ significantly which actually is the case. The t-value of the mean differences is as high as 5.33.

Thus, disguised unemployment affects the settled cultivation much more than the jhum cultivation.

These results highlight the inadequacy of the agricultural sector of the chosen village economy to absorb the labour force in economically meaninful sense. So the economy is in urgent need of the generation of more employment opportunities in the non-agricultural sectors of the economy. The fact that the settled cultivation bears the much greater incidence of disguised unemployment than the jhum, also suggests that the mere conversion of the jhum lands into the settled fields cannot solve the problem of generating economically viable employment opportunities.

Employment Intensity

Standardised employment in the settled cultivation is 34.51 men as against total employment of 190.19 persons in agriculture as a whole. The remaining 155.58 persons are employed in the jhumming. Thus, the settled cultivation accounts only for 14.08% of the total employment, though it accounts for as much as 28% of the total holdings in the village, while these settled holdings are spread over 67.5 acres out of the total 222 acres of cultivated area as a whole in the village. Thus, the settled holdings account for 30.41 percent of the total area cultivated in the village. The proportion of the total employment generated by the settled cultivation is only half of the proportion of the holdings while it is even less than half the proportion of the area that it accounts for in the

total area cultivated. As against this, the jhum absorbs 85.91% of the total agricultural workers in the village though it accounts only for 72% of the total holdings spread over 154.5 acres. The area under the jhum is 69.59 per cent of the total cultivated area. The differences of these proportions suggest that the jhum is the more labour intensive technique than the settled cultivation.

The inference is further tested by the t-value of the mean differences. Employment per acre in the jhum and in the settled cultivation is 1.01 and 0.51 persons per acre respectively. Thus, on an average the jhum generates 1.98 times more employment than the settled cultivation. This difference between the two means is highly significant, t-value being as high as 68.91.

The relative shares of the two types of cultivation both in open and disguised employment are significantly different. Thus, the jhum emerges as more labour absorptive than the settled cultivation, while the latter is much more prone to disguised unemployment than the jhum cultivation.

The differences between the absolute levels of employment in the two types of agriculture might have arisen from either the difference in the number of holdings or the total area cultivated. The first factor has been neutralised by the consideration of employment on per acre basis. Similarly, the

influence of the difference between the number of holdings in each type of cultivation will be eliminated if we consider employment on per holding basis.

In this case also, there is a significant difference in the labour absorption capacities of the holdings under the jhum and settled cultivation. The employment per holding in jhum cultivation is 4.44 persons, while that in settled cultivation it is 1.196 persons. The value of 't' of the difference between the employment per holding in the jhum and settled cultivation is 2.49 which is statistically significant at 5% probability level.

The difference between the employment per holding in the settled cultivation and agriculture as a whole is also significant, t-value being 2.13. However, the difference between the labour absorption per holding in the jhum and in overall agriculture is not significant, t-value being as low as 1.32.

These results imply that each holding under the jhum cultivation generates more employment that the holdings under the the settled cultivation.

Holding Size

Both employment and output are generally related to the size of the holdings under cultivation. Besides, the holding size is also associated with certain socio-economic traits.

For example, most of the owners of small and marginal holdings cannot afford to engage hired labour. At times, they themselves may not be able to get full employment on their own holdings. This may force them to offer themselves as wage workers in order to supplement their family incomes. So family labour and disguised unemployment are mainly associated with the marginal and small holdings. It may suggest that our results imply that the average holding size under the settled cultivation is less than the average size of the holdings under jhum, and that the marginal and small holdings may be more numerous among the settled than the shifting holdings. Similarly, weak economic base of these owners may not permit them to undertake the investment designed to improve lands and the yield - raising-technology. Hence, the per acre yield and the employment may also be relatively low. But the jhumias may also be deterred from undertaking such land improving and yield raising investment as their fields may shift from time to time. The investment in land that is to be abandoned in future is likely to be envisaged as the waste of individual resources. In order to evaluate the influence of such factors upon employment geration impact of the jhum and the settled cultivation, we have compared the average size of holdings under the two types of cultivation. Average size of holdings in agriculture as a whole in the village is 4.44 acres, while the average size of holdings in the jhum is 4.292 acres and that of the settled cultivation is 4.82 acres.

If for some socio-economic and other reasons, it is desired that the jhum should be replaced by the settled cultivation, then the implications of these findings would have to be kept in view, lest the policy should fail.

If the jhumias are persuaded to become the settled cultivators, then alternative employment opportunities will have to be provided to those who will be released from their jobs as a consequence of the conversion of jhum into settled cultivation which needs less labour than jhum. The additional job opportunities may be provided in agriculture itself as only a fraction of the holdings owned under jhum are cultivated each year; whereas the settled cultivation may facilitate the continuous cultivation of each plot of land which implies more intensive use of land. For optional use of the land resources, it is imperative that only the jhum lands are converted into the settled holdings but these holdings are bestowed with an adequate investment in land augmenting inputs like fertilizers, high yielding variety seeds, etc.. So that the levels of employment, yield, output and hence incomes may be raised commensurately. But this will need substantial investment. The employment may even have to be supplemented by additional opportunities in the non-agricultural sectors of the economy. This, in any case, seems to offer a better solution as both the jhum and settled cultivation are characterised by the existence of disguised employment.

Labour Productivity

As seen from our results, jhum absorbs more labour. In absolute terms the shares of jhum and settled cultivation in disguised unemployment are 33 and 28 respectively. However, after converting these absolute figures to averages we see that disguised unemployment affects the settled cultivation much more than the jhum cultivation. But as jhum is more labour intensive than the settled cultivation, and as production of output in the jhum is less than the settled cultivation, it is obvious that the productivity of labour in jhum is lower than the settled cultivation, and this is actually the case because from our data we have computed that the average productivity of labour in agriculture as a whole is 843.109. In the jhum cultivation, it is 282.477 and in the settled cultivation the average productivity level of labour stands at 2284.73. The settled cultivation absorbs less labour than the jhum but it yields higher income to those who succeed in getting absorbed in this type of cultivation. Thus, the productivity of both the land and labour in the settled cultivation is higher than their corresponding levels in the jhumming. So the settled cultivation is capable of making much better and effective use of both the primary factors of agricultural production, viz. land and labour. As the North-Eastern economy is a labour scarce economy, jhum is an inappropriate technique of

cultivation. It accentuates the labour scarcity. Therefore, the conversion of jhum into settled cultivation will facilitate the loosening of the constraining influence of labour. Besides, the emerging scarcities of land will also be mitigated by the conversion.

We have already seen that overall output per acre in money terms is Rs.1876.39. As against this, the output per acre in jhum is only Rs. 1618.04 while the settled cultivation yields an income of Rs.2540.68. Thus, there is a significant difference between the output on per acre basis between jhum and settled cultivation, t-value being 10.38. Statistically significant differences also exist between the output levels of agriculture as a whole and jhumming; and agriculture as a whole and the settled cultivation, t-values being 5.49 and 8.812 respectively.

Income per holding for agriculture as a whole is Rs.6350.4, whereas for the jhum and the settled cultivation corresponding income levels on per holding basis are Rs.3883.2 and Rs.22680 respectively. As expected from our earlier results, income from the jhum is much less than that from the settled cultivation. It is also less than the average income of the total agriculture. In fact, the income per settled holding exceeds the overall average by 257 per cent, while it is 484 per cent above the average of jhum whose income falls below the overall average by as much as 65

per cent. For purposes of evaluating the adequacy or inadequacy of income, family is the appropriate unit for consideration. It is obvious, thus, that the families of the settled cultivators are 484 times better off than the families of the jhumias. The value of t of the differences of output per holding between jhum and settled cultivation is 8.26 which is statistically significant. The difference of income between jhum and overall agriculture is also significant, t value being 3.85. The difference of income between settled cultivation and overall agriculture is also significant as the t value is 7.66.

These results have important implications for the rural poverty alleviation programmes and policies. Our study area, in fact the whole of North-East India is a labour scarce economy. If the jhumias could be made to take up settled cultivation, then the constraining influence of labour may be reduced to a great extent. Adoption of the settled cultivation will raise the level of income of the cultivators. However, the investment costs involved in the conversion of the jhum holdings into the settled ones is also warranted by the differentials returns on investment in such programmes. To be precise, the investment will be justified on economic grounds as the net rate of return on investment derivable from the lifetime streams of the differential incomes relative to investment required for the conversion of the plots into settled holdings and the adoption

of the alternative mode of cultivation is substantially higher than zero. But we do not have any information about these investments and the durability of the converted holdings. So we cannot pass judgement about the time period needed to recover the invested capital.

Initial costs of the conversion may, however, be partially or wholly borne by the government. As the income differentials are to accrue to the cultivators, economic attractiveness of the conversion can easily be demonstrated to the intended beneficiaries.

Output

Agricultural income of a farm household depends upon two factors :

Amount of output and the price commanded by it in the market. Output itself is, however, a function of two factors - area and the yield. In order to neutralise the role of area, yield or output per acre may be considered. Yield in fact is an indicator of the productivity of land which, of course, depends largely upon the techniques of cultivation. Yield or the average productivity of land represents the capacity of the land inputs to tproduce output. A study of the factor productivity reveals if its capacity to produce output is increasing or decreasing through time, similarly, a comparison of the average productivities of a given factor input in two distinct activities at a given point of time reveals the degree of effectiveness with which the given factor is being used. It often reflects the differentials between the two techniques or methods of production. Therefore, a comparative study of overall output and yield per unit of cultivated land under jhum and the settled cultivation is likely to throw light on the efficiency with which land is used in the two modes of cultivation.

As a number of crops are raised on the holdings under both the settled and the jhum cultivation, it would be

desirable to compare crop wise yield rates of the two methods of cultivation. This is important from another view point also. Different crops generally command different prices in the market. Therefore, the yield of high value crops in money terms, even if the productivity of land in terms of the physical output is relatively low, may be high.

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But we find it difficult to compare the cropwise yield in physical terms as the jhumias plant different crops in the same plot at the same time. This makes it difficult to determine the area under each crop even if the cropwise output is measurable separately. So we will examine the yield rates of all the crops taken together in money terms, though this does not preclude the possibility of the comparison of cropwise yields. But the estimates may be highly rough approximations. This is also possible only in case of the main crop of paddy.

The main crops grown in the village are rice, potatoes, millets, maize, chillies, ginger, cotton, pineapple, papaya, banana, sesamum, brooms, turmeric and vegetables like peas and brinjal.

Overall output per acre in money terms is Rs.1876.39. As compared to this, the output per acre in jhum is Rs.1618.04 and in the settled cultivation it is Rs.2540.68. Thus, it is obvious that the income per acre derived from the jhum is the least as its average is lower than the overall average as well as the corresponding average income from the settled cultivation. Besides, the average income from settled cultivation is higher than the overall average as well. Thus, the income per acre from the settled holdings is 57 per cent more than the per acre income from the jhum, and the average income from the settled cultivation exceeds the average income level of the total agriculture by 35.4 per cent. The average income from jhum falls short of the overall average by as much as 15.97 per cent. Thus, the jhum cultivation emerges as the less productive of the two modes of production. The differences of Rs.922.64 in absolute terms and 57.02 per cent in relative terms are quite high. At the margin, the differences are likely to be very substantial as well.

Marketed Surplus

Marketed surplus is that portion of the agricultural produce that is actually sold to the market. It is, therefore that portion of the produce which is made available to the non-cultivators by the farmers. We should, however, distinguish between the concepts of "marketed surplus" and "marketable surplus. The former is that which we have explained above; but the latter term ise. marketable surplus represents total surplus which producers can potentially supply to the market. This is that portion of the produce which will be left in the hands of the farmers after meeting their own requirements of consumption, payment of wages in kind, feed, and seed requirements, etc.

In case of poor farmers, marketed surplus may be larger than the marketable surplus because they sell out of distress and have to repurchase later, in all probability, at higher prices in order to meet their consumption needs. Thus, in case of poor small and marginal farmers, marketed surplus may be larger than the marketable surplus whereas in case of rich farmers, marketable surplus may be greater than the marketed surplus. The case of rich farmers is different. They can often afford to keep a portion of their marketable surplus in the form of stocks, in order to realise the benefits of higher prices in lean seasons. Hence, for them marketable surplus may be greater than the marketed surplus. This will

hold true especially in the harvesting season.

Mathur and Ezekiel opine that the significance and appropriateness of the two terms (Marketed surplus and Marketable surplus) depends upon the nature of an economy. In developing countries, producers sell that amount of output which is sufficient to meet their necessary cash requirements, and it is consumption rather than the sales which is treated as the residual. As against this, in developed economies, producers treat their consumption requirements as essential, while the sales are treated as a residual.

Marketable surplus can be gross or net. Gross marketed surplus refers to the total quantities actually marketed and net marketed surplus is the gross marketed surplus minus repurchases from the market for own use.

Increase in agricultural productivity is no doubt necessary for economic development in general and rural development in particular, but the pace of development cannot be sustained by the growth of agricultural productivity alone. What is needed is a concomitant growth of marketed surplus along with the growth of output. Growth of productivity tends to raise total output and income of the farmers which in its turn leads to changes both in the levels and patterns of consumption. There is an upper limit to the consumption of food by a household. Engel's law also establishes that the

proportion of income spent on food declines with increases in income. Hence, increases in output resulting from the growth of productivity raises the marketable surplus. Then, the investible funds required for raising the productivity levels can be generated only by raising the level of the marketed surplus if the growth process is to be sustained on a long term basis. In the absence of consistent growth of the marketed surplus, bottlenecks and constraints may emerge that will obstruct and stullify rapid development. The growth of marketed surplus is desired because it provides necessary funds for capital formation, it may also increase foreign exchange earnings if extra supplies are exported increased output reduces or eliminated the need to import agricultural goods to fill up the gaps between domestic output and demand, and which eases the problem of balance of payments. Thus, the level of the marketed surpluses may be used as an indicator of the stage of agricultural development and the level of prosperity of the cultivators. Hence, we have examined the average levels of marketed surplus both in jhum and settled cultivation.

In the surveyed village, the marketed surplus per acre in money terms for agriculture as a whole is Rs.750.104. But the marketed surplus per acre in jhum is less than this and is equal to Rs. 658.41. But the level of surplus generated by settled cultivation is much higher than this. It's value is Rs.985.88. Thus, the average level of marketed

surplus generated by the settled cultivators is 1.3 times more than the overall average, while it is 1.5 times the level of surplus generated by the jhumias. It implies that the conversion of jhum into settled cultivation is likely to lead not only to the accelerated agricultural development but it will also introduce greater degree of commercialisation of agriculture which will strengthen the linkages between the rural and urban segments of the economy. These figures reveal that the farmers of that village do not engage in subsistence agriculture irrespective of the mode of cultivation as these averages are decided significantly different from zero.

So far as the settled cultivators are concerned, they have high surplus in rice, while most of the jhumias face the paucity of rice for self consumption. They have a high surplus in millets. It implies that most of the millets are produced for the market while the cultivation of rice cater to the needs of self-consumption of the jhumias.

NOTE (ref. page no. 38)

[1] It may, however, be noted that the malady of disguised unemployment in the developing economies like the Indian one has percolated from agriculture to the tertiary sectors of the economy in general and the administrative services and public undertakings in particular. It is this which partly explains the development of the tertiary activities ahead of the secondary sectors. Public enterprises and administrative services abound in attempts to disguise open unemployment of the educated.

Chapter V

Conclusions

From the results derived by us the data relating to output, employment and marketed surplus in shifting and settled cultivation the following major inferences emerge :

1) Jhum is more labour intensive than the settled cultivation both in relative, absolute and average terms.

2) Disguised unemployment affects the settled cultivation much more than the jhum cultivation.

If the jhumias are to be persuaded to take up the settled cultivation, then alternative employment opportunities will have to be provided to those who will be released from their jobs as a consequence of the conversion of jhum into settled cultivation which needs less labour than jhum. The additional job opportunities may be provided in agriculture itself as only a fraction of the holdings owned under jhum are cultivated each year, whereas the settled cultivation may facilitate the continuous cultivation of each plot of land, which implies more intensive use of land. But this will need substantial investment. The employment may even have to be supplemented by additional opportunities in the non-agricultural sectors of the economy. This, in any case, seems to offer a better solution as both the jhum and settled cultivation are characterised by the existence of disguised unemployment.

3) The income per acre derived from the jhum is less than the overall average as well as the corresponding average income from the settled cultivation. Besides, the average income from settled cultivation is higher than the overall average as well. In fact, the income per acre from the settled cultivation is 57 per cent more than the per acre income from the jhum, and the average income from the settled cultivation exceeds the average income level of the total agriculture by 35.4%. The average income from jhum falls short of the overall average by as much as 15.97%. So, the jhum cultivation emerges as the less productive of the two systems. Thus, land under jhum is less productive than the land under settled cultivation.

4) Since jhum absorbs more labour and produces less output than the settled cultivation, the productivity of labour in jhum is lower than that of settled farmers.

5) Settled cultivators generate more marketable surplus than the jhumias. So the settled cultivator represents a higher stage of development and a greater degree of commercialisation than jhum.

6) Jhumias may not take to the settled cultivation unless the persons rendered surplus by the conversion of the jhum into the settled holdings are provided alternative employment which will generate at least as much income as they get from the jhum. Besides, the jhumias will have no incentive

to convert the jhum lands into the settled fields unless the income that is likely to accrue to them from the settled cultivation is raised to a level sufficiently higher than that from the jhum which will be adequate to at least cover the investment required for the conversion per acre.

Our results show that the income differentials are sufficiently high to warrant the under taking of such investment.

Jhum cultivation cannot always be blamed for soil erosion. Verrier Elwin for example, said that if the climatic conditions and soil favour the quick regrowth of vegetation, then there cannot be soil erosion due to jhumming because the jhum lands are immediately covered by fresh outgrowths. But this view is not supported by the empirical evidence that is available so far. According to M.S. Sivaraman, Adviser, Programme Administration of the Planning Commission said: "It is a mistake to assume that the shifting cultivation in itself is an unscientific land-use. Actually it is a practical approach to some inherent difficulties in preparing proper seed beds in steep slopes where any disturbance of the surface by hoeing and ploughing will result in washing away the fertile top soil. The tribal people, therefore, take care not to plough or disturb the soil before sowing. The destruction of weeds and the improvement of tilth necessary for a proper seed bed are achieved with the help of fire. In most

of the hill areas the communication is not developed and sufficient land suitable for terracing is not available. The jhumming alone can be done for the present, and as such, every effort should be made to improve the fertility of the jhum land."

Professor Shri Prakash has raised an interesting point that nobody has asked or studied the opportunity cost of leaving the land fallow. Everybody says that reduction in the jhum-cycle has caused a calamity. But no one has studied what is the economic cost or the opportunity cost of leaving the land fallow for 20 or 15 years.

P.C. Goswami says that it is not possible to abolish or stop jhumming in the near future and provide employment to all the people engaged in jhum cultivation in other occupations. At least for the next 50 to 100 years jhumming will be there. Hence efforts should be made to improve jhumming.

Jhumias should be helped and encouraged to take up horticulture and livestock farming.

Jhumias now grow cash crops like ginger and cotton. They earn a lot of money, upto about Rs.50,000/- which they use to buy valley lands. They have taken up horticulture and pineapple is grown in plenty. There are cases of Meghalayans exporting truck-loads of pineapples to Delhi and

in the pineapple competition there, one such jhumias' pineapple stood first in size.

Statistical Data

Bivariate Table showing Relationship between Land under Cultivation and Output per acre in agriculture as a whole

y	v \ x / u	1150 -3	1450 -2	1750 -1	2050 0	2350 1	2650 2	2950 3	Nr	vNr	v^2Nr	U	uV
0.5	-3	-	-	1	1	-	-	-	2	-6	18	-1	3
1.5	-2	-	4	4	3	1	-	-	12	-24	48	-11	22
2.5	-1	4	11	4	1	-	-	-	20	-20	20	-38	38
3.5	0	-	2	-	-	-	4	1	7	0	0	7	0
4.5	1	-	-	-	-	3	1	-	4	4	4	5	5
5.5	2	-	-	-	-	1	2	-	3	6	12	5	10
6.5	3	-	-	-	-	2	-	-	2	6	18	2	6
	Nc	4	17	9	5	7	7	1	50	-34	120	-31	84
	uNc	-12	-34	-9	0	7	14	3	-31				
	u^2Nc	36	68	9	0	7	28	9	157				
	V	-4	-19	-15	-10	9	5	0	-34				
	uV	12	38	15	0	9	40	0	84				

Bivariate Table showing the Relationship between Area Cultivated and Output per acre in the Jhum

y \ x / v \ u	1150 -2	1450 -1	1750 0	2050 1	2350 2	Nr	vNr	v^2Nr	U	Vu
0.5	-1	-	-	1	1	-	2	-2	2	1	-1
1.5	0	-	4	4	3	1	12	0	0	1	0
2.5	1	4	11	4	1	-	20	20	20	-18	-18
3.5	2	-	2	-	-	-	2	4	8	-2	-4
	Nc	4	17	9	5	1	36	22	30	-18	-23
	uNc	-8	-17	0	5	2	-18				
	u^2Nc	16	17	0	5	4	34				
	V	4	15	3	0	0	22				
	uV	-8	-15	0	0	0	-23				

Bivariate Table showing the Relationship between Area Cultivated and Output per acre in Settled Cultivation

y \ x / v / u	2400 -1	2600 0	2800 1	Nr	vNr	v^2Nr	U	Vu
4.5 -1	1	4	2	7	-7	7	1	-1
5.5 0	3	2	-	5	0	0	-3	0
6.5 1	2	-	-	2	2	2	-2	-2
Nc	6	6	2	14	-5	9	-4	-3
uNc	-6	0	2	-4				
u^2Nc	6	0	2	8				
V	1	-4	-2	-5				
uV	-1	0	-2	-3				

Bivariate Table Showing Relationship between Land Cultivated and Marketed Surplus in agriculture as a whole

y	v \ x / u	450 -2	650 -1	850 0	1050 1	1250 2	1450 3	Nr	vNr	v^2Nr	u	vU
0.5	-3	-	1	1	-	-	-	2	-6	18	-1	3
1.5	-2	3	3	4	3	-	-	13	-26	52	-6	12
2.5	-1	10	7	1	2	-	-	20	-20	20	-25	25
3.5	0	1	1	1	1	1	1	6	0	0	3	0
4.5	1	-	-	1	2	1	-	4	4	4	4	4
5.5	2	-	1	2	-	-	-	3	6	12	-1	-2
6.5	3	-	-	1	1	-	-	2	6	18	1	3
	Nc	14	13	11	9	2	1	50	-36	124	-25	45
	uNc	-28	-13	0	9	4	3	-25				
	u^2Nc	56	13	0	9	8	9	95				
	V	-16	-14	-4	-3	1	-	-36				
	uV	32	14	0	-3	2	-	45				

Bivariate Table Showing Relationship between Area Cultivated and Marketed Surplus in Jhum

y \ x / v \ u	850 -2	1150 -1	1450 0	1750 1	2050 2	2350 3	Nr	vNr	v^2Nr	U	Vu
0.5 -1	2	-	-	-	-	-	2	-2	2	-4	4
1.5 0	-	5	3	1	1	1	11	0	0	1	0
2.5 1	1	4	8	3	3	3	22	22	22	12	12
3.5 2	-	-	1	-	-	-	1	2	4	-	-
Nc	3	9	12	4	4	4	36	22	28	9	16
uNc	-6	-9	0	4	8	12	9				
u^2Nc	12	9	0	4	16	36	77				
V	-1	4	10	3	3	3	22				
uV	2	-4	0	3	6	9	16				

Bivariate Table showing Relationship between Land under Cultivation and Marketed Surplus in Settled Agriculture

y	v \ x / u	2500 -2	3500 -1	4500 0	5500 1	6500 2	Nr	VNr	V^2Nr	U	Vu
4.5	-1	1	1	3	3	1	9	-9	9	2	-2
5.5	0	-	-	1	2	-	3	0	0	2	0
6.5	1	-	-	-	1	1	2	2	2	3	3
	Nc	1	1	4	6	2	14	-7	11	7	1
	UNc	-2	-1	0	6	4	7				
	U^2Nc	4	1	0	6	8	19				
	V	-1	-1	-3	-2	0	-7				
	uV	2	1	0	-2	0	1				

Bivariate Table Showing Relationship between Land Cultivated and Employment in Agriculture as a whole

y \ x (u / v)	1.5 (-3)	3.5 (-2)	5.5 (-1)	7.5 (0)	9.5 (1)	11.5 (2)	13.5 (3)	15.5 (4)	Nr	vNr	V^2Nr	U	vU
0.5 (-3)	-	-	-	-	-	1	-	1	2	-6	18	6	-18
1.5 (-2)	-	-	2	3	3	2	-	2	12	-24	48	13	-26
2.5 (-1)	-	2	4	1	1	-	-	-	8	-8	8	-7	7
3.5 (0)	5	8	6	-	-	-	-	-	19	0	0	-37	0
4.5 (1)	4	-	-	-	-	-	-	-	4	4	4	-12	-12
5.5 (2)	3	-	-	-	-	-	-	-	3	6	12	-9	-18
6.5 (3)	2	-	-	-	-	-	-	-	2	6	18	-6	-18
Nc	14	10	12	4	4	3	-	3	50	-22	108	-52	-85
uNc	-42	-20	-12	0	4	6	-	12	-52				
u^2Nc	126	40	12	0	4	12	-	48	242				
V	16	-2	-8	-7	-7	-7	-	-7	-22				
uV	-48	4	8	0	-7	-14	-	-28	-85				

Bivariate Table showing Relationship between Land Cultivated and Employment in Jhum Cultivation

y \ x / v \ u	3.5 -3	5.5 -2	7.5 -1	9.5 0	11.5 1	13.5 2	15.5 3	Nr	VNr	V^2Nr	U	Vu
0.5 -2	-	-	-	-	-	-	1	1	-2	4	3	-6
1.5 -1	-	2	3	3	2	-	2	12	-12	12	1	-1
2.5 0	8	10	1	1	1	-	-	21	0	0	-44	0
3.5 1	2	-	-	-	-	-	-	2	2	2	-6	-6
Nc	10	12	4	4	3	-	3	36	-12	18	-46	-13
UNc	-30	-24	-4	0	3	-	9	-46				
U^2Nc	90	48	4	0	3	-	81	226				
V	2	-2	-3	-3	-2	-	-4	-12				
uV	-6	4	3	0	-2	-	-12	-13				

Bivariate Table showing Relationship between Land Cultivated and Employment in Settled Cultivation

y	x / u / v	0.75 / -1	1.25 / 0	1.75 / 1	Nr	VNr	V^2Nr	U	vU
4.5	-1	3	4	3	10	-10	10	0	0
5.5	0	3	-	-	3	0	0	-3	0
6.5	1	1	-	-	1	1	1	-1	-1
	Nc	7	4	3	14	-9	11	-4	-1
	UNc	-7	0	3	-4				
	U^2Nc	7	0	3	10				
	V	-2	-4	-3	-9				
	uV	2	0	-3	-1				

Results

Sl. No.	Aspects Studied	'r'	't'	'b'	'a'	σ^2	C.V.
1.	Employment (Jhum & Settled)	-0.732	-7.445	-1.2995	0.96	0.83835	0.6358
2.	Employment (Jhum)	-0.2673	-1.8208	-0.293	1.551	1.4124	0.6602
3.	Employment (Settled)	-0.4019	1.5204	-1.615	0.5178	0.05835	0.4746
4.	Output (Jhum & Settled)	-0.55	4.6	-197.1	3673.94	1205962.23	0.5853
5.	Output (Jhum)	-0.59	4.26	-0.0016	4.7	1113664.6	0.6522
6.	Output (Settled)	-0.63	1.80	-0.0032	13.42	1358593.8	0.4588
7.	Marketed Surplus (Jhum & Settled)	0.30	2.18	0.0016	1.55	203983.74	0.6021
8.	Marketed Surplus (Jhum)	0.32	1.97	0.0005	1.39	200342.51	0.6798
9.	Marketed Surplus (Settled)	0.42	1.59	0.0003	3.54	212543.31	0.4676
10.	Rroductivity per person (Jhum & Settled)	0.4533	3.5234	0.00066	3.88	493448.14	0.8332
11.	Productivity per person (Jhum)	-0.40456	2.61	-0.003196	3.4116	26725.49	0.5787
12.	Productivity per person (Settled)	-0.8581	5.7886	-0.00056	1.1886	2464942.9	0.6872

Bibliography

Awasthi, R.P.; Gupta, R.N.; Verma, R.N.; Gangwar, S.K.; Singh, M.D.; Mandal, B.K.; Verma, A. (1988): "Integrated approaches as alternative to Shifting cultivation." ICAR Research Complex for N.E.H. Region, Shillong. Paper presented in the review and re-appraisal seminar on shifting cultivation in North-East India, 13-14 May, 1988, organised by North-East India Council for Social Science Research (ICSSR), Shillong : 3, Meghalaya (India).

Bhattacharya, P.C. (1988): "Impact of jhuming on wildlife of the North-Eastern Region". Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May 1988, organised by ICSSR, Shillong : 3, Meghalaya (India).

Bhattacharya, T. (1988): "Jhumming in Karbi Anglong" paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May, 1988, Organised by ICSSR, Shillong : 3, Meghalaya (India)

Borah, D.; Goswami, N.R. (1977) : "A comparative study of crop production under shifting and terrace cultivation" - A case study in Garo Hills, Meghalaya. Agro-Economic Research Centre for North East India, Assam Agricultural University, Jorhat-13, Assam.

Borkakoti, S.K. (1988): "Alternative plan for jhum area development". Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May 1988; Org. by ICSSR, Shillong : 3, Meghalaya.

Borthakur, D.N. (1979) : "Problems of Agricultural development" Agriculture in the Hills : A Case Study of Meghalaya, Ed. by B. Datta Ray, North East India Council for Social Science Research.

Dasgupta, M. (1983): "Anatomy of a jhum failure, Some extensions." Journ. of N.E. India Council for Social Sc. Research, Vol.7(1), April 1983.

Dasgupta, M. (1988): "Rehabilating jhumias on Rubber Plantations - An assessment of the Tripura experiment." Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India; 13-14 May 1988; Org. by ICSSR, Shillong: 3, Meghalaya.

Ganguli, G.B. (1970): "Jhumia resettlement and social change in Tripura". N.E. Res. Bull. Vol. 18, 1970-79.

Garret, H.E. (1966): "Statistics in Psychology and Education" 6th Edition, Vakils, Teffea and Simons, Bombay.

Goswami, P.C. (1988): "Control of shifting cultivation in N.E. India - certain basic issues". Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May 1988; Org. by ICSSR, Shillong: 3, Meghalaya.

Kenny, and Keeping (1974): Mathematics of Statistics 3rd edition. Pub. Affiliated East-West Press, New Delhi.

Mathews, T. (1980): "Tribal Economy of the N.E. Region." Spectrum Publications, Gauhati, 1, Assam.

Mawthoh, P.R. (1988): Shifting cultivation or jhumming practice in Meghalaya." Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May 1988; Org. by ICSSR, Shillong: 3, Meghalaya.

Mishra, B.K., Ramakrishnan, P.S. (1982): "Energy flow through a village ecosystem with slash and burn agriculture in North-East India." Applied Sc. Publ. Ltd. England.

Prasad, R.N., Singh, A.; Varma, A.: "Shifting cultivation and Land degradation : Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May, 1988; Org. by ICSSR, Shillong, Meghalaya.

Ramakrishnan, P.S.; Toky, O.P.; Mishra, B.K. and Saxena, K.G. (1978): "Slash and Burn agriculture in North-Eastern India". Proceedings of the conference, "Fire Regimes and Ecosystem Properties". Dec. 11-15, 1978, Honolulu, Hawaii.

Rani, S. (1982): "Determinants of Behavioural properties of Farmers in India : A Comparative study of Haryana and Punjab farmers with respect to consumption and sales of foodgrains in post G.R. Period.". M.Phil dissertation. The Punjabi Univ. Patiala.

Reddy, S.N. and Rao, N.V. (1988): "Shifting cultivation : Attitudes, Constraints and Approaches". Paper presented in the review and re-appraisal seminar on Shifting cultivation in N.E. India, 13-14 May, 1988; Org. by ICSSR, Shillong:3, Meghalaya.

Roy Burman, B.K. (1988): "Definition and main characteristics of shifting cultivation." Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May 1988; Org. by ICSSR, Shillong:3, Meghalaya.

Sarma, S. (1988) .: Shifting cultivation of Meghalaya : A Quantitative Analysis and Cartographic Representation." Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May 1988. Org. by ICSSR, Shillong: 3; Meghalaya.

Sharma, B.D. (1984): "Shifting cultivations and Their Development". N.E.H.U. Journ. of Soc. Sc. and Humanities, Vol. II(2), April-June, 1984.

Shetty, V.S. (1988): "Some Issues on Rural Development". Pigmy Econ. Review. Monthly Econ. Journ. of Syndicate Bank. Vol. 33(II), June 1988.

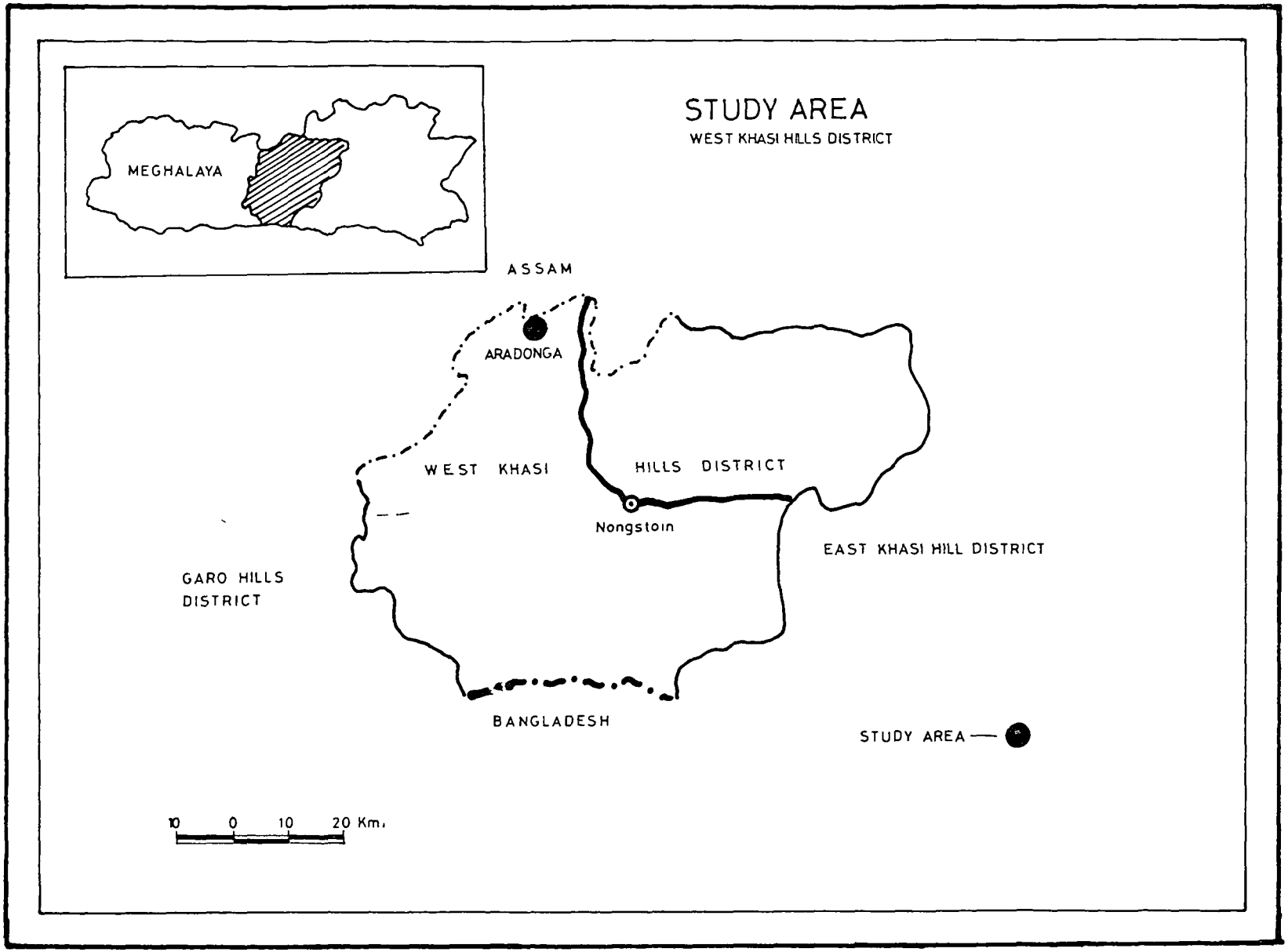
Singh, M.D., Mandal, B.K., Varma, A. (1988): "Integrated approaches as alternative to shifting cultivation", I.C.A.R. Res. Complex. for N.E.H. Region, Shillong. Paper presented in the review and re-appraisal seminar on shifting cultivation in N.E. India, 13-14 May 1988, Org. by ICSSR, Shillong: 3, Meghalaya.

Sri Prakash (1977): Educational System of India - An Econometric Study. Publ. by Concept Publ. Comp. Delhi.

Yule and Kendall (1950): Introduction to the Theory of Statistics, 14th edition Rev. & Enl. edn. London Publisher Charles Griffin.

Appendix 'A'

Map of the Study Site


STUDY AREA
WEST KHASI HILLS DISTRICT
MEGHALAYA
ASSAM
ARADONGA
WEST KHASI
HILLS DISTRICT
Nongstoin
EAST KHASI HILL DISTRICT
GARO HILLS
DISTRICT
BANGLADESH
STUDY AREA
10 0 10 20 Km.

Appendix 'B'

Questionnaire

Survey of Output, Employment and Marketed Surplus under Jhum and Settled Cultivation

I. Identification Particulars :

a) Name of the head of the household

b) Name of the respondent

c) Size of family

(d) Particulars of members of the family

Sl. No.	Name	Sex	Age	Education	Marital status	Earnings	Empd./Unempd./ student	If employed is regular For how many days have you been employed? Did you have work before this job? If yes, what work, where and for how many days?
1								
2								
3								
4								
5								
6								

Sl. No.	Nature of Employment					
	Main	Subsidiary	Self employed	If empld. on regular, part-time or temp. basis	No. of hrs. worked in a day and in a week	Since when empld.
1						
2						
3						
4						
5						
6						

II. a) Size of land holdings:

In Settled			In Jhum		
Cropss and Fruits	Output	Area	Crops and Fruits	Output	Area
1. Rice					
2. Wheat					
3. Maize					
4. Potatose					
5. Millets					
6. Turmaric					
7. Ginger					
8. Chillies					
9. Pepper					
10. Papaya					
11. Pine apple					
12. Brooms					

III. a) Who owns the land ?

Individual / Community / Government / Others' land

b) If land is leased out or taken on lease then the terms and conditions of lease :

c)

Land leased-in	Land leased-out
Area ...	Area ...
Crops ...	Crops ...
Output ...	Output ...
Rent paid ...	Rent paid ...
Period of lease ...	Period of lease ...

d) Whether land is compact or scattered. If scattered the distance at which scattered.

Scattered Land

Sl. No.	Locality	Distance	Area	Type of cultivation settled/jhum	Crops

4. Agricultural assets and equipmentsused:

Names	Self-owned	Hired/Borrowed	Payment	Price at which purchased and data	Maintenance cost
Spade					
Hoe					
Axe					
Plough					
Cattle					

5.1 Area under :
a) Fruits :
b) Forests :
c) Grazing :
d) Fallow :

5.2 Area under : Rabi Khariff Others
Whether they have both Rabi and Khariff

6. Irrigation facilities :

Modes	Area	Expenses Rates	Power
River			
Canal			
Wells			
Tanks			
Ponds			

7. a)

Name of crops grown	Seeds	Area under		Output
		Tradition	H.Y.V.	

b) Fertilizers :

Afea fertilized	Chemical fert.		Biological fert.		Subsidies got in seeds/fert.
	Quantity	Value	Quantity	Value	

c)

Amount consumed	Amount sold	Amount kept at stock

8.

Names of goods consumed	Quantity consumed per month	Self-produced	Bought

1. Rice
2. Potato
3. Onions
4. Spice

8. cont'd.

Names of goods consumed	Quantity consumed per month	Self-produced	Bought
5. Salt			
6. Sugar			
7. Oil			
8. Milk			
9. Milk products			
10. Fish			
11. Eggs			
12. Meat			
13. Fruits			
14. Kerosene			
15. Beatle nuts & Pans			
16. Wheat			
17. Millets			
18. Broom			
19. Firewood			
20. Vegetables			
21. Other fuels			
22. Light			
23. Clothes			
24. Durables			
25. Health			
26. Education			
27. Transport			
28. Taxes charities			

9. Market sales

Crops	Quantities	Price	Agencies

10. a) How many persons are working and for how many hours in a day in :

Ploughing/Clearing Forests	Sowing	Weeding	Harvesting	Etc.

b) Who are engaged in the above occupations ?

Family members / Wage Labour / Exchange Labour

Whether payment is made in cash, kind or labour/ how much paid ?

11. a) Jhum cycle : Average period for which the land is left fallow:

b) For how many times the same field is cultivated before being left fallow?

c) Earnings forgone by leaving the land fallow.

12. Estimated cost incurred in changing a jhum land to settled land.

13. Whether there are any land improvement programmes, viz.

Cost

1. Terracing
2. Fencing
3. Bunding
4. Tree plantation
5. Consolidation
6. Chemical treatments for reclaiming sterile land

14. a) Credit facilities

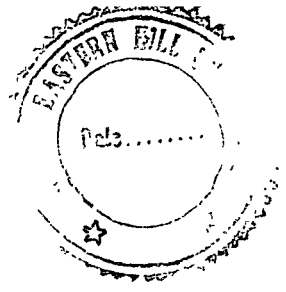
Source	Amount borrowed	Purpose	Amount in instalments	Time span	Whether repayment is made in instalment or in lumpsome	Interest paid

b) If loan is taken by mortgaging land, property, etc.

c) If they get any grants & subsidies from the government

15. Whether the output produced is sufficient for his needs and if any is left over for sale.

16. If they are given government help through the various programmes like I.R.D.P.


EASTERN BILL
Pds.....