Population, Poverty and Environmental degradation in Nagaland: An overview Analysis

Chubakumzuk Jamir[1]

[1] Yingli College, Department of Economics
Longleng, Nagaland: India

E-mail: ckumzuk7@gmail.com

Abstract

Nagaland is located in the Far East region of East Asia towards Northern part of Indo-Myanmar mountain ranges is well-known among conservationists and environmentalist for its unique forest ecosystems and also for its alarmingly high rates of deforestation through various forms of economic activities. High population growth and continued economic development have caused serious environmental damage in the region. To this end, the study seeks to assess the impact of population pressure on environment resources, with particular reference to the degradation of natural endowments like forest and land resources. This paper reviews existing evidence and offers a conceptual framework for the investigation of complex dynamics among population growth, poverty and environmental degradation. The evaluation suggests that higher population and fertility rates were associated with higher deforestation rate in the tropical evergreen forest of Nagaland. Poverty reduction and environmental protection are two international obligations for sustainable development. The relationship between population, poverty and environmental degradation is regionally unique or has regional uniqueness. The study is based on both primary and secondary source of data. A total of 400 household were selected using stratified random sampling technique for measurement of Multidimensional Poverty Index. This paper analyses the poverty level using below poverty line (BPL) card holder. Composite Index was used to compare the environmental degradation cause by rapid rise in poverty level. The finding shows that during 1987-88 the poverty rate was 34.43% and the forest loss was found to be -192 sq. km which further increases to 33.83% (poverty rate) and forest loss to -450 sq. km during 2016-17. The result highlights high level of poverty thereby, affecting the environment resources. The paper suggests suitable measures which can ameliorate the poverty and environmental degradation.

1. Introduction

In underdeveloped and developing countries deprived population have normally taken the burden of shouldering the whole blame for the cause of serious trouble in the society, the most present day accountability directed in opposition to them is that they cause destruction of ecosystem (Boyce, 1994; Duraiappah, 1998). The Brundtland Commission record generally well-known definition of sustainable development, this definition enclose the social, financial and environmental necessities of both present and future generations and prominence the mannequin that what we do at present determine what is possible tomorrow (United Nations, 1987; Drolet, 2015). The Bruntland Commission Report 1983, which unexpectedly has been welcome as the plan for environmental preservation, it is obviously cited that income deprivation is a predominant cause of environmental troubles and enhance of poverty is a requisite and fundamental condition of any successful program to deal with environmental assignment (Kramer, 2012; Bruntland Commission, 1983).

The World Bank 1992 joined the agreement with the World Development Report, where it openly stated, low income households who have to meet short term basic needs mine the natural assets by excessive cutting of trees for firewood and failure to restore soil nutrients. However there is a mounting progress in the economic literature which disputes the conventional concept and content that more composite set of variables comes into play and that simple generalizations of this multidimensional hassle are often invalid and misses many considerable points. These studies point out population, social, political, economic and institutional determinants as central parameters in the poverty-environmental degradation connection. In the World Bank mission declaration, combating poverty with enthusiasm and professionalism for lasting results, the World Bank has expanded its focal point on poverty reduction program. Increasingly, country actions are focusing exclusively on poverty reduction outcomes, and are requiring the sectors to work collectively to achieve those outcomes. Until recently, the controlled approach for environmental activities within any particular country or place is primarily based on attaining the most environmental benefit for a unit of expenditure. Environmental benefits are notion to promote society as a whole, so our goal has flawlessly been to maximize our societal benefits. In the equal way, other sectors have pursued their very own objectives, regularly aiming for the greatest social advantage or economic development and now not particular to limit poverty (World bank, 1992).

The World Bank updated poverty line of $1.90 a day, the estimated for 2012 put in light the number of extremely poor population at about 900 million or 12.7% of global population based on 2011 purchasing power parity (Global Monitoring Report, 2015-16). In 1998 World Bank Report, "Reducing Poverty in India" focuses on the number of anti-poverty programes of the government. During the last seventy years since independence, India has accomplished many astonishing social and economic parameters in different fields like education, health care, reducing gender inequality, raising standard of living, manage over the population growth, reducing income inequality, employment generation etc. Accordingly government has carried out range of plan, projects, policies and programme for the improvement of the poor people. For India poverty level according to C. Rangarajan during 2011-12 was 29.5%. For the state of Nagaland the average MPCE (monthly per capita consumption expenditure) was 1229.83 for rural sector and Rs 1615.78 for urban sector, and the total poverty level was 14%. In recent time Government of India highlighted that Nagaland is the absolute best upward shove in poverty level with 4.1 lakhs population residing under poverty line in 2009-10, as against 1.7 lakhs in 2004-05 (Planning Commission, 2014).

Poverty in Nagaland is most rigorous in rural sectors where an estimated 71.14% of the total population lives in, obtain their livelihood from the natural resource base (Census, 2011). One of the most key attribute of agriculture zone in Nagaland is the massive existences of subsistence economy, which makes agriculture even more vital for food supply and sustainability. However, over the ultimate four decades, soil erosion and land degradation have turn out to be most necessary environmental issues and present an upsetting risk to nutrient safety and sustainability of agriculture production and productivity (Jamir, 2015; Longkumer and Jamir 2012). Broad range of efforts on poverty reduction program have failed to bring adequate progress and development despite decades of development support by the central authority by implementing number of employment and income generation programs (Jamir and Ezung, 2017a). On the other hand rapid boom of population in combination with poor initial natural resource endowments and inclined macro-economic policies towards agriculture sector have not only proven catastrophic to reduce poverty, but also led to the worsening of the natural useful resource base on which rural livelihoods depend. It is typically conventional that development hyperlink on the scope of ecological sustainability, monetary viability and social recognition. However, a range of vital dimensions in the development scenario are unfavorable, but they symbolize the essential problems associated to sustainable development. These improvement domain dimensions include agro-ecological potential, population, market access and institutional setting. Less favored areas are normally characterized by a combination of low agricultural possible and disadvantage market access; often existing in an institutional setting that is now not conducive to choice possible improvement pathways (Jamir, 2021).

2. Literature review

Malthus (1798) was concerned about the growth of population to outrun the available food supply. The negative impact on the nature due to increasing pressure caused by the population growth and natural judgment of diminishing marginal productivity of resources was highlighted in his An Essay on the Principles of Population. In Malthusian view, the population growth would undo itself through its rising pressure on natural resources like land, water, forest and thereby declining the productivity of such natural resources and rising incidence of poverty.

Ehrlich (1968) empirically indicated the pressure of a fundamental relationship between rapid population growth and environmental degradation. He argued that if the existing patterns of population growth and resource use continued, it would lead to environmental collapse. Even the renewable natural resources like forest, water can be exhausted if the population exceeds the carrying capacity and thus rate of extraction is higher than the rate of regeneration. Therefore a balance between the population growth and resource use is well warranted for the maintenance of ecological balance and sustainable growth of the economies.

Trainer (1990) stated that most of the developing nations suffer because of the rapid increase in population, that in turns cause to shrink environmental resources, raising air and water pollution, deforestation, soil erosion, overgrasing and damage to ecosystem. There is a tremendous pressure on land to produce more food for growing population.

Cropper and Griffiths (1994) argued that population growth, by increasing the demand for arable land, encourages the conversion of forests to agriculture. Since the people living in rural areas who are dependent on agriculture as a livelihood, one would expect deforestation to increase with rapid population density as well as rising demand for wood for both timber and fuel.

Leach and Mearns (1995) Poverty and environmental degradation are positively linked in a vicious circle, which forces deprived population to engage in practices that have an unfavorable impact on the environment as they are searching for primary provision to enhance their livelihood Study have established that poor household depends on environmental assets for their sustainability and also the poor people rely on the natural resources for many of their basic economic activities.

Agarwal (1997) the study traced why and how this degradation and the misuse of natural resources in rural sector of India. It was once observed that the poor households in rural region are alleged as having a short-time scope, discounting the future benefits from conservations of environment rather heavily owing to the urgency to make a sustainable livelihood and avoid hunger. Such a time horizon leads to unsustainable use of natural resources.

Rozelle et. al., (1997) Major work was undertaken to learn about the correlation amongst population growth, poverty and environmental degradation in China in 1997. The paper examined the affect that each had on the China's environmental resources such as land, water, air and forest resources. They determine that institutional policy have been ineffective in controlling environmental resources degradation primarily due to the fact of its limited resources. Some studies divulge that due to deforestation and agricultural growth there has been considerable destruction of forest resources causing environmental degradation.

Dreze and Sen (1989) have also identified the incidence of poverty and not the population growth as the principal reason for the degradation of resources. They also cited the example of countries like Israel, Hong Kong and Portugal where per capita food production declined during the decade of 1980s but those countries able to compensate the underproduction through imports as the countries were developed and people had the entitlement to afford to buy imported items unlike many African citizens.

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 not only due to the rapid growth of population but also owing to the escalation of consumption of fossil fuel, industrial production and the growth of the economy, which have been much higher than the rate of growth of population. Therefore, the degradation of natural resources is a complex interplay of population growth, growth of consumption of resources per capita, advancement of technology and the later one is much more important than the former one

Goodstein (1999) has argued that the poorer has a tendency to have more children and spent very less on birth control for their future security. Therefore the family size and population growth is rapid in many underdeveloped and developing countries. The rising population even for sustainable activities enhance pressure on natural especially forest resourcesTherefore, due to these premises, the objectives of the study will be to examine environmental degradation caused by rapid rise in poverty level and study the effect and measure to control of shifting cultivation in the region.

3. Materials and Methods

### 3.1. Study areas and period of research survey

Nagaland came into existence as the sixteenth state of Indian Union on 1 December, 1963. It is situated in the Northeastern part of India between 25°6' to 27°4' North latitudes and 93°0' to 95°15'·East longitudes with an area of about 16,579 sq. km,

Assam in its North and West, Arunachal Pradesh in its North East, the state of Manipur in the South (Figure 1). The state is bound by the long International boundary of Myanmar in its Eastern side. The terrain is lush with luxuriant forest, rolling mountains, enchanting valleys and swift flowing streams and rivers making the landscape beautiful. The altitude varies from 200 meters in the plains to 3,840 meters in the hills. The inhabitants of Nagaland are tribal having distinctive dialect and culture. The State's population is predominantly rural with about 71.14% of its population living in rural sector. The State is comprised of 12 administrative districts with 74 blocks and 1428 inhabited villages (Census, 2011). Each district is inhabited with one or more tribes thereby imparting to it a distinct linguistic, cultural, traditional and socio-political characteristic. The terrain is predominantly hilly and is covered by a rich and varied floral and faunal assemblage. It forms part of one of the 35 biodiversity hot spots of the world, i.e., the Indo-Burma biodiversity hotspot zone.

The physiographic creates specific situations and sometimes limitations for rural development like vulnerability, inaccessibility, specific resource niches and areas of population concentration. These aspects of physiographic conditions directly or indirectly influence the distributive nature of natural resources and human concentration. The study of such aspects of landscape would be helpful in understanding the required processes of rural development and also helpful in identifying the areas of available resources where the developmental processes may be intensified in future for raising standard of living of the local population.

Nagaland is primarily ago based economy. People are based on agriculture and allied activities for their sustainable livelihood. Comparing to other food crops about 80% of the cropped region is under rice production. The farm production and productivity for all food crops is very low, in contrast to other states. Presently, the Jhum/shifting to terraced cultivation ratio is 4:3 (Nayak, 2013). Forestry is also an important source of income generation for rural sector (Ghosh, 2016). Nevertheless, agriculture and forestry contribute a majority of Nagaland's Gross Domestic Product (GSDP). Nagaland's GSDP grew at 9.9 percent compounded annually for a decade, thus more than doubling the per capita income (Nagaland Economy Report, 2011-12). The data collected relate to the year 2016-17.

Figure 1 – Nagaland map
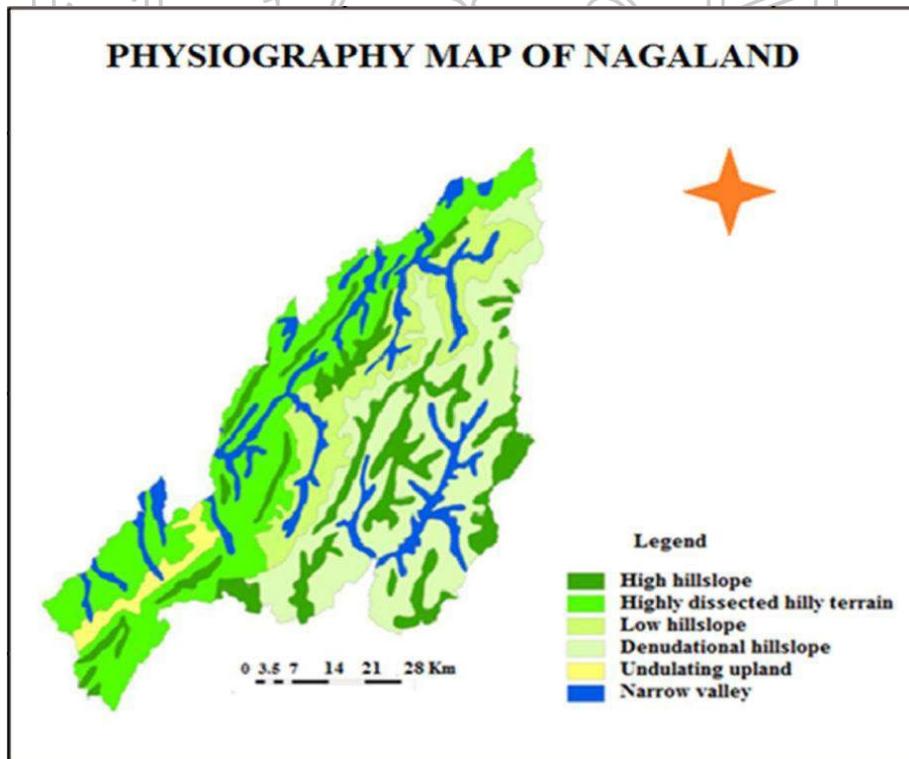
Source: *Nagaland Science and Technology Council, Government of Nagaland, Kohima*

Figure 2 – Nagaland soils map
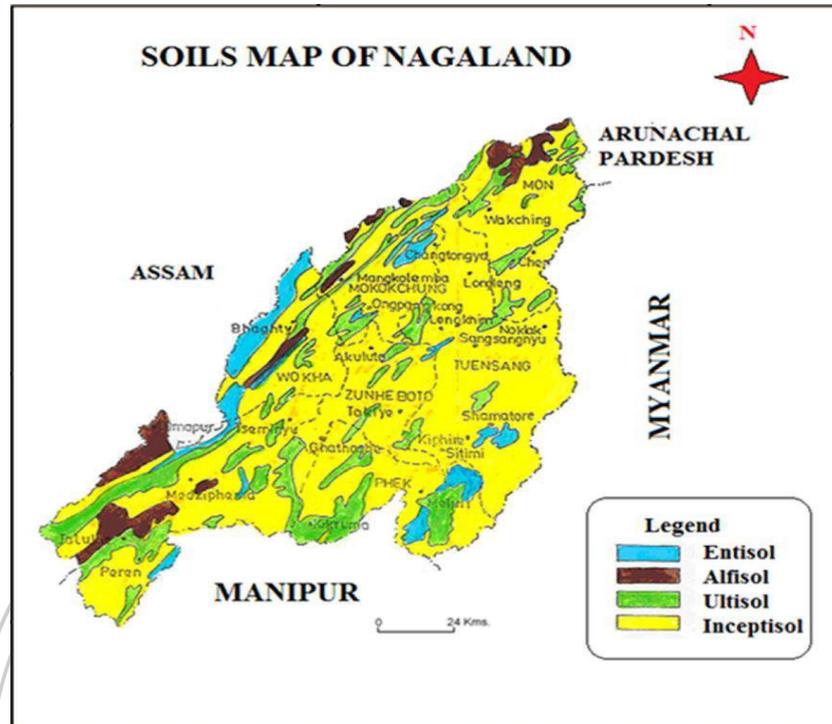
Source: *Indian Council of Agriculture Research, Nagaland Centre*

Figure 3 – Nagaland land use
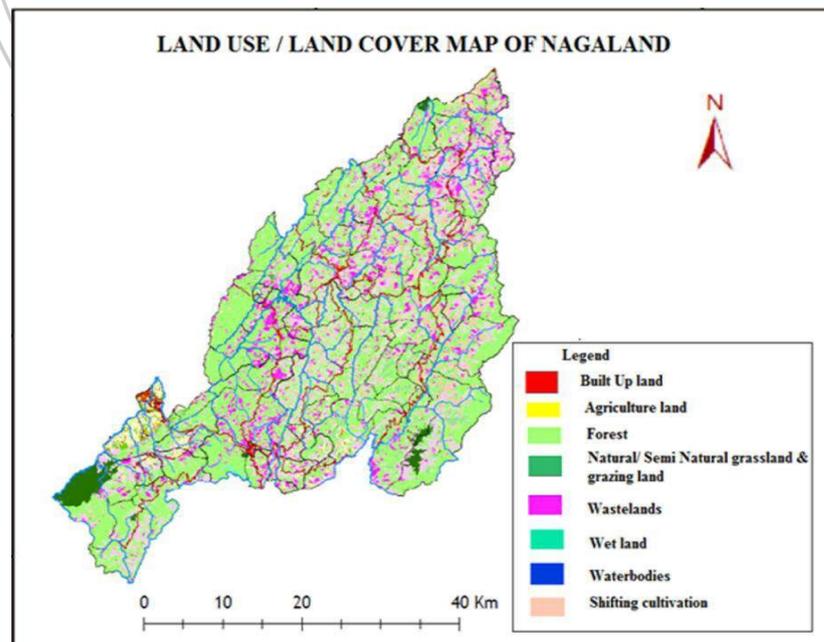
Source: Remote Sensing Application Centre, Kohima, Nagaland

3.2. Data collection

The evaluation of population, poverty and environmental degradation is based totally on both primary and secondary source of data. The subsequent step of poverty analysis is the identification of poverty line that distinguishes the poor from non-poor. The NSSO (National Sample Survey Organisation) estimated a poverty line of Rs 1229.83 for rural and Rs 1615.78 for urban Nagaland during 2011-12 (Planning Commission, 2014). The report of the expert group maintains that the domestic household consumer expenditure is more consistent than income and subsequently more appropriate for measuring poverty. A total of 400 household were interviewed from the sample villages and wards of Nagaland. Thus, MPCE was used as a proxy for the actual income while determining poverty (Ezung, 2011).

3.3. Data analysis and estimation

3.3.1. Head Count Ratio

The headcount ratio measures the percentage of the population that is poor (Watts, 1968; Sen, 1979; Foster, 1984).
Head Count Ratio (H) if then:

$$H = q/n$$

3.3.2. Multidimensional Poverty Index (MPI)

The MPI measures those experiencing multiple deprivations on year of schooling, school attendance, food, child mortality, household cooking fuel, sanitation, water supply, power, housing floor and assets. Formally, the first component is term as multidimensional headcount Ratio (H) (Alkire and Santos 2010, Atkinson, 2003).

$$H = q/n$$

Here q is the number of people who are multidimensional poor and n is the total population. The second component called the intensity (or breadth) of poverty (A) and can be expressed as:

$$A = \left(\sum_{i=1}^{n} [\![c_i(k)]\!] \right)/q$$

Where $c_i(k)$ is the censor deprivation score of individual i and q is the number of people who are multidimensional poor.

MPI is the product of both $MPI = H \times A$.

3.3.3. Composite Index

To make a significant comparison of different districts of Nagaland in terms of indicators of poverty and forest cover the following formulae are used to arrive at the degradation index of the indicator variables as mentioned against each.

$$(FINDEX) = \frac{Max(X_{ij}) - X_{ij}}{Max(X_{ij}) - Min(X_{ij})}$$

$$(PINDEX) = \frac{Max(X_{ij}) - X_{ij}}{Max(X_{ij}) - Min(X_{ij})}$$

4. Results and discussion

Population affects on the environment principally through the use of natural assets and is related with environmental stresses like land degradation, loss of biodiversity, air and water pollution (Figure 4 and 5). The results shows population growth of Nagaland has doubled since 1971. It has increased from 516449 persons in 1971 to 1990036 persons in 2001, adding 1473587 persons in the remaining three decades. Such a remarkable expands of population led to large scale environmental degradation. Investigation of record on poverty rate in Nagaland affirm that on an average 33.05% of population (both urban and rural) have been beneath poverty line in 2015-16 (refer table 2&3). The finding show that Mon district having highest incidence of poverty (48.78%), while Kohima district show the lowest incidence of poverty, most of the districts of eastern Nagaland such as Tuensang, Mon, Kiphire and Longleng were observed to have failed in the poverty eradication programs even after two decades of policy implementation. Districts with sensible advancement in this regard were Mokokchung, Phek, Wokha and Zunheboto. Table 3 shows growing trends of aggregate poverty in Nagaland from 1987-88 to 2016-17 i.e., 34.43 to 37.92% and also multidimensional poverty index (MPI) of 30.8% during 2015-16 (NSSO, 2012; Jamir and Ezung, 2017b; Jamir, 2020).

The study found that the state has recorded forest areas of 862532 hectares in 1987-88 but decline to 862300 during 2016-17. The end result exhibits vital activities accountable for deforestation were identified with commercial agents actively involved in all five with the poor farmer taking part in two of the five activities. There was a common consent among the studies that commercial agents were the majority group pursuing logging and agricultural development activities (Somanathan, 1991; Anderson, 1989; Repetto, 1990; Goodland, 1991) as a result there was a continuous decline of forest areas in Nagaland since 1987-88 to 2016-17 as per Forest Survey of India report (refer table 2&3). The study also determine that unsustainable deforestation activities such as shifting cultivation, coal mining, quarrying, diversion of forest lands for developmental activities, large scale plantation, agriculture expansion and natural catastrophe like landslide and fire alternatively end result in environmental degradation which has affect on rainfall disruption, production and productivity and shortage of fuel wood supply. There was also agreement that market and institutional failure have been the foremost incentives driving both agents to unsustainable deforestation activities. Studies disputing that the poor do not have the possessions adopt unsustainable deforestation activities and neither do they reveal the short time preferences which would force them to undertake the unsustainable activities (Tiffen, 1993). Study found that the state is losing its forest cover at an alarming rate of 200 sq. km per year next to Mizoram in North Eastern Region as per Environment, Forest and Climate change Government of Nagaland Survey Report, 2018 (Nagaland post, 2018) (Figure 4).

Figure 4: Environmental resources

        (a): Mount Saramati (Kiphire)   **(b)**: Dikhu river from Chare (Tuensang)
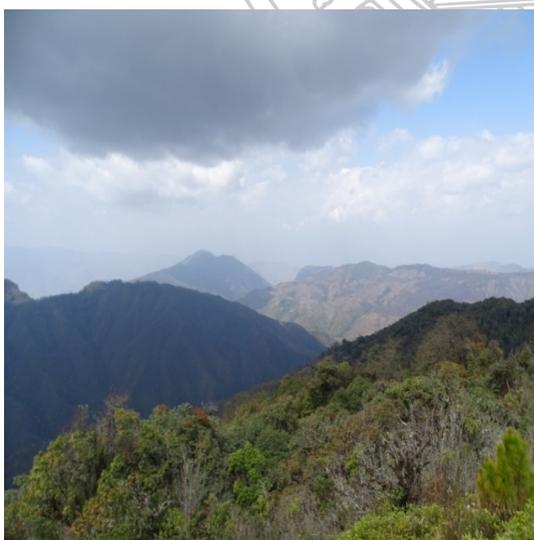
Source: Author elaboration

(c): Dzukou valley (Kohima)

(d): Kepamodzu mountain in Pfutsero (Phek)
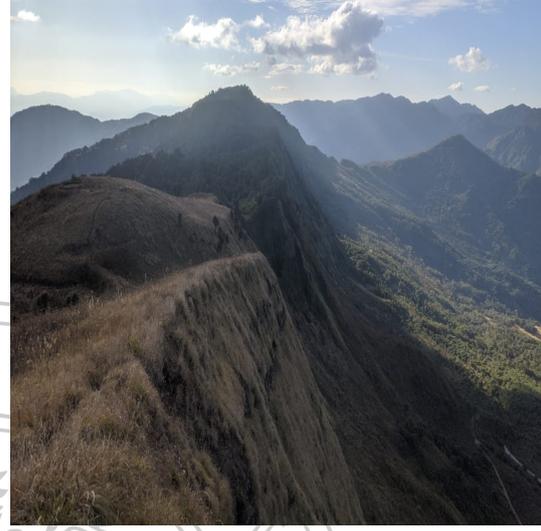
Source: Author elaboration

The study found that agriculture activities and forest cover should be closely linked; due to the fact clearing for agricultural use is the principal motive of deforestation. The consequences shows that 1987-88 forest loss was found to be -192 sq. km which in addition increases to -450 sq.km during 2016-17 (refer table 3). The analysis of composite index of poverty and environmental degradation exposed that the districts which were hard hit in 2011 (PEINDEX ≥ 0.7) were Zunheboto, Kohima, and Dimapur. The least affected districts (PEINDEX ≤ 0.5) were Tuensang, Kiphire, Longleng and Mon. The remaining of the districts were moderately hit (0.5 ≤ PEINDEX ≤ 0.7) were Peren, Wokha, Mokokchung and Phek (refer table 1). Higher population growth, low degree of employment and income, poverty, shifting cultivation, logging, and infrastructure improvement is the most common variables that affects environment (Barbier, 2001).

Deforestation itself is not a problem and in fact may be a requisite condition for economic development. When this takes place on a large-scale, it becomes imperative to discover the factors behind the trend. Degradation of environment resources caused either by the underprivileged or the rich has both direct and indirect impacts not only on the cost of production but also on the productivity of crops and ultimately lowering the earning of the underprivileged population. Poor get more affected than the rich and become poorer due to environmental degradation manifested through destruction of forest for fuel wood, timber, jhum cultivation; degradation of land via the use of chemical fertilizer, pesticide, etc in modern farming and pollution of air due to consumption of biomass fuel. Thus, a vicious circle is mounted between poverty and environmental degradation. Each turns into the purpose and effect of the other. The current paper in this regard is a humble strives to quantify the magnitude of each poverty and environmental degradation over time and throughout states and affirm empirically the link between them (Figures 5, 6 and 7).

Figure 5: Deforestation in different part of Nagaland for Jhum cultivation

(a): Kiphire   **(b)**: Tuensang

(c): Mokokchung

Source: Author elaboration

Table 1: Indices of rural poverty and environmental degradation

Districts	PINDEX	FINDEX
Dimapur	0.895	1.00
Kohima	1.00	0.00
Mokokchung	0.906	0.653
Mon	0.154	0.493
Phek	0.584	0.306
Wokha	0.762	0.699
Zunheboto	0.758	0.782
Tuensang	0.191	
Kiphire	0.104	0.045
Longleng	0.00	
Peren	0.421	0.759

Source: Author elaboration

Table 2: Total population and percentage of population below poverty line

Districts	Total Population	% of Population Below Poverty Line
Dimapur	3,78,811	25.14
Kohima	2,67,988	22.37
Mokokchung	1,94,622	24.85
Mon	2,50,260	48.78
Phek	1,63,418	33.39
Wokha	1,66,343	28.66
Zunheboto	1,40,757	28.78
Tuensang	1,96,596	45.82
Kiphire	74,004	46.12
Longleng	50,484	48.89
Peren	95,219	37.71
Total	19,78,502	33.05

Source: Author elaboration

Table 3: Rural poverty and total forest area

Year	Urban/Rural poverty	Forest Area	Loss/Gain (Sq.km)
1987-88	34.43	8,62,532	-192
1993-94	37.92	8,62,000	+27
2004-05	19.00	8,62,930	-296
2011-12	14.00	8,62,929	-146
2016-17	33.83	8,62,300	-450

Source*: Statistical Handbook, Government of Nagaland, 1987, 1993, 2006 and 2012*
Forest Survey of India, 1987, 1993, 2004, 2012, 2016 and 2017

**Figure 6**: Village having higher level of poverty in Nagaland

(a): Buranamsang (Longleng)

(b): New Pangsha (Noklak)

(c): Chare (Tuensang)

(d): Sakshi (Longleng)

Source: Author elaboration

Figure 7 – Percentage of population below poverty line
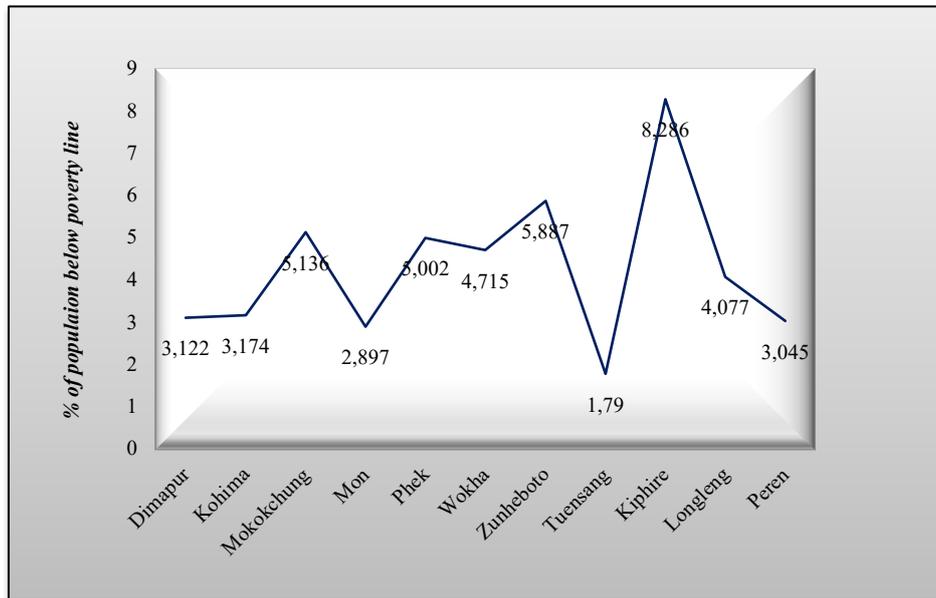
Source: Author elaboration

5. Shifting cultivation and its effects in Nagaland: An overview

Shifting cultivation is an age-old conventional cultivation practice and still predominant in Nagaland, where a land is selected for cultivation for one or two years and thereafter left it desolate for quite a few years (Figure 8 and 9). Shifting cultivation includes a rigorous approach of clearing massive forest area, slashing and burning massive chunk of trees. Therefore, the unsystematic cutting and burning down the forest has brought greater erosion of soil. This amounts to loss of top fertile soil and biodiversity within the area and if left unchecked leads to low productivity in the following cycle that result approximately in about 5-10 years fallow (Chatterjee, 2012; Chauhan, 2001). The penalties of deforestation can now not solely be at once felt in an area but its effects can be carried on to harm the future generations and their environment. As a result of rapid population growth, demand for food and fuel has increased and land availability for agriculture has been reduced. Shifting cultivation has been creating problems on physiographic and environmental conditions in Nagaland. Regularly shifting from one land to the other, has affected the biodiversity of these regions (Christanty, 1986). The area under natural forest has declined continuously (refer table 3) the fragmentation of environment, disappearance of species and incursion by exotic weeds and other plants are a number of the opposite ecological cost of shifting cultivation. Within predominantly jhum areas, the loss of top soil is at the highest. Apart from the loss of soil fertility and productiveness as cited above, jhumming is also accountable for massive scale deforestation in the hills, residue of reservoir, drying up of the natural stream and river and irreparable damages to flora and fauna (Das, 2006; Stocking, 2001; Mishra and Ramakrishnan, 1983).

Figure 8 – Practice of Jhum cultivation in Nagaland

(a): Mokokchung

(b): Tuensang
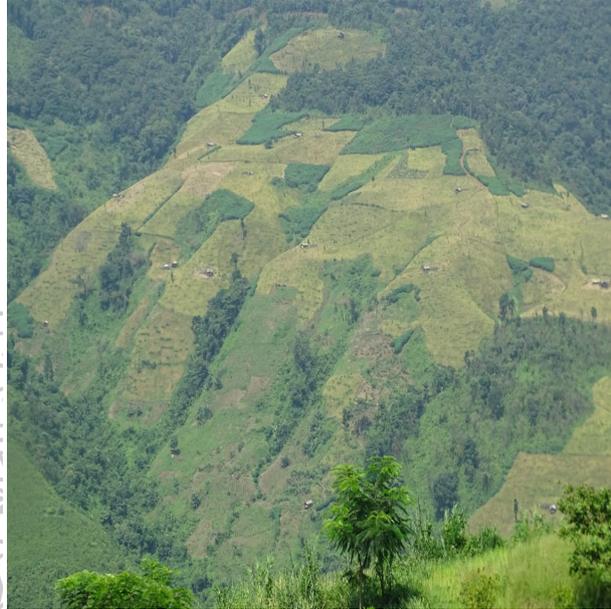
(c) Wokha

(d): Kiphire

Source: Author elaboration

Figure 9 – Terrace cultivation which is more eco-friendly and sustainability

(a): Kohima   **(b):** Phek


Source: Author elaboration

Nagaland possessed the second highest acreage under shifting cultivation next to Manipur. Land use pattern of Nagaland revealed that almost 16% of the total geographical area is under net sown area. About 123909 ha area is under shifting cultivation, which accounts for almost 7.5% of total area, 42% of total cropped area and 47.5% of net sown area (Rukuosietuo, et. al., 2014). The practice of shifting cultivation involved 61% households in rural areas, covering about 1 million ha in the entire state. It exposes about 5.65% of the total geographical area of the state to soil erosion (Deka and Sarmah, 2010). About 20,000 hectares of forest is felled every year in the state for jhum cultivation, as per the report of the department of Land Resources. The extensive practice of Jhum results in an average loss of 30.62 tonnes of soil area per hectare annually, as per Soil and Water Conservation Department, Government of Nagaland annual document for 2017-18.

In rural Nagaland each and every household heavily depend on fuel wood for cooking and space heating (Bhatt and Sachan, 2003) which accelerates forest degradation at a rapid rate. Many studies deal with fuel wood consumption in the mountainous region (Maikhuri, 1994; Maikhuri and Gangwar, 1991). The current fuel wood harvests on fallow fields are not adequate to cover fuel wood demands due to short fallow periods and insufficient per capita fallow forest areas as a result of high population growth. In the past slash and burn agriculture and commercial timber logging has led to a severe decrease in forest cover and degradation of forest (Figure 10).

Figure 10 – Different methods of fuel wood harvest

(a): Phek   **(b)**: Longleng

Source: Author elaboration

6. Conclusion

Developing region has been experiment a serious problem of rapidly growing population, that accelerating environmental degradation. High population growth with high poverty rate worsened environmental condition during the past four decades that seem to eroding the economic and social progress of Nagaland. The finding show that Mon district having highest incidence of poverty in Nagaland (48.78%), while Kohima district show the lowest incidence of poverty, most of the districts of eastern Nagaland such as Tuensang, Mon, Kiphire and Longleng were observed to have failed in the poverty eradication programs even after two decades of policy implementation. Accordingly, a better coverage would require in integrating various income generation schemes along with health care programme, water supply, electricity, sanitation and housing policies, which are almost absent in rural areas, funding for improving education level and labour market opportunities for younger population should seriously be considered, since lack of these determinants represent the main reason of their disadvantage (Ezung and Jamir 2018). While poorest of the poor depend their daily livelihood from natural resources like forest, river etc environmental degradation would certainly have its effects on them. Similarly increase in incidence of poverty would surely increase the anxious attack on environmental resources. This is sufficiently borne out by the case of the eastern location of Nagaland where shifting cultivation on the hill slopes has established a vicious circle of poverty of the hill community and denudation of forest leading to environmental degradation.

The analysis of composite index of poverty and environmental degradation exposed that the districts which were hard hit in 2011 (PEINDEX ≥ 0.7) were Zunheboto, Kohima, and Dimapur. The least affected districts (PEINDEX ≤ 0.5) were Tuensang, Kiphire, Longleng and Mon. The remaining of the districts were moderately hit (0.5 ≤ PEINDEX ≤ 0.7) were Peren, Wokha, Mokokchung and Phek. The results support that population have a deleterious impact on environment. In Nagaland shifting cultivation is not only the way to earn livelihood of rural population but also significantly contributes to the rural economy by generating employment and income. But on the different aspects it has many negative consequences on environment, biodiversity and ecological balance in the region. Under this situation, short term measures need to be undertaken to enhance productivity and additionally to take a look at soil erosion. Considering the physiographic characters of land, climate conditions,

social customs, food habits and many others alternative system of farming like diversified agro farming need to be introduced. This would require a system which includes agriculture, horticulture along with animal husbandry, fishery and rooster farming. In the same way success of this alternative farming system depends upon the gaining of confidence of (Jhummias) through persuasion, demonstration and applied fundamental research to be conducted very slowly without any haste.

Strengthening of agriculture production and productivity using present day's inputs might reduce pressure on forest by making shifting cultivation less attractive (Angelsen and Kaimowitz, 1999; 2001). To control shifting cultivation completely, it will require massive investment and robust rural livelihood schemes (Jamir, 2019). These policies are to be based on sound macro-and micro economic management, with good governance aimed at ameliorating poverty and promoting sustained economic growth have perceptible and permanent effect in lowering population growth. Population growth momentum in Nagaland is really huge hence the pressure of demand on resources are obviously large, it is only one of many alternative causes as a result of over-consumption based, unsustainable development that may have an even larger impact. Our choice of how to use those resources (i.e. our economic policies) and for what purposes (i.e. our political directions and policies) are critical issues as well on the resulting impact on the environment to meet those uses and purposes.

Acknowledgements

References

Agabi, J.A. (1995). Biodiversity Loss in Nigerian Environment Lagos: Macmillan. Agarwal, A. (1985). The 5th Annual World Conservation. London: WWF.

Agarwal, B. (1997). Gender, Environment and Poverty Interlinks: Regional Variations and Temporal shifts in Rural India, 1971-91. *World Development* 25(1): 23-52.

Alkire, S.; Santos, M.E. (2010). Acute Multidimensional Poverty: A New Index for Developing Countries. OPHI Working Paper Series No.3 University of Oxford.

Allen, J.C.; Barness, D.F. (1995). The Causes of Deforestation in Developed Countries. *Annals of the Association of American Geograpere* 75(2): 163–84.

Anderson, P. (1989). The myth of sustainable logging: The cause for a ban on tropical timber imports. *The Ecologist* 19(5): 166-168.

Angelsen, A.; Kaimowitz, D. (1999). Rethinking the causes of deforestation: Lessons from economic models. *World Bank Research Observer* 14: 73–98.

Atkinson, A.B. (2003). Multidimensional deprivation: contrasting social welfare and counting approaches. *Journal of Economic Inequality* 1(1): 51–65.

Barbier, E. (2001). The economics of tropical deforestation and land use: an introduction to the special issue. *Land Economics* 77(2): 155–171.

Bhatt, B.P.; Sachan, M.S. (2003). *Fuelwood consumption along an altitudinal gradient in mountain villages of India*, Agro forestry Division, ICAR Research Complex for NEH Region, Umiam, Meghalaya, India.

Boserup, E. (1965). *The Conditions of Agricultural Growth.* Chicago: Aldine.

Boyce, J.K. (1994). Inequality as a cause of environmental degradation. *Ecological Economic* 11(3): 169-178.

Brady, N.C. (1996). Alternatives to slash-and-burn: a global imperative. *Agriculture, Ecosystems and Environment* 58(1): 3-11.

Broad, R. (1994). The poor and the environment: friends or foes. *World Development* 22(6): 811–822.

Bruntland Commission, (1983). *Bruntland Commission Report.* Oxford University Press, Oxford, London.

Cavendish, W. (2000). Empirical regularities in the poverty-environment relationship of rural house-holds: evidence from Zimbabwe. *World Development* 28(11): 1979–2003.

Census of India, (1981). Government of India. New Delhi.

Census of India, (1991). Government of India. New Delhi.

Census of India, (2001). Government of India. New Delhi.

Census of India, (2011). Government of India. New Delhi.

Census of Kohima, (2011). Directorate of Census Operations, Kohima, Nagaland.

Chatterjee, D. (2012). Impact of shifting cultivation on soil and environment: Strategic way out. In: Deka BC., Patra MK, Thirugnanavel A, Chatterjee D, Borah TR and Ngachan SV (eds.) *Resilient Shifting Cultivation: Challenges and Opportunities,* Published by: Director, ICAR Research Complex for NEH Region, Umiam 793103 Meghalaya 27-34.

Chauhan, B.S. (2001). *Shifting cultivation in Perspective.* Nagaland University.

Christanty, L. (1986). *Shifting cultivation and tropical soils: Patterns, problems and possible improvements*. In Gerald G. Marten (eds.) Traditional Agriculture in Southeast Asia: A Human Ecology Perspective, Boulder, Westview Pressn 226.

Cropper, M.; Griffiths, C. (1994). The Interaction between Population Growth and Environmental Quality. *American Economics Review* 84, 250–254.

Das, D. (2006). Demystifying the myth of shifting cultivation: Agronomy in the north-east. *Economic and Political Weekly* 41(47): 4912-4917.

Dasgupta, P.; Maler, K.G. (1994): Poverty, Institutions and the Environmental Resource Base, World Bank Environmental Paper 9, World Bank.

Deka, P.K.; Sarmah, D. (2010). Shifting cultivation and its effects in regarding of perspective in Northern India. *International Journal of Commerce and Business management* 3(2): 157-165.

Drolets, J. (2015). Disasters in Social, Cultural and Political Context. International Encyclopedia of the Social and Behavioral Science 2nd Edition, 478-484.

Duraiappah, A.K. (1998). Poverty and Environmental Degradation: A Review and Analysis of the Nexus. *World Development* 26(12): 2169-2179.

Ehrlich, P.R.; Holdren, J.P. (1971). The Impact of Population Growth. *Science* 171, 1212–1217.

Ezung, T.Z. (2011). Poverty in Nagaland. Akansha Publishing House, New Delhi.

Ezung, T.Z.; Jamir, C.K. (2018). Disparities in Infrastructural Development of Nagaland: A Case Study of Kohima and Longleng districts. *Journal of Economic Affairs* 63(2):375-379.

Fearnside, P. M.; Laurance, W.F. (2004). Tropical deforestation and greenhouse gas emissions. *Ecological Applications* 14:982–986.

Forest Survey, (1987). Government of India. New Delhi.

Forest Survey, (1993). Government of India. New Delhi.

Forest Survey, (2004). Government of India. New Delhi.

Forest Survey, (2012). Government of India. New Delhi.

Forest Survey, (2016). Government of India. New Delhi.

Forest Survey, (2017). Government of India. New Delhi.

Foster, J.E. (1984). On Economic Poverty: A Survey of Aggregate Measures. Advances in *Econometrics* 3: 215-251.

Ghosh, S. (2016). *A Window to the Northeast. The Hindu*. Retrieved 21st March 2017.

Global Monitoring Report, (2015-16). Development in an Era of Demographic Change. World Bank: Washington DC.

Goel, N.P.; Krishnan, G. (2000). *Geography of Northeast India.* Shillong Book Stall, Bara Bazar, Shillong.

Goodland, R. (1991). *Tropical deforestation solutions, ethics and religions.* World Bank Environment Working Paper, World Bank, Washington DC.

Houghton, R.A.; Lefkowitz, D.S.; Skole, D.L. (1991). Changes in the landscape of Latin America between 1850 and 1985. I. Progressive loss of forests. *Forest Ecology and Management* 38(3/4): 143-172.

Jamir, A. (2015). *Shifting options: a case study of shifting cultivation in Mokokochung District in Nagaland, India,* In: Shifting Cultivation, Livelihood and Food Security: New and Old Challenges for indigenous People in Asia. FAO, IWGIA and AIPP19-21.

Jamir, C.K. (2020). Education and Poverty Level: A Gender Analysis of Kohima and Longleng districts of Nagaland, India. *International Journal of Economics, Business and Politics* 4(1): 221-236.

Jamir, C.K (2021). Organic Large Cardamom Farming in Longleng District: Promoting Growth with Poverty Reduction. *Black Sea Journal of Agriculture* 4(1): 8-17

Jamir, C.K. (2019). *Macro economic Impact of social Protection Programme through VDBs in Alleviate Rural Poverty in Nagaland:* Bridging the gaps in Artur Borcuch 2019, Economic in Post (Modern World), Knowledge Laboratory, Poland.

Jamir, C.K.; Ezung T.Z. (2017a). Poverty and Inequality in Nagaland. *International Journal of Arts Humanities and Management Studies* 3(6): 64-72.

Jamir, C.K.; Ezung, T.Z. (2017b). Impact of Education on Employment, Income and Poverty in Nagaland. *International Journal of Research in Economics and Social Sciences* 7(9): 50-56.

Jodha, N.S. (1990). Rural Common Property Resources Contributions and Crisis. *Economic and Political Weekly* 25(26), A65-78.

Kalipeni, E.; Cleaver, Kevin M.; Schreiber, Gotz A. (1996). Reversing the Spiral: The Population, Agricultural, and Environmental Nexus in Sub-Saharan Africa. *African Studies Review* 39(2):170

Kramer, K.L. (2012). Sustainability, User Experience, and Design. User Experience in the Age of Sustainability, 1-30.

Leach, M.; Mearns, R. (1995). *Poverty and environment in developing countries. An Overview Study.* Institute for Development Studies, University of Sussex, Brighton, UK.

Longkumer, L.; Jamir, T. (2012). *Nagaland: Land alienation: Dynamics of colonialism, security, and development.* Published by Aakar Books in association with Other Media: Delhi

Maikhuri, R.K. (1994). Eco-energetic analysis of village ecosystem of different traditional societies of northeast India, *Energy* 21(12): 1287-1297.

Maikhuri, R.K.; Gangwar, A.K. (1991). Fuel wood use by different tribal and nontribal communities in North-East India. *Natural Resources Forum* 15(2): 162-165.

Maikhuri, R.K.; Ramakrishnan, P.S. (1991). Comparative analysis of the village ecosystem function of different tribes living in the same area in Arunachal Pradesh living in north-eastern India. Agricultural Systems, 9:57-72.

Malthus, T.R. (1798). *First Essay on Population*. Reprinted. London: MacMillan.

Meadows, D. H.; Meadows, D. L.; Randers, J.; Behrens, W.W. (1974). The Limit to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind. (2nd eds.) New York: Universe Book.

Medhi, R. (1992). *Global warming and its implications for the development world.* Rawat Publication.

Mink, S.D. (1993). Poverty, Population, and the Environment. World Bank Discussion Paper 189. Washington, DC: the World Bank.

Mishra, B.; Ramakrishnan, P. (1983). Slash and burn agriculture at higher elevations in north-eastern India. II. Soil fertility changes. *Agriculture, Ecosystems and Environment* 9(1): 83-96.

Myers, N. (1993). Tropical forests: the main deforestation fronts. *Environmental Conservation* 20(1): 9-16.

Nadkarni, M.V. (2000). Poverty, Environment, Development: A Many-Patterned Nexus. *Economic and political weekly* 35(14): 1184-1190.

Nagaland Economy Report (2011-12). Archived 14th July 2014 at the Wayback Machine IBEF, India.

Nayak, P. (2013). Some Facts and Figures on Development Attainments in Nagaland Archived 30 June 2014 at the Wayback Machine, Munich Personal RePEc Archive, MPRA Paper No. 5185.

NSSO Report, (2012). National Sample Survey Organisation Report, Government of India. New Delhi.

Omotor, D.G. (2000). Environmental Problems and Sustainable Development in Nigeria. Journal of Development Studies 2 (1): 146-149.

Pearce, D.W.; Warford J.J. (1993). World without End: Economics, Environment and Sustainable Development, Oxford University Press, New York.

Planning Commission, (2014). *Report of the expert group to Review the Methodology for Measurement of Poverty.* Government of India. New Delhi.

Ramakrishnan, P.S. (1992). *Shifting agriculture and sustainable development: an interdisciplinary study for North-Eastern India.* Man and Biosphere Series, Book 10, UNESCO and Parthenon Publishing.

Reardon, T.; Vosti, S.A. (1995). Links between Rural Poverty and the Environment in Developing Countries: Asset Categories and Investment Poverty. *World Development* 23(9): 1495-1506.

Repetto, R. (1990). Deforestation in the Tropics. *Scientific America* 262(4): 36-45.

Repetto, R.; Holmes, T. (1983). The Role of Population in Resource Depletion in Developing Countries. *Population and Development Review* 9(4): 609–632.

Rozelle, S.; Huang, J.; Zhang, L. (1997). Poverty, Population and Environmental Degradation in China. *Food Policy* 22(3): 229-251.

Rudel, T.K. (1989). Population Development and Tropical Deforestation. *Rural Sociology* 54(3): 327–338.

Rukuosietuo, K.; Chatterjee, D.; Deka, Bidyut C.; Kumar, R.; Ao, Merasenla.; Konsam V. (2014). Shifting cultivation: An 'Organic Like' farming in Nagaland. *Indian Journal of Hill Farming.* 27(2): 23-28.

Sen, A.K. (1979). Issues in the Measurement of Poverty. *Scandinavian Journal of Economics,* 81: 285-307.

Serrao, E.A.; Nepstad, D.; Walker, R.T. (1996). Upland agricultural and forestry development in the Amazon: sustainability, criticality and resilience. *Ecological Economics* 18(1): 3-13.

Somanathan, E. (1991). Deforestation, Property Rights and Incentives in Central Himalayas. *Economic and Political Weekly* 26(4): 37-46.

Statistical Handbook, (1987). Government of Nagaland. Kohima.

Statistical Handbook, (1993). Government of Nagaland. Kohima.

Statistical Handbook, (2006). Government of Nagaland. Kohima.

Statistical Handbook, (2012).Government of Nagaland. Kohima.

Statistical Handbook, (2015). Government of Nagaland. Kohima.

Stocking, M.A (2001). Land Degradation: An Old Problem with New Urgency International Encyclopedia of the Social and Behavioral Sciences, 2001, 8242-8247.

Tiffen, M. (1993). Productivity and environmental conservation under rapid population growth; A case study of Machakos district. *Journal of International Development* 5(2): 207-224.

Trainer, F.E. (1990). Environmental Significance of Development Theory. *Ecological Economics* 2, 277–286.

United Nations, (1987). World Commission on Environment and Development, ed. *Report of the World Commission on Environment and Development: Our Common Future*. Oxford: Oxford University Press.

Watts, H.W. (1968). *An Economic Definition of Poverty,* in On Understanding Poverty, (eds.) by D. P. Moynihan. New York: Basic Books.

World Bank, (1992). *World Development Report.* Oxford University Press, Oxford.

WWW. Nagaland Post, 9/12 2018.

WWW.Nagaland Science and Technology Council, Government of Nagaland, Kohima

WWW. Indian Council of Agriculture Research, Nagaland Centre.

WWW. Remote Sensing Application Centre, Kohima, Nagaland