Chapter 8

Nature of Relationship Among the Growth of Population, Incidence of Poverty and the Degradation of Forests in Meghalaya

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8.1: Introduction

The linkages between population, poverty and environmental quality or the degradation of forests have long been the subject of debate and concern. It is interesting to investigate to what extent does the growth of population affect the environment or how is the degradation of forests affected when population increase? Various assessments have assigned the major responsibility in the loss of forest cover either to population growth (usually defined as the growth of landless farmers on the perimeter of the forests) or logging, or other commercial resource extraction, including the spread of cattle ranches. All of these factors, are however, linked to population growth occurring somewhere -- the local growth to the inhabitants of the countries where the forests are found; the logging and cattle ranching to increase global demand for tropical woods and beef. This growth clearly relates both to population and economic growth worldwide (Engelman, 1997, p. 18).

Since much of the population still depending directly on land-based subsistence production, especially in the region like the state of Meghalaya, the relationship between population and land degradation (especially forest land) is also very much of interest. The relationship between population, poverty and environment could hardly be direct since, as some have argued, low living standards in the rural areas contribute to increased pressure on natural resources, which in turn aggravate poverty. However, some argue that environmental degradation and rapid population growth are both cause and consequence of poverty. The increasingly complex issues
in environmental degradation intertwined with issues in population change, poverty and food security need to be better understood, especially in Meghalaya, where these linkages are understudied.

A growing population requires more food, which increases the demand for agricultural land in the rural areas. Also, an expanded industrial sector will compete for land with the agricultural sector, which might put additional pressure on land and soil quality. The question is how increased population affects the level of poverty of the poor and how large an impact on forest degradation has resulted from increases in the poor population in the agricultural sector and more in-migrated people in the industrial sector (and/or out-migration of poor people to the non-agricultural sector). The impact of population on agricultural production includes less land per capita, more intensive use of land, and higher dependency ratios per household and income generation and hence poverty. The reverse causality resulting from the complexity of the inter-linkages among population, poverty and forest degradation is also an issue.

The impact of population size on natural resources becomes significant when a growing population increasingly impinges on a resource base that is inelastic in supply like land, major minerals and also forest to a certain extent. This implies a diminished in per capita availability of resources and a negative impact on living standards. The impact on the environment is often viewed in terms of the concept of carrying capacity, which is defined as the maximum number of individuals that can be supported by a given habitats, and that is usually related to the availability of a limiting resource (Reidhead, et al, 1997, p. 47).

To meet the human wants and enhancing the quality of life, that is, development, in the context of growing population, tends to put increasing demands on the environment. Thus, there is a clear link between population, environment, and
sustainable development. Maintaining a balance between the productive potential of the ecosystem with minimal or no damage to its environment and the increase in human welfare, which has to cope with increasing numbers, is very critical issue facing by a contemporary society or economy. Focus on increase in production to cope with the increasing population should ensure that production itself that does not degrade resources beyond their regenerative capacity. The interrelationship between population and environment is a complex one. People modify their environment, population, in turn, is affected by changes in the environmental conditions. While these interrelationships unfold over time, the socio-economic context that plays an important role in mediating them. In a similar fashion, political, social, and economic institutions also play an important role in the overall changes of the environment.

The link between poverty and environment has often been mentioned in the sustainable development literature. The literature that treats the link usually focuses on the vicious circle between poverty and environmental degradation. Malthus was the first to formulate the model on the inter-linkage between population growth and the resource constraints. As a result of rapid population growth, poverty increases and it also induces changes in cropping pattern and extension of cultivation to fragile marginal lands, where the yield is very low that further impoverishes farmers. Existing literature offers two major viewpoints about the precise relationships between population growth and environmental changes. Ehrlich (1968), Ehrlich and Ehrlich (1990), Mink (1993), Subedi (1997) take the view that environmental deterioration is the direct consequence of population growth. They argue that population growth causes a disproportionate negative impact on the environment and that redistributing population would be a dangerous pseudo solution to the population problem.
This signifies that the use/misuse, utilisation, and the assessment of the carrying capacity is manifested through existing technology, affluent/poverty, consumption levels, and efficiency (or misconduct) of existing social, economic, and political institutions (Subedi, 1997, p. 193).

About 80 per cent of the population in Meghalaya still live in rural areas and agriculture is their main occupation. The people have constantly looked for additional land for expanding their cultivation to support the increasing population as well as to improve their economy. In this process, people have been extending cultivation even to the steep hill slopes and clearing forest, raising tendency of soil erosion and affecting the environment. Net cropped area has increased from 174 thousand hectare in 1976-77 to 219 thousand hectare in 2003-04. Also pressure on forest land increased due to rising number of families under shifting cultivation (as shown in chapter-7). Moreover, there has been increasing demand for timber and non-timber forest products, which is clear from the rising aggregate outputs from the forest in Meghalaya (chapter-7). Also, apart from cutting and clearing of forests for agriculture, a large amount of trees have been cut annually for fuel-wood, as firewood is the major source of energy especially in the rural areas.

The resource base in the region has been shrinking and environmental conditions are rapidly deteriorating with heavy population growth and unsustainable consumption patterns of the poor people and their life-styles. This leads to the decline in the forest cover as shown in chapter-6. The degradation of forest cover contributes to poverty through worsened health and by constraining the productivity of those resources upon which the poor rely, and poverty restricts capacity of poor to acting in ways, which are damaging to the environment (Neena, 2000, p. 289).

Gill (1999, p. 22) has recognised the deteriorating impact of growing human
population on the environmental condition and the resulting fragile environment of Jammu and Kashmir. He opined to contain the population growth that was essential to sustain the population there without causing undue stress and damage to the physical environment. However, now it has been widely accepted that if the environment is significantly being degraded and the degradation is not accounted for, then the development will be wrongly measured. Sustainable development, therefore, is not just about protecting the environment but it is about how we can best make productive use of our natural resources in order to eliminate poverty and improve human welfare as well as quality of life (Aluko, 2004, pp. 62-63). These interests has arisen to growing awareness of, and fear about environmental degradation effected by the increasing pressures on resource caused by population growth and by increasing inequalities in access to resources. Despite this growing awareness, it is only in recent times that concerted attempts are being made to address the problems resulting from environmental deleterious and unequal development. These efforts thus require a multidisciplinary approach to understand the ways in which environmental degradation has contributed to the entrenchment of poverty especially in the state of Meghalaya.

Forests meet essential and indispensable needs of the rural population in the form of small timber, fuel, fodder, grazing, and a variety of minor forest produce such as grass, fencing material, bark, fibre, edible flowers and roots, gum and honey, etc. In rural areas, forests even supply food and shelter to the people as well as animal population. Forests yield a variety of produce of commercial and industrial importance such as timber for buildings, pit props and supports for mining, raw material for forest-based industries like pulp and paper, plywood and boards, rayon, matches, shellac, medicinal plants, and essential oils (Chauhan and Chuahan, 1998,
Meghalaya has a pool of renewable and non-renewable resources. But to a large extent the exploitation of these resources has failed to meaningfully alleviate the poverty of most of the population in the state. The exploitation of the resources required particular attention because, by its very nature (due to open access or extent of rural poverty), this is unsustainable. In this chapter the inter-linkages among population, poverty and forest in Meghalaya has been explained. However, some people have argued that the market if work freely, would take care of any resource problem. But in Meghalaya the market never works freely and fairly and hence provides improper signal.

Firstly, markets are monopolistic in many cases in the local areas and secondly, due to infrastructural problem, there is lack of information and huge lag in effects of changes in prices. Moreover, the speed of development and adoption of technology is very slow in the state. Hence, with the rise in prices, we observe very slow substitution of forest based materials by non-forest based and environment friendly technology. Also, still now in the rural areas forest based products (as collected from wild forest without paying anything or purchased from local area) are relatively cheaper and people mostly use forest based products in their daily life. Still fuel-wood and charcoal is used at large for cooking and keeping the room warm in winter (that is shown through primarily collected data later). Also, most of the houses especially of the poorer are made of forest based resources. Moreover, timber is used largely in housing and other construction works in the urban areas also, though concretes are being increasingly used over time. Because of population growth total requirements are also being increased (even with substitution) over time. In spite of rise in price of timber it is still in use because of its suitability to socio-economic and
climatic condition. Spread of education is assumed to raise awareness among the people and improve management of forest resources and economic condition or poverty also dominates in explaining the nature of consumption and extraction of forest resources and thus considered in the present analysis.

First of all a brief review of some available earlier studies on such linkages has been done. Thereafter, the correlation between inter-district variation in population growth, density of population, rural literacy rate, income from forest and degradation of forest has been calculated. The correlation results of pairs of relevant variables are presented in a two-way correlation table. From the correlations among the variables, we tried to find out the dynamic linkage if exists and its nature in the state of Meghalaya. But, as the district-wise data on over time changes in poverty is not available and hence correlating changes in poverty with that of forest or population is not possible; we took recourse to primary data to better analyse the inter-linkages among those variables.

8.2: A Brief Review of Some Earlier Studies on Linkages

Plethora of studies are available on the inter-linkage among population, poverty and environmental and resource degradation. Various studies provide different dimensions of inter-connections and thus found different factors responsible for the environmental degradations at various places. In the literature, various factors have been identified as responsible for degradation of resources at various levels depending on the social and economic conditions in different regions. These are population growth, poverty, institutional mechanism, market failure, public policies, lack of awareness and many more. Therefore, there are debates regarding to what extent poverty is responsible for population growth and environmental and resource
degradation and vice versa. Though review of available literature is provided in detail in Chapter-2, here a brief review of studies on linkages is given.

Malthus (1798) first raised voice against the growth of population to outrun the available food supply. The negative impact of population growth on the available food supply, resources and nature was highlighted in his famous book *An Essay on the Principles of Population*. Since 1960s we observe a series of writings by Ehrlich (1968), Meadows et al (1972), Ehrlich and Ehrlich (1990) etc., who were of the opinion that the world would be falling short of critical natural resources after some time if population continues to grow. They argued that if the existing patterns of population growth and resource use continued, it would lead to environmental breakdown and economic collapse. Even the renewable natural resources like forest, fishery can be exhausted if the population exceeds the carrying capacity and thus rate of extraction is higher than the rate of regeneration. Therefore the Club of Rome stressed on maintaining a balance between the population growth and exploitation of resources for the maintenance of ecological balance and sustainable development of the economies.

On the other hand, free market economists (the neoclassical) and Julian Simon (1981, 1996), Simon and Myers (1994) etc were of the opinion that population growth is not a danger, but a benefit. The world is not running at the risk of shortage of resources. Population growth in many ways helps economic development and better management of resources through their effort and improving knowledge, innovation. Human being continuously learns how to overcome the bottlenecks imposed by the nature. Johnson (2000) also tried to prove through evidences that in spite of huge population growth in the last century the level of well-being has increased manifold and that has been mainly due to the advancement of technology.
During the last Century especially after 1950 maximum growth of population is recorded because of several scientific developments that led to drastic reduction in mortality and manifold increase in food supply in the world. Still now, Malthusian catastrophe that was expected to happen much before and the world to return to a subsistence level have not been observed. The progress was supposed to halt because of over dependence on agriculture (that was subject to diminishing returns) and economic growth was supposed to be outstripped by the growth in population. The interesting point to note is that at the time of Malthus, most societies were constrained by the agricultural limits and the world population was what India’s population today. Still now we did not observe any such catastrophe, rather we are living on an average in a better world today with better food security, fewer famines, lower mortality rates, enhanced life expectancy, better amenities and access to resources and most of those have been possible due to the advancement of education and technology in different fields. Whatever famines and food insecurity we observe today are mostly localised and occur largely due to war, political unrest, market distortions, loss of entitlement and sometimes due to crop failure (that sometimes may be because of unplanned or unsustainable use of land resources).

At the same time, during the second half of 20th Century we observe rising pollution level at many parts of the world, global warming, acid rain, ozone layer depletion, declining forest resources, rising mortality due to lack of access to safe drinking water, falling long term land productivity, loss of biodiversity etc. Those may be not only due to the growth of population but also for the application of advanced technology (but not environment friendly) to meet the increasing need of the growing population and thus raise question about perception and measurement of development.
Here it is to be noted that rising population, when total population is well below the carrying capacity, growth of population normally helps better utilisation of resources with given technology and other parameters. If it crosses that limit, it would lead to rise in pressure on and thus depletion of resources. Definitely, technological development enhances the scope for use of any resource, its productivity and the capability to tolerate and bear more people (i.e., enhance carrying capacity) over time but there is uncertainty whether the same can grow at the required pace all the time and uniformly. It also varies with the variation in consumption basket that changes along with the changes in standard of living and adjusted by the people with technological invention and innovation (De, op. cit). However the concept of carrying capacity is of very little relevance to those who have been optimistic (Simon, Johnson, Solow, Hartwick etc.) and think each and every constraint would be solved through market, if everybody is free and the markets are perfect, which is very difficult to ensure.

Dreze and Sen (1989) have also identified the incidence of poverty and the population growth as the principal reason for the degradation of resources.

Bhagat and Hassan (1994) have shown that the changes in major environmental parameters and degradation of resources in the world during the last Century especially after 1950 was mainly due to the rapid growth of consumption of fossil fuel, industrial production and the growth of the economy, which haven been much higher than the rate of growth of population. Therefore, the degradation of natural resources is not only due to the growth of population but also due to the rapid growth of consumption of resources coupled with the advancement of technology and the later one is much more important than the former one (Macneill, 1989, p. 105). The rise in per capita consumption of such resources in North America and Western
Europe have been much higher than that of other parts of the world, though the rate of population growth was comparatively lower in North America and Western Europe.

Therefore population may be one of the reasons but not the only reasons for the degradation of forest. Ownership pattern may be the other reason. If the resource whether forest or any other is a common resource it will be prone to over-utilisation and hence subject to rapid degradation (Hardin, 1968). Though a major part of forest in Meghalaya is under the community ownership, in most cases there is open access.

By using panel data at the cross country level and using regression analysis, Cropper and Griffiths (1994) show that economic growth would not necessarily solve the problem of degradation of forest. Deforestation in developing countries are also due to market failure arises out of undefined property right, zero private cost of deforestation and as most of the poor people has no property right they do not have the incentive to make efficient use of forest land. But higher population growth leads to higher deforestation and thus in their opinion, controlling population growth is the best method of reducing the rate of deforestation.

Though poorer are often blamed for the degradation of the forest, actually they are not always responsible for that, as in many cases they do not have even proper access due to lack of property right. Also because of their indigenous knowledge and for survival, sometimes they are found to better manage and invest in such resources. It is rather the non-poor who have better access to such resources, damage much of the forest resource. The rich overexploit the forest to make profit whereas the poorer are highly affected due to such degradation (World Bank, 1987 & 1988).

Boyce (1994) also argued that it is not poverty but a combination of greed, power and wealth that causes environmental degradation in many developing countries. Many studies also pointed towards logging activities as the principal
activity responsible for unsustainable deforestation in many parts of Asia, Central Africa and South America (Somanathan, 1991; Anderson, 1989; Repetto, 1990; Cropper and Griffiths, 1994). During 1980s also in Meghalaya to a certain extent, due to attractive benefit in the logging industries many of the community forests were privatised that had been harvested unsustainably.

Also there are studies that show that agricultural and pastoral encroachment has been the primary forces behind unsustainable deforestation and logging has been the catalyst. The infrastructure (road etc) developed due to the expansion of logging opened up forestlands for agricultural and pastoral activities that intensified unsustainable deforestation activities in Amazon basin (Goodland, 1991). Westby (1987), Cruz and Gills (1990) argue that shifting cultivators, agricultural and pastoral encroachment in the wake of logging trails were the major causes of deforestation. Jaganathan (1989) highlighted that market were the main factors causing deforestation in Indonesia. There logging activities were followed by conversion of such land to estates and mixed gardens. Of course poorer were involved in unsustainable activities on such logged lands after being abandoned by previous landlords.

FAO (1993) study also concluded that agricultural expansion driven primarily by population pressures was the principal cause for tropical deforestation in the past. Population pressure as well as government policies, which provided incentives for people to move into these areas contributed to the conversion of large tracts of forestlands into permanent agricultural lands. Also FAO (2005) study shows that the highest rate of deforestation in South America especially in Brazil in the world during 2000-2005 was due to the expansion of soybean plantations and cattle ranches. During the same period the second largest net loss in forests were observed in Africa.

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1 It came out during the discussion of the Author with some District Council Members in East and West Khasi Hills Districts.
particularly in Nigeria and Sudan, which was largely due to the subsistence activities.

Southgate (1988) as well as Ives and Messerli (1988) also cited population growth as the prime contributor to unsustainable deforestation in tropical Africa and the Amazon basin, through the expansion of agriculture and other subsistence activities. Also some other studies show that poverty intensified population growth are partly responsible for large-scale deforestation.

De (2004) explained the inter-linkages among population, poverty and other indicators of human resource development with degradation of environment especially forest in terms of cause-effect flow diagram. Also by using panel data on degradation of forest, incidence of poverty and level as well as variation in per capita SDP, De (2006) has found a significantly positive correlation between income variation and degradation. Also a positive relation is observed in his study between reduction in poverty and degradation of forest. EKC principle however says that the degradation first increase with the rise in income (i.e., in the early stage of development) and after reaching a peak level it declines with further development (Grossman and Krueger, 1995). He opined that the states of North East India were still low developed having lower per capita income than the national average and hence, they were on the rising phase of EKC. Moreover, whatever poverty reduction had taken place it was at the cost of forest resources, which were easily accessible by the people.

Taking village level primary data in Arunachal Pradesh Kuri (2005) has examined the dependence of people on the forest resources and found that almost one-fourth of family income of the poor households comes from common forests resources. The rapid growth of population in the North East India is also partly due to the influx of people from the neighbouring countries, Bangladesh and Nepal and those
immigrants in many cases are responsible for the damage of forest cover (Singh, 1987, p. 146).

Joshi (1990, p. 147) also argued that poverty and population growth (over 2 per cent per year) has affected the economic growth and development of the state of Meghalaya. Sen (1994, p. 53) in his study mentioned that the growth of population is the cause of several problems such as it intensifies food problem, reduces the quality of life of the people and also the happiness of the human race. Dasgupta also identified the degradation of forest that affects the environment and the resources available for economic development. The main causes of forest degradation are the institutional fashion and poverty. He argued that when population size is higher relatively to the resources available, the more urgent is the need to control the growth of population (Dasgupta, 1994, pp. 39-40). At the local level, the combination of poverty and rapid growth of population is often cited as contributing to environmental degradation - for example, rising population pressure leads to farming to hill sides and other marginal areas causing more soil erosion or heavy cutting of forests for fuel, etc. (Birdsall, 1994, pp. 179-80).

The rate of growth and size of population in the states of North Eastern India has influence on environment, natural resources and existing system of food productions. As a result of this, the region is experiencing depletion of flora, fauna and soil, fragmentation of cultivated land, rise in import of food grains from other regions and some socio-economic and cultural problems (Husain, 1994, p. 118).

Lamin (1995, pp. 78-79) argued that the fast growth of population in the state of Meghalaya is responsible for environment and forest resource degradation. The demand for timbers, fuel-wood and other commercial uses of forests continued to rise rapidly causing adverse ecological change. In rural areas with large number of
population, there is always a tendency to over-exploit the supply of natural resources. Exploitation of forest resources can be attributed to the commercial logging and cultivation purposes, which consequently led to the deforestation and soil erosion (Sanchez, 1998, p. 100). Datta (2000, p. 174) and Dutta (2000, p. 382-83) also blamed high rate of growth of population, lack of planning and uneconomic use of land for shifting cultivation for the loss of forest cover in vast areas of Meghalaya.

8.3: Analysis of Secondary Data

Most of the studies on population, poverty and environment interlinkage North-East India, particularly in Meghalaya are superficial and descriptive, devoid of any scientific investigation or mathematical exposition. Hardly any study is there that explicitly use time series or cross section data to find out the inherent reasons for the degradation of forest in the state through observed linkages. So it is essential to investigate the factors that act as mediators in the linkage so that proper policies can be adopted to target the areas of action. Data on all the variables are not available for long period of time as well as for all the districts of Meghalaya. For inter-district comparison thus regression analysis cannot be done due to very low degrees of freedom. Therefore, through two-way correlation table (as mentioned earlier) the pattern of relationship among inter-district variation in population growth, rural poverty, changes in contribution of forestry to Net District Domestic Product (NDDP), changes in net earning from the forest, variation in literacy rate etc is explained.

In the correlation table, changes in poverty (especially rural poverty) are not incorporated as district-wise time series figures are not available. But one point to be noted is that, the state itself is a poverty prone state and changes in Net District
Domestic Product or per capita NDDP, which is very low, can be an indicator of economic condition of the people and thus it is considered for the analysis. More per capita NDDP of a district (if distribution does not differ much) implies relatively less poor district and vice versa. Also persistence of jhum cultivation is there that is normally practised by the poor families.

Table-8.1

Two Way Correlation Table

<table>
<thead>
<tr>
<th></th>
<th>Population Growth</th>
<th>Rural Literacy Rate</th>
<th>Growth of Population Density</th>
<th>Growth of NDDP</th>
<th>Growth of Per capita NDDP</th>
<th>Changes in Contribution of Forest to NDDP</th>
<th>Percentage of Family in Jhum Cultivation</th>
<th>Area under Jhum Cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Growth</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural Literacy Rate</td>
<td>0.146</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth of Population Density</td>
<td>-0.512</td>
<td>-0.487</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth of NDDP</td>
<td>-0.774</td>
<td>0.30</td>
<td>-0.715</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in contribution of Forest to NDDP</td>
<td>0.5266</td>
<td>-0.60</td>
<td>0.461</td>
<td>0.069</td>
<td>-0.923</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of Family in Jhum Cultivation</td>
<td>-0.107</td>
<td>-0.306</td>
<td>-0.09</td>
<td>0.43</td>
<td>-0.28</td>
<td>0.453</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Area under Jhum Cultivation</td>
<td>-0.17</td>
<td>-0.431</td>
<td>-0.24</td>
<td>0.062</td>
<td>-0.354</td>
<td>0.481</td>
<td>0.6714</td>
<td>1</td>
</tr>
<tr>
<td>Degradation of Forest Land</td>
<td>0.411</td>
<td>-0.265</td>
<td>0.298</td>
<td>-0.31</td>
<td>-0.511</td>
<td>0.461</td>
<td>-0.52</td>
<td>-0.0479</td>
</tr>
</tbody>
</table>

Source: Compiled from the data available from Secondary sources viz. Census of India, Planning Commission and Directorate of Economics and Statistics, Government of Meghalaya

From correlation table-8.1, it is observed that the inter-district variation in growth of population and density of population are significantly inversely correlated to that of NDDP and per capita NDDP and significantly positively correlated with the variation in contribution of forest to NDDP and degradation of forest. Variation in growth of literacy rate and per capita NDDP are negatively correlated to contribution
of forest to NDDP and degradation of forest. These two are also negatively related with the variation in percentage of family under jhum cultivation, and area under jhum cultivation but not significantly. Percentage of family in jhum cultivation, area under jhum cultivation and contribution of forest to NDDP are positively correlated among themselves.

Therefore the results indicate that population growth and rising density significantly and adversely affect and are affected by the growth of NDDP i.e., positively associated with the incidence of poverty if there is resource constraint. Even if natural resources are there, major minerals are owned by a few individuals and thus people especially poorer are more dependent on easily accessible forest. Normally poor people prefer more children for better security and collection from the degraded forest. However, if people become educated, they look for alternative opportunities and stress on forest also declines and hence its share in NDDP as well rate of degradation also declines. But in Meghalaya, the effect of education is not so strong because of presence of chronic poverty. Though inter-district variation in growth of per capita NDDP has significantly negative impact on contribution of forest to total NDDP or degradation of forest (indicating that with economic growth or development, pressure on forest declines), actually growth of per capita NDDP of all the districts are much lower than at all India level (which is also clear from the decline in state level ranking in human development and human poverty index) and hence impact on percentage of family and area under jhum cultivation is not so strong. But when income rises, people become less dependent on forest for food, fodder and other materials and hence degradation is likely to be less. However, if contribution of forest to NDDP rises growth of NDDP will be higher and that is likely to compound degradation.
Here it is observed that percentage of family and area under jhum cultivation are negatively correlated to variation in degradation of forest. Still now many of the families especially in rural areas of some districts are still dependent on jhum cultivation (because of low income and alternative opportunities) and still now density of population in those districts is much lower than all India average and other districts (e.g., East Khasi Hills) where less people are less dependent on jhum but due to more density of population per capita availability of land is very less. Therefore the district where relatively less people are engaged in jhum, due to less per capita forest land fallow cycle is short and hence more degradation is observed (as in East Khasi Hills). But the district with more percentage of people in jhum, due to relatively more per capita land availability, fallow period is relatively longer and hence recorded comparatively low degradation. Moreover, if the people become gradually educated but due to lack of availability or entitlement cannot adopt modern techniques of settled cultivation, they try to judiciously manage the cultivable land. Therefore there is likely to be relatively less degradation of forest. However, rapid population growth in that case can disturb the balancing use of forest land for survival. But given the population growth, the district having better quality of forest and hence larger contribution of forest, will have relatively higher growth of per capita Net Domestic Product.

The relation as observed from the correlation table is also shown in the circular flow-chart below. The flow-chart-8.1 indicates how population growth (directly or indirectly) affects and is affected by degradation of forest resources. Similarly, it shows how poverty or growth of per capita income affects and is affected by degradation of natural resource like forest and also how population growth affects and is affected by the variation in per capita income. So it explains the nature of
relationship among population growth, per-capita income and thus incidence of
poverty (where income growth is faster, incidence of poverty is likely to decline) and
degradation of forest in Meghalaya (especially during 1990s).

Flow-Chart 8.1

The relationship can be shown as:

Faster Population Growth

↓

Slow Growth of Per Capita Net Domestic Product

↓

More Dependence and Extraction of Forest Resource

↓

Higher Proportional Contribution of Forest to Net Domestic Product

↓

Faster the Degradation of Forest

↓

Low Per Capita Income/Higher Incidence of Poverty
8.4: Analysis of the Linkage on the Basis of Primary Data

As there was lack of data on exact poverty and the nature of dependence of people on forest, primary data have been collected during January-March 2006, from four sample villages in Meghalaya and from the observations on socio-economic characteristics of the sample households and their utilisation of forest resources we tried to explain the pattern of linkages.

Four villages have been selected purposively (two from East Khasi Hills, one from West Khasi Hills and one bordering East and West Khasi Hills) after having a preliminary idea about their locations, characteristics and level of degradation of the forest resource, distance from their nearest towns and business centres, communication facilities and socio-economic condition of the people. Also, the requirement of time, accessibility and cost for the collection of data has been taken into consideration in this regard. These villages are Mawtawar, Laitjem, Sohiong and Mawlangkhar.

Mawtawar and Laitjem are located in Mylliem Community and Rural Development Block and Sohiong in Mawphlang Community and Rural Development Block of the East Khasi Hills district. Whereas, Mawlangkhar belongs to the erstwhile Nongstoifi (and now to Mawthadraishan) Community and Rural Development Block of West Khasi Hills district.

Sohiong and Mawlangkhar are situated far away from their nearest towns, approximately 30 and 20 kilometres away from Shillong and Nongstoifi respectively. Mawtawar and Laitjem are within 5 and 12 kilometres from their nearest town, Shillong. That means two villages are located nearer to their nearest towns (within 15 KM) and two are far away from their nearest towns (more than 15 KM). Presence or absence of timber industries in and around the village is also taken into consideration.
while choosing the villages. There is only one saw-mill now operating at Mawtawar. Earlier there were five at Laitjem of which now, only three are in operation and at SohTong earlier there were five and only two are actively running and there is no timber industry at Mawlangkhar though earlier there was one.

From each village, 40 families have been selected by simple random sampling without replacements i.e., in total 160 families have been chosen as sample units. From each family, information on their social and economic background especially family size and composition, level of education, land holding, occupation, monthly income, method of cultivation (if farmer), monthly consumption items, housing pattern and materials used in housing, land holding, number of cattle owned, materials (food, non food, housing and marketable items) collected from the neighbouring forests have been gathered. Also we have taken note of the nature of degradation of forests in all those four villages. From there we tried to find out the reasons for differences in dependence of people on the forest and the difference in level of degradation. From the personal experience, we observe that Mawtawar and SohTong recorded very high degradation of forests during past decade. Most part of the primary forests in these two villages have been disappeared because of both subsistence and commercial activities and still now it is going on because these two villages are nearer to business centres and incidence of poverty is also high (though relatively better than the other two villages) in spite of having better urban contact and facilities. Influx of population from the remote villages further compounded the problem. Because of lack of alternative opportunities, education facilities and rising pressure on jhum land; poor people migrate to urban informal sector and settle in the outskirt of the city or stay in the nearby villages from where they can shuttle everyday to their working place. The degradation of forest in the other two villages, Laitjem and Mawlangkhar, are
however less as compared to Mawtawar and Sohong, though they are relatively poorer and there is less availability of substitutes of forest produce like fuel-wood. Agriculture is their main occupation. However, people are also engaged in other occupation and business activities in these villages but on a very minor scale except in Mawtawar.

8.5: Socio-Economic Profile of Sample Villages

The population, family size, the characteristics of their dwelling houses, literacy rate and educational status of the people, their income, etc are first described in this section. Population and its sex composition as observed from the Census of India 2001 are displayed in table-8.2.

Table-8.2
Total Population in the Sample Villages

<table>
<thead>
<tr>
<th>Village</th>
<th>Persons</th>
<th>Males</th>
<th>Females</th>
<th>Sex Ratio per 1000 Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>1134 (36.13)</td>
<td>561 (36.24)</td>
<td>573 (36.01)</td>
<td>1021</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>1062 (33.83)</td>
<td>513 (33.14)</td>
<td>549 (34.51)</td>
<td>1070</td>
</tr>
<tr>
<td>Sohong</td>
<td>655 (20.87)</td>
<td>307 (19.83)</td>
<td>348 (21.87)</td>
<td>1134</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>288 (9.17)</td>
<td>167 (10.78)</td>
<td>121 (7.61)</td>
<td>725</td>
</tr>
<tr>
<td>Total</td>
<td>3139 (100.00)</td>
<td>1548 (100.00)</td>
<td>1591 (100.00)</td>
<td>1028</td>
</tr>
</tbody>
</table>

Source: Census of India, 2001
Note: Figures in brackets indicate percentages to total population of the four sample villages.

The total population in the four sample villages surveyed was 3139, of which 1548 are males and 1591 are females. In Laitjem, there are 1134 persons of which 561 are males and 573 are females. In Mawtawar out of 1062 total populations, 513 are males and 549 are females. In Sohong, out of the total population of 655 persons, 307 are males and 348 are females and in Mawlangkhar, out of 288 persons, 167 are males and 121 are female population. On an average the sex ratio is in favour of females in the surveyed villages, which is opposite to that of all India level and Meghalaya as a
whole. Laitjem and Mawtawar have sex ratios 1021 and 1070. It is the highest in Sohiong (1134) and lowest in Mawlangkhar (725) respectively.

Variation in family size and family-wise age and sex composition in the sample villages are shown in table-8.3. The family size in the sample villages as obtained from the survey data ranged from around 6 to 8.35 persons per family. The number of males and females also comprised of 3 to 5 persons. Also the number of adult and children varies from 3.48 to 4.77 and 2.57 to 3.58 respectively. Sex ratio among the adult and child category also follows similar pattern as that of total population. Among the four villages, Mawtawar has the lowest average family size and number of children per family reflecting the influence of urban contact, educational facilities, and health care hence relatively better human development. On the other hand Mawlangkhar has the highest family size.

Table-8.3

<table>
<thead>
<tr>
<th>Village</th>
<th>Persons</th>
<th>Males</th>
<th>Females</th>
<th>Adult</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>6.82</td>
<td>3.30</td>
<td>3.55</td>
<td>3.62</td>
<td>3.20</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>6.07</td>
<td>3.13</td>
<td>3.00</td>
<td>3.48</td>
<td>2.57</td>
</tr>
<tr>
<td>Sohiong</td>
<td>7.30</td>
<td>3.70</td>
<td>3.60</td>
<td>3.65</td>
<td>3.65</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>8.35</td>
<td>4.82</td>
<td>4.52</td>
<td>4.77</td>
<td>3.58</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

Mawtawar is more advanced among all the four villages in terms of educational achievement as described in table-8.4. Among all the members of the forty families in Mawtawar 52.50 per cent are literate of which 40 per cent are just literate, 5 per cent are secondary passed but less than graduate and 7.5 per cent are graduates and above. It is followed by Laitjem with 32.50 per cent of population literate of which, 5 per cent are secondary passed but less than even high secondary and only 2.5 per cent are graduates. Mawlangkhar records 30 per cent literacy rate of which merely 2.5 per cent are secondary passed, while Sohiong ranked last with just
10.00 per cent of the people are literate. The fact is that Mawtawar has the benefit of urban influence, while Sohörong and Mawlangkhar are far away from the urban area and no urban influence is observed.

Table-8.4

<table>
<thead>
<tr>
<th>Village</th>
<th>Illiterate</th>
<th>Literate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Literate but &lt; Secondary</td>
<td>Secondary but &lt; H.S.</td>
</tr>
<tr>
<td>Laitjem</td>
<td>67.50</td>
<td>25.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>47.50</td>
<td>40.00</td>
<td>2.50</td>
</tr>
<tr>
<td>Sohörong</td>
<td>90.00</td>
<td>10.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>70.00</td>
<td>27.50</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

The incidence of poverty as estimated by using the standard of Rs 327.56 per capita monthly income as poverty line for the sample villages is shown in table-8.5. Most of the families in Mawlangkhar (97.50 per cent) are observed to be poor, which is followed by Laitjem (80 per cent) and Sohörong (75 per cent). Only 32.5 per cent of families in Mawtawar are poor. Despite variations in the level of education, all these four villages are suffering from poverty, which is chronic.

Table-8.5

<table>
<thead>
<tr>
<th>Village</th>
<th>Poor</th>
<th>Non-Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>80.00</td>
<td>20.00</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>32.50</td>
<td>67.50</td>
</tr>
<tr>
<td>Sohörong</td>
<td>75.00</td>
<td>25.00</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>97.50</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

The average monthly income and expenditure of the households in the sample villages are very low compared to national average as shown in table-8.6. The average monthly family income varies from Rs 1870.25 in Mawlangkhar to Rs 3743.75 in Mawtawar. Similarly, monthly family expenditure is the lowest in Laitjem, Rs 1702.40 and it is the maximum in Mawlangkhar, Rs 1867.80. One may be sceptical
about the highest family expenditure of the families of Mawlangkhar where about 97.5 per cent of the families are poor. Actually, in the estimation of total family income the imputed values of items collected from the forest either for consumption or building cottages or fuel-wood or for sale are considered. In Mawlangkhar, family size is larger than other village and most of the members go for collecting forest resources primarily for their subsistence consumption. Though in Mawlangkhar these items are mostly not traded the average value of those items in other markets where these are traded are being taken into account. Similarly for the other villages whether the items are traded or consumed are also considered. Moreover, in the expenditure, values of the items collected and consumed are also incorporated. In Mawlangkhar the harvesting and hunting in the forest is carried out mainly for subsistence where as the in Mawtawar extracted resource is used for both subsistence and commercial purposes. However, in the expenditure we have considered only the general consumption expenditure whether the items are collected from forest or not. But the expenditure on fixed asset like housing etc that is received as aid is not considered.

Table 8.6

<table>
<thead>
<tr>
<th>Village</th>
<th>Family Income</th>
<th>Family Expenditure</th>
<th>Per Capita Income</th>
<th>Per Capita Expenditure</th>
<th>Coeff. of Var. in family income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>2126.50</td>
<td>1702.40</td>
<td>311.8</td>
<td>249.62</td>
<td>99.11</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>3743.75</td>
<td>1753.60</td>
<td>616.76</td>
<td>288.90</td>
<td>95.79</td>
</tr>
<tr>
<td>SohTong</td>
<td>2446.75</td>
<td>1831.80</td>
<td>335.17</td>
<td>250.93</td>
<td>87.99</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>1870.25</td>
<td>1867.80</td>
<td>223.98</td>
<td>223.69</td>
<td>48.51</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

Though average family expenditure is the highest, per capita monthly expenditure is the lowest in Mawlangkhar (Rs 223.69), which is highest in Mawtawar (Rs 288.9). This is because of the larger family size in Mawlangkhar compared to that of Mawtawar. Moreover, coefficient of variation in income is the highest in Laitjem
(99.11) and lowest in Mawlangkhar (48.51). The values for Mawtawar and Sohiong are about 96 and 88 per cent. So, higher income area has a tendency to be associated with greater inequality in the distribution of income.

Percentage distribution of families according to the job status of the head of households is displayed in table-8.7. From the table it is clear that in Mawlangkhar and Sohiong, number of head of the households in the government service and business activities are nil. Most of them are engaged in the cultivation (75 percent) and equal 12.5 percent are agricultural labourer and engaged in other economic activities respectively in Sohiong. In Mawlangkhar, 57 and 35 per cent are in cultivation and other activities (carpenter, mason or other informal occupation) respectively and the rest are agricultural labourer. 25 and 5 per cent respectively in Mawtawar and Laitjem are in service while 40 and 45 per cent head of the families in those two villages are in other activities. Also 12.50 and 7.5 per cent are working as agricultural labourers and in business in Mawtawar. In Laitjem, cultivators are 35 per cent and 10 per cent are in business and only 5 per cent are agricultural labourer.

Table-8.7
Distribution of Families According to the Job Status of Head of the Households in the Surveyed Villages (in Percentage)

<table>
<thead>
<tr>
<th>Village</th>
<th>Service</th>
<th>Agricultural Labourer</th>
<th>Cultivator</th>
<th>Business</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>5.00</td>
<td>5.00</td>
<td>35.00</td>
<td>10.00</td>
<td>45.00</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>25.00</td>
<td>12.50</td>
<td>15.00</td>
<td>7.50</td>
<td>40.00</td>
</tr>
<tr>
<td>Sohiong</td>
<td>0.00</td>
<td>12.50</td>
<td>75.00</td>
<td>0.00</td>
<td>12.50</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>0.00</td>
<td>7.50</td>
<td>57.50</td>
<td>0.00</td>
<td>35.00</td>
</tr>
</tbody>
</table>

Source: Compiled from the Field Survey.

The majority of people in the sample families are living in Kachha houses and only few of them live in the Pucca houses, which are described in table-8.8. Over 92 per cent of the families in Laitjem, 77.50 per cent in Mawtawar and 97.50 per cent in Sohiong live in Kachha houses. However, all the families in Mawlangkhar stay in
Kachha houses. For the construction of Kachha houses major portion of the materials (timber, bamboo, leaves etc) are collected from the nearby forest. Those who are relatively better off in terms of job status as well as income and do not collect themselves (either for status and position in the society or higher opportunity cost), purchase those items from others. Only a few in the survey villages live in Pucca houses and most of them belong to Mawtawar.

Table-8.8

Distribution of Families According to the Character of Dwelling Houses

<table>
<thead>
<tr>
<th>Village</th>
<th>Kachha</th>
<th>Pucca</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>92.50</td>
<td>7.50</td>
<td>100.00</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>77.50</td>
<td>22.50</td>
<td>100.00</td>
</tr>
<tr>
<td>Sohiong</td>
<td>97.50</td>
<td>2.50</td>
<td>100.00</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>100.00</td>
<td>0.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: Compiled from the Field Survey

Table-8.9 shows that fuel-wood is the main items that the people of these sample villages are using for their cooking purposes. Only a few of the people are using charcoal, LPG and other cooking materials like kerosene and electricity. Only 2.5 per cent of the families in Mawtawar, which is nearer to town, are using LPG gas and 12.5 per cent are using other cooking materials while 17.5 per cent use charcoal. It indicates that some families in Mawtawar are using combination of two/three types of fuel. In Sohiong and Mawlangkhar, 27.5 and 12.5 per cent of the families use charcoal along with fuel-wood. The figure is only 5 per cent in Laitjem. Therefore, forest is the main source of fuel or energy especially in the rural areas. In the more interior areas even the richer are compelled to use litters and fuel-wood as other sources of fuel are not available.
Table-8.9
Distribution of Families According to the Use of Fuel for Cooking in the Sample Villages (in Percentage)

<table>
<thead>
<tr>
<th>Village</th>
<th>Fuelwood</th>
<th>LPG</th>
<th>Charcoal</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>100.00</td>
<td>0.00</td>
<td>5.00</td>
<td>2.50</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>95.00</td>
<td>2.50</td>
<td>17.50</td>
<td>12.50</td>
</tr>
<tr>
<td>Sohiong</td>
<td>100.00</td>
<td>0.00</td>
<td>27.50</td>
<td>0.00</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>100.00</td>
<td>0.00</td>
<td>12.50</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

From table-8.10 we observed that almost all the families in the village Mawlangkhar go for collecting fuel-wood. But in other three villages the figure varies from 45 to 62.5 per cent though most of the families in those villages also use fuel-wood or charcoal (as seen in table-8.9). It indicates that many of the families in those villages purchase fuel-wood, charcoal (of course that comes from the nearby forest) from the market and many people earn by selling those. Another reason may be that the family size is small in Mawtawar and hence they have less manpower to collect fuel-wood from the relatively more degraded area and some of them have relatively better job opportunities and hence opportunity cost of collecting fuel-wood is more.

Table-8.10
Distribution of Families in the Sample Villages Collecting Items of Daily Need from the Forests (in Percentage)

<table>
<thead>
<tr>
<th>Village</th>
<th>Fruit</th>
<th>Leaves</th>
<th>Fuelwood</th>
<th>Timber</th>
<th>Bamboo</th>
<th>Grass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>0.00</td>
<td>5.00</td>
<td>50.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>0.00</td>
<td>0.00</td>
<td>45.00</td>
<td>0.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Sohiong</td>
<td>5.00</td>
<td>35.00</td>
<td>62.50</td>
<td>5.00</td>
<td>5.00</td>
<td>25.00</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>15.00</td>
<td>52.50</td>
<td>97.50</td>
<td>20.00</td>
<td>10.00</td>
<td>60.00</td>
</tr>
<tr>
<td>Total</td>
<td>5.00</td>
<td>23.12</td>
<td>63.75</td>
<td>6.25</td>
<td>5.00</td>
<td>22.50</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

Many of the people in the sample villages used to collect some other necessary items from the forests for meeting a part of their daily needs such as fruits, leaves, timber, bamboo, grass, etc. The table shows that 15 per cent of families of Mawlangkhar and 5 per cent of Sohiong used to collect fruits from the nearby forests.
Also 52.00 and 35.00 per cent used to collect leaves, 97.50 and 62.50 per cent timber, 10.00 and 5.00 per cent bamboo and 60.00 and 25.00 per cent grass respectively in those two villages. On the other hand, families of Laitjem and Mawtawar used to collect mainly fuel-wood (50.00% and 45.00% respectively) and only very few of them collect other items. Whereas the over all collection of fuel-wood and timber is done by the 63.75 and 6.25 per cent of families in the four villages. Apart from those items, people of rural Meghalaya also collect wild roots, stems, bamboo shoots, seeds for consumption and some people also go for hunting. However, wild biodiversity has been declining due to loss of dense forest. Though time series data is not available on those aspects one can safely argue that the availability of those materials must be declining with the degradation of their host, which is forest.

Table-8.11

<table>
<thead>
<tr>
<th>Monthly Average Income, Expenditure and Per Capita Income of the Households that collect materials from the Forests (in Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Village</td>
</tr>
<tr>
<td>Laitjem</td>
</tr>
<tr>
<td>Mawtawar</td>
</tr>
<tr>
<td>Sohiong</td>
</tr>
<tr>
<td>Mawlangkhar</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey, Note: HH means household.

Table-8.11 shows the average family and per capita income and expenditure of the households that used to collect materials from the forests. In Laitjem, out of 40 households, 21 households who collect material from forest have average family income of Rs. 1717.29. The figures for 17, 25 and 39 families of Mawtawar, Sohiong and Mawlangkhar are Rs. 2955.88, Rs. 2909.84 and Rs.1840.54. The per capita income of those families in the respective villages is Rs. 231.17, 474.06, 363.73 and 218.18 respectively. Similarly average family expenditure of those families varies
from Rs 1711.61 to Rs. 2026.88. Per capita expenditures however are Rs. 230.41, 236.72, 253.36 and Rs. 217.50. Except in Sohiong in other villages’ per capita income and expenditure of the families who collect materials from forest are lower than those, who do not collect anything from forest. It is observed when we compare it with the results for all families as shown in table-8.6. It indicates that the poorer collect more for their subsistence from the forest than the relatively better off families.

In Sohiong actually 75 per cent of the families are cultivator and also many of them harvest their clan forest primarily timber, bamboo along with other items, which are sold in the timber industries located in their village. Whereas in other villages especially in Laitjem and Mawlangkhar, people who do not have sufficient alternative opportunities mainly harvest forest for fuel-wood, grass, leaves for their subsistence. In Mawtawar however the earning of the people who collect material from forest is more than those of other villages though they collect mainly fuel-wood and a few collect bamboos. This is because the families who collect forest resource (it is their subsidiary income) in Mawtawar simultaneously earn from other sources as some other family members are engaged in relatively better (mainly informal) opportunities in the nearby town. Also they get better price of the forest products in town.

### Table 8.12

<table>
<thead>
<tr>
<th>Village</th>
<th>Cow</th>
<th>Goat</th>
<th>Sheep</th>
<th>Pig</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sohiong</td>
<td>53</td>
<td>24</td>
<td>7</td>
<td>28</td>
<td>112</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>143</td>
<td>23</td>
<td>13</td>
<td>33</td>
<td>212</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>196</td>
<td>47</td>
<td>20</td>
<td>83</td>
<td>347</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

Owning of cattle by the sample households is displayed in table-8.12. The total number of cattle recorded by the people of the sample villages was 347, (196
cows, 47 goats, 20 sheep and 83 pigs). Mawtawar is the only village that has been found without any cattle rearing. Moreover, people of this village are relatively rich and forest in Mawtawar is already degraded compared to other villages and so people will have to go far away for grazing their cattle. But the family size here is smaller and number of children who generally performs this task is less in number and most of the available children are in education and thus very less time is devoted to such activities. Also the opportunity cost of grazing cattle by the high collar job holders are more and hence there is less incentive in rearing cattle. In Laitjem only 23 pigs are recorded. However, maximum number of cattle is reared in Mawlangkhar and followed by Sohiong, which is an indication of deep dependence on neighbouring forest resources of Mawlangkhar.

Table-8.13

Distribution of Family Members of the Cultivator Headed Families in the Sample Villages (in Percentage)

<table>
<thead>
<tr>
<th>Village</th>
<th>Permanent (1)</th>
<th>Shifting (2)</th>
<th>Both (1+2)</th>
<th>None-of these</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>20.00</td>
<td>17.50</td>
<td>22.50</td>
<td>40.00</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>17.50</td>
<td>5.00</td>
<td>0.00</td>
<td>77.50</td>
</tr>
<tr>
<td>Sohiong</td>
<td>37.50</td>
<td>17.50</td>
<td>30.00</td>
<td>15.00</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>55.00</td>
<td>0.00</td>
<td>35.00</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

Earlier we had seen that maximum families in Sohiong and Mawlangkhar are cultivators (in table-8.7). Both permanent and shifting cultivation have been practised by the villagers, which is shown in table-8.13. Rice is grown in the field especially by those practising permanent cultivation, whereas in shifting cultivation, besides the main crops of rice and maize, other crops such as vegetables, millets, potatoes, sweet potatoes, pulses, chillies, ginger, cabbage, cauliflower and many others are also grown. Table-8.13 also shows that 30 per cent and 35 per cent of the cultivator headed families in Sohiong and Mawlangkhar respectively follow both shifting and settled cultivation. Now many are following permanent cultivation due to lack of forest
resources and that is compounded by the rising population though the productivity is still lower because of non-application of modern inputs. The non-of these, here indicate the children or very old people of the cultivator headed families and to those who are engaged in raising orchids, other plantations or in small business etc.

Table-8.14

Distribution of Families According to Ownership of Land they use (in Percentage)

<table>
<thead>
<tr>
<th>Village</th>
<th>Own Land</th>
<th>Community Land</th>
<th>Other Private Land</th>
<th>Own &amp; Other Private Land</th>
<th>Both</th>
<th>Other Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>19.44</td>
<td>8.33</td>
<td>58.33</td>
<td>2.78</td>
<td>11.11</td>
<td></td>
</tr>
<tr>
<td>Mawtawar</td>
<td>2.78</td>
<td>22.22</td>
<td>69.44</td>
<td>5.56</td>
<td>00.00</td>
<td></td>
</tr>
<tr>
<td>Sohong</td>
<td>16.22</td>
<td>32.43</td>
<td>48.65</td>
<td>2.70</td>
<td>00.00</td>
<td></td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>32.26</td>
<td>00.00</td>
<td>54.84</td>
<td>12.90</td>
<td>00.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

Distribution of families according to ownership of land is presented in table-8.14. It is noticed that 19.44 per cent of families in Laitjem have their own land for settled cultivation and other purposes and the rest of the people are using community land (8.33%), other private individual land (58.33%) and other land not included in the above category (11.11%). Only 2.78 per cent family use both own and other private land. In Mawtawar, only 2.78 per cent of the people own land, 22.22 per cent uses community land and 69.44 per cent enjoys other private land and 5.56 per cent use both types of land. In Sohong, 16.22 per cent of the inhabitants have their own land and 32.43 per cent depend on the community or clan land and 48.65 per cent encroach to other private individual land, whereas in Mawlangkhar 32.26 per cent of the people are owning land and 54.84 per cent depend on other private land, 12.90 per cent use both and nobody is found to use community land as there is no community land in this village.

Based on the reply by the people of these villages, it is observed that most of the people in Laitjem agree that in-migration has taken place in that village during last 15 years (because it is nearer to town, though it is also a poor village) from interior
villages for business, cultivation or joining as daily labourer due to lack of sustenance in their native villages. The crisis in the migrants' original village has been due to population growth and simultaneous fall in availability of forest resource (table-8.15). Out-migration of the people in Mawtawar is nil and 100.00 per cent of the people agree that in-migration has been there from interior villages to have opportunities in neighbouring town and other reasons mentioned above. Also 77.50 per cent of the people in Sohiong informed that the people from the village migrated to other parts of the state in search of job and employment opportunities and 85.00 percent of the people in Mawlangkhar are migrated to urban areas and centres for accessing better unskilled job and facilities to improve their standard of living. However, no immigration has been reported by the respondents of this village. Some people of Sohiong and Mawlangkhar are reluctant to say anything about it. It indicates that the people of Mawlangkhar, who are very poor and due to large family size (hence rising population over time); intensity of dependence on forest increase but income drawn from forest declining and hence people forced to go to other relatively developed or virgin forest areas for the survival.

Table-8.15

<table>
<thead>
<tr>
<th>Village</th>
<th>Out-migration</th>
<th>In-migration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laitjem</td>
<td>2.50</td>
<td>97.50</td>
</tr>
<tr>
<td>Mawtawar</td>
<td>0.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Sohiong</td>
<td>77.50</td>
<td>12.50</td>
</tr>
<tr>
<td>Mawlangkhar</td>
<td>85.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey

From the comparison of tables we find that people of poorer village earn relatively more from forest. However, people of village adjacent to town or having more timber industries also harvest forest and both for sustenance and commercial activities and hence intensify the process of degradation. Though major fuel source in
all the villages is firewood, in the distant village intensity of fuel-wood use is relatively more due to lack of alternative energy resources. For the cultivation or harvesting of forest materials people of all the villages depend both on personal, community and other private land. Government forest land is very less in these areas. To explain the relationship between education, income (poverty) etc on population growth from micro level data or to examine the specific impacts of education, family size, income etc on the dependence of families on forest resources for specific purposes (such as fuel wood collection, earning etc), regression method is followed and explained in the next part.

8.6: Regression Result

Here simple linear regression is followed and though education, family size, job status are supposed to be correlated we find no significant correlation among them except between job status and education or family size and income, which is presented in the two-way correlation table-8.16. Hence in some equations we exclude job status or consider only average schooling of the adults’ only and record changes in parameters but no significant changes in result is observed.

Table-8.16
Two-Way Correlation Table

<table>
<thead>
<tr>
<th></th>
<th>Average Schooling</th>
<th>Monthly Family Income</th>
<th>Distance from Town</th>
<th>Land Ownership</th>
<th>Job Status</th>
<th>Family Size</th>
<th>No. of Saw Mill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Schooling</td>
<td>I</td>
<td>.0508</td>
<td>-.307</td>
<td>-.0556</td>
<td>-.516</td>
<td>-.1046</td>
<td>.0057</td>
</tr>
<tr>
<td>Monthly Family Income</td>
<td>1</td>
<td>1</td>
<td>-.1989</td>
<td>-.2752</td>
<td>.0785</td>
<td>-.539</td>
<td>-.0709</td>
</tr>
<tr>
<td>Distance from Town</td>
<td></td>
<td></td>
<td>1</td>
<td>.0703</td>
<td>.2669</td>
<td>.14232</td>
<td>00</td>
</tr>
<tr>
<td>Land Ownership</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>-.0277</td>
<td>-.017</td>
<td>.02009</td>
</tr>
<tr>
<td>Job Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>.0905</td>
<td>-.02913</td>
</tr>
<tr>
<td>Family Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>-.01581</td>
</tr>
</tbody>
</table>

Source: Compiled from the field survey
The result obtained by simple linear regression is presented below:

1. \( FW = 0.3316 - 0.078 \text{EDU} - 0.0003 \text{FI}^* + 0.0521 \text{FSIZE}^* - 0.03125 \text{JOB} \)
   \((-0.668) \quad (-1.75) \quad (3.76) \quad (-1.077)\)
   + 0.1735 \text{LAND}^* + 0.1833 \text{D}^*
   \((1.984) \quad (2.42)\)
   \(R^2 = 0.281, n = 160, df. = 153\)

2. \( INF = 0.072 + 0.0171 \text{EDU} - 0.00012 \text{FI}^* + 0.00502 \text{FSIZE}^* - 0.009 \text{JOB}^* \)
   \((0.822) \quad (-4.13) \quad (2.03) \quad (-1.75)\)
   + 0.0111 \text{LAND} + 0.064 \text{D}^*
   \((0.7192) \quad (4.78)\)
   \(R^2 = 0.32, n = 160, df. = 153\)

Note:
Here \( FW = \)Fuel-wood, \( INF = \) percentage of family income earned due to forest resources, \( \text{EDU} = \)Average Schooling, \( \text{FI} = \)Monthly Family Income, \( \text{FSIZE} = \)Family Size, \( \text{JOB} = \)Job Status, \( \text{LAND} = \)Land Ownership, \( \text{D} = \)Distance of Village from the nearest town, \( df \) indicates the degrees of freedom, figures in the parentheses are the t-values and * and ** indicate that the coefficient is significant at 5 and 10 per cent level of significance respectively.}

[Average schooling index per family is calculated in the following way. First we have assigned values 0 for illiterate, 1 for literate but less than secondary passed, 2 for secondary but less than higher secondary, 3 for higher secondary but less than graduate and 4 for graduate and above. After assigning the values for each individual we added to get aggregate value of each family and then dividing by the family size we estimated average schooling index. Similarly the education index for the adults is constructed. For job status, we have put 1 for service, 2 for agricultural labourer, 3 for cultivator, 4 for business and 5 for others. Normally we assume that more combined job status of families will have a negative impact on degradation. Though service holders have relatively less tendency to degrade but here we observe very few people who belong to that category.]

Incorporating the number of sawmills in the villages we find,

3. \( INF = 0.12 - 0.0076 \text{EDU} - 0.00012 \text{FI}^* + 0.005 \text{FSIZE}^* - 0.0082 \text{JOB}^* \)
   \((0.38) \quad (-4.19) \quad (2.024) \quad (-1.714)\)
   + 0.011 \text{LAND} + 0.0602 \text{D}^* - 0.014 \text{SM}^*
   \((0.75) \quad (4.81) \quad (-4.94)\)
   \(R^2 = 0.402, n = 160, df. = 152\)

Considering only the average schooling of the adult members and leaving job status of the head of the families we get,
4. INF = 0.089 - 0.0019 EDU(Adult) - 0.00011 FI* + 0.0043 FSIZE*
   (-0.2075)   (-4.43)   (1.65)
   + 0.011 LAND + 0.064 D* - 0.014 SM*
   (.754)   (5.15)   (-4.97) ; R^2 = 0.3892, n = 160, df = 153

Considering job status of the head of household and leaving number of sawmills we get,
5. INF = 0.078 - 0.0029 EDU(Adult) - 0.00011 FI* + 0.0045 FSIZE** - 0.0086 JOB*
   (-0.306)   (-4.155)   (1.61)   (-1.671)
   + 0.0116 LAND + 0.061 D*
   (0.75)   (4.56)  R^2 = 0.32, n = 160, df = 153

The result indicates that there is very insignificant impact of education on the collection of fuel-wood or percentage of income earned from forest. Actually there is high degree variation in educational level and a very few are educated in the sample villages. Moreover the villagers are poor and hence human development level is also low. The incidence of poverty and lack of other opportunity push them towards forest resources and more so if it is common. Both, collection of fuel-wood and earning from forest are significantly positively affected by family size and negatively related to total family income. Better job opportunity is also negatively related to dependence of people on forest.

Larger family size means more requirements and thus it intensifies harvesting of forest. Moreover we have seen the low educated, relatively poor village has relatively larger family size and hence dependence is more. The negative coefficient of FI indicates that the affluent people will be less dependent on forest. It does not mean that they do not use forest resource. What it indicates is that they devote less time for harvesting forest due to the high opportunity cost of their time. Rather they collect fuel-wood, charcoal and other items from the other people as in the interior villages LPG and other fuel is not available. Also they find some locally collected
items cheaper than at town and hence many of the items available in the nearby forest also find place in their daily menu though the percentage is less for the rich.

Though from the over all sample villages we find inverse relation between income and extraction of forest resource, in one village (Mawlangkhar) we observed average income of the people who extract forest is more than who do not. Actually in that village (which is also far away from town/business centre) forest and agriculture together constitutes the main occupation due to lack of other opportunities. Hence those who collect more they earn more. Moreover, a very few people own land (31 family out of 160 in total) and thus forest and hence they harvest commercially though on a limited scale and their income is therefore much more than the others in that village. That is why the distance here has significantly positive impact on collection of fuel-wood and contribution of forest to family income. Though there is limited commercial activity, it is one of their main earning sources. However, presence of sawmill (some of which are closed now) has negative impact on the percentage of earning from forest. Actually, sawmill are run through large scale commercial extraction of timber, but that is of private forest of the owners in many cases or if community forest then it provides revenue mainly to those who have better access and control over power to use it. The general poor families extract mainly for survival.

8.7: Conclusion

From the correlation table-8.1 and flow-chart-8.2 as well as the regression output of the primary data we can argue and conclude that population growth where technology and industrial development is very poor in the state like Meghalaya, has significantly positive impact on the rate of extraction of forest resources either for
fuel-wood or consumption or generating revenue. The correlation between district-wise variation in population growth and per capita Net District Domestic Product during 1993 to 2000 was significantly negative but correlation of variation in population growth with that of rural literacy rate is insignificant (here we have considered only rural literacy as more than 80 per cent of population in Meghalaya are rural. Though rising educational level is expected to raise the capacity to earn more and reduce demand for more children, and also raise awareness about the need for judicious use and preservation of forest; just mere variation in literacy is not enough and more so if the area suffers from high degree of poverty. The poorer even if little educated is expected to prefer more children for their future insurance and also to extract forest resources for survival where there is no other major source of sustenance (Goodstein, 1999, Pp. 429-460). However, educated people may try to better manage forest resource for their survival. But that is not possible unless property right of those people is secured.

Poverty level in the state has not been reduced significantly relative to other states, which is clear from the over time lowering of position at all India ranking in poverty as well as human development as explained in Chapter-5.

Forest is the source of a part of income and survival of those living around it. So pattern of cooking fuel, cattle rearing and other consumption habits and thus quality of life is also partly shaped by the availability of forest resources. Also a few people earn substantial income from timber collection and that is expedited if there is better access and timber industry is there in and around the village. Even though some of the families who do not collect forest resources by themselves, forest resources become a part of their daily uses. They collect those from the others who collect such materials and sell, as these are relatively cheaper than their substitutes in the villages
and more so when alternatives are not available. So, the relatively better off families also save a part of their income due to availability of forest resources.

From the regression results, we observe rising income has significantly negative impact on the fuel-wood or percentage of income collected by the families from the forest and thus their dependence at the micro level. However, land holding has positive relation with the rate of fuel-wood extraction. One may think that larger the land holding means better economic condition of the family and hence less dependence and hence degradation. But, here whatever the bigger landowners earn is actually from the use of their agricultural land or forest land in the absence of any other opportunity and thus a direct impact on the forest. But the impact on percentage of earning from forest of land holding is not significant. Though at the individual household level, rising income is inversely related to the degradation of forest, from correlation table we observe, the more the contribution of forest, with other things remaining identical (technology, productivity of other sector etc) the faster will be the NSDP growth. It means the area or district that has higher potential for extraction of forest resource, observes better growth of income. So in that case, it is essential to main a good quality forest for the sustainable growth of the economy. Therefore, although in general rising income is supposed to be associated with the reduction in dependence on forest, in the interior villages without alternative opportunity except farming and where forest is common, the income rises proportionately with extraction.

Collection of fuel-wood or other consumption items is positively associated with the family size, which is significant. Actually a smaller family can also extract more if they do it for commercial purposes or if their per capita consumption of such items is higher.
From the regression we also observe significantly positive impact of distance at family level on the fuel-wood extraction or percentage of income earned from the forest. This is because the families of the interior village have less scope of earning from other source and most of them are poor as we have seen from the collected data. Also, alternatives of fuel-wood are not available in the interior areas. However, comparing the four villages on personal observation we find that the village adjacent to town or having saw-mill observes more degradation, which has been mainly due to the large scale commercial harvesting in the earlier years. Hence now people of that village is relatively less dependent on forest as less resource is available and alternative source of income is there either in nearby town or developed within the village.

Moreover, distance of villagers’ from the nearby forest affect negatively the amount of collection as more distance requires more time and manpower to collect the same. But here most of the families in all four villages except a few in Mawtawar are located within forest area and thus we have not considered it in our regression as another explanatory variable.

Also though people of Mawlangkhar are highly dependent on forest but degradation (from personal observation) is less as they use forest mainly for subsistence but place like Mawtawar where marketing is the primary consideration degradation is rapid. So even with identical population pressure degradation can be more if extraction is for commercial purposes.

Finally we can say that the best way to preserve forest and improve the condition of the people is to improve economic condition of the people through education and technological development, suitable cultivation approach and also to follow a judicious land use pattern so as to maintain the forest resource and its
productivity, which in turn provide sustainable sustenance to the people and also improve the condition of the poorer. Participatory management has been advocated by many and thus became an alternative option for this. Moreover, education would help in controlling family size and thus population and raise the efficiency and productivity of the people and lead to better management of forest resource that would avail them sustainable benefit. Though good connectivity with the remote areas enhance the chance of commercial extraction, it can help reaching alternative fuel to the interior, increase scope of education and other opportunities to the interior people. If that is associated with simultaneous effort on social forestry, farm forestry, eco-tourism etc then it can help better management of forest. The harvesting should not be stopped as peoples' economic condition is highly dependent on forest. Rather a scientific and judicious approach can help improving living conditions of local people or standard of local economy as well as better forest areas.

References:


Joshi, B. K (1990): “Poverty, Inequality and the social Structure,” in Tarlak Singh (Ed), Social Science Research and Problem of Poverty, Concept Publishing Company, New Delhi, p. 147.


