POPULATION GROWTH, POVERTY INCIDENCE AND FOREST DEPENDENCY IN NEPALESE TERAI

Menaka Panta [a], , Kyehyun Kim [b] , Hari Sharma Neupane [c], Chudamani Joshi [d] and Eunji Park[e]

[a] Ph.D student, Department of Geoinformatic Engineering at Inha University, Incheon, S.Korea
Email: menaka@inhaian.net
[b] Professor, Department of Geoinformatic Engineering at Inha University, Incheon, S.Korea
Email: kyehyun@inha.ac.kr
[c] Ministry of Agriculture and Cooperatives, Crop Diversification Project, Kathmandu, Nepal
Email: neupane06890@itc.nl
Tel: +82-32-860-7602, Fax: 032-863-1506
[d]Ministry of Environment, Science and Technology, PO Box 19038, Kathmandu, Nepal
Email: Joshi@itc.nl
[e]Department of Geoinformatic Engineering at Inha University, Incheon, S.Korea
Email: ethel_126@naver.com

Abstract

Since the human civilization, people's livelihood is dependent on natural resources primarily on forest. Human dimensions such as population, poverty, agricultural expansion and infrastructure development are some of the underlying factors and their interrelated associations which could play a vital role in deforestation and forest degradation. This process is not only related to the human population but also connected to the various socio-economic factors. This paper focuses to link the spatio-temporal extent of population, poverty incidence and forest dependency and their severity on Terai forest of Nepal. Secondary data on censuses were used. ArcGIS and descriptive statistics were also used for data analysis. Based on analysis & literature review we concluded that population, poverty and forest dependency have largely expanded over time in Terai and their interrelated associations substantively influence on deforestation. However, the direct relationship of such factors with deforestation and forest degradation found to be incompatible, complex and hard to perceive with fragmented and inconsistency censuses data. So, deforestation and forest degradation issues intertwined with socioeconomic factors need detailed analysis to comprehend, where these linkages are still unravel.

KEY WORDS: Livelihood; Human dimensions; Interrelated association; Deforestation and forest degradation

1. INTRODUCTION

For the centuries, forest has been used as main component for rural livelihood in Nepal. Gilmour and Fisher (1991) realized that forests, farmers, livestock and agriculture were symbiotically interacted each other in Middle Hills of Nepal. But, a human impact has severely increased on the natural environment over the last quarter of a century (Mackenzie, 1998). According to Tole (2003), population pressures exert various socioeconomic burdens and that can also intensify their impacts on forest. Further, population pressure, political instability, and economic development activities also affect the deforestation and forest degradation (Hussin and Sha, 1996 in Panta, 2003). Similarly, demographic, economic and social changes continue exert pressure on forest cover (Achard *et al.*, 2002). Directly or indirectly population growth also put tremendous pressure on natural resources (ADB, 2004). High degree of poverty and rapid population growth in Terai not only exerts pressure on the natural resources but it also accelerated the forest degradation (FAO, 1997; Poudel, 2002). Terai forest is more accessible and commercially valuable than Hill's forest. Terai forest is also one of the major sources of national revenue in Nepal (Hobley, 1996). According to ADB (2004) report Nepal is characterized as a predominantly rural country where 85.8 percent of the population lives in rural areas. In Nepal, poverty has largely been a rural incident. Poverty extended throughout the country in Nepal however it is severe mostly in rural areas (UNDP, 2002). So, Terai forest of Nepal is susceptible with various socioeconomic factors. However, so far very few studies have taken into account with this fact. Thus, our main objective of this study was to link the spatio-temporal extent of population

growth, poverty incidence and forest dependency and their severity in Nepalese Terai.

2. METHODS AND MATERIALS

2.1 Study area

Terai region has selected for the study. It covers 17 % of the total land area of Nepal. Terai region is a lowland tropical and subtropical belt of flat, alluvial land. It is more important than the other regions because of its terrain, infrastructure, productivity, rapid economic growth, better livelihood, and easily accessible resources. Moreover, due to the presence of both farm and forest lands, the Terai were becoming Nepal's richest economic region. It has the largest commercially exploitable forests. However, forests are being increasingly destroyed because of growing demands of timber, land productivity, rapid population growth and migration. Hence, Terai forest is facing serious problem of deforestation and forest degradation (MPFS, 1988).

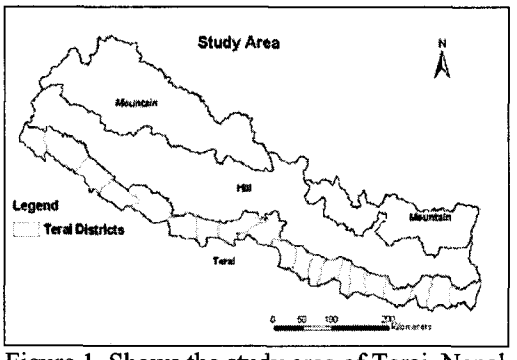

Figure 1. Shows the study area of Terai, Nepal

2.2 Data use and data analysis

Data were collected from CBS (Central Bureau of Statistics), Nepal, and NPC (National Planning Commission) as secondary sources. Lack of financial support was the major constraint to carry out detail socioeconomic field survey. So, censuses data of CBS which is one of the authentic data source for the country were used for this analysis. Similarly, ArcGIS 8.3 was used to analyse and map the spatial extend of population growth, poverty incidence and their severity across the region. Dynamic fluctuation of socioeconomic parameters over time and space was executed using simple descriptive statistics. Available data with inconsistency nature and collected for different purposes were highly influenced the flow of analysis. However, Excel spreadsheet with simple bar diagram and pie charts were optimally utilized to conclude the results.

3. RESULTS

3.1. Population size, distribution, density and growth

Data reveals that, population size in Terai is increased by nearly double, 6.56 million in 1981 and 12.44 million in 2005. Similarly, the share of population size is increased by 11 percent in Terai whereas decreased by 8 percent in Hills and nearly 3 percent in Mountain between 1971-2001. Figure 2 shows that the concentration of population primarily in Terai districts, except Kathmandu valley and its surrounding districts. Moreover, Eastern Terai has more concentration of population than Western Terai. Most of the Western Hills and Mountain districts have low distribution of population (i.e. less than 0.15 million). Figure 3 further states that population density in Terai has increased sharply and reached almost four folds such as 330 million in 2001 from 85 million in 1952/54 per square kilometre. Although population distribution trend in Terai districts are not equal, however the overall trend of population density is very high in Terai region.

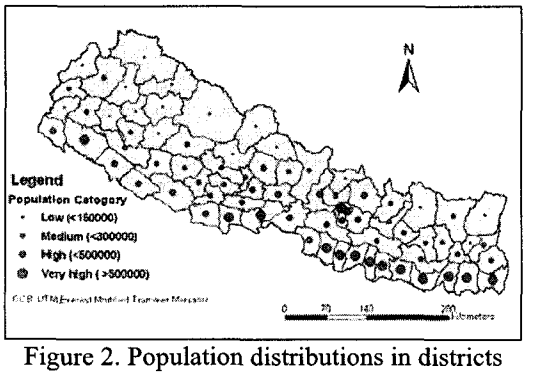

Figure 2. Population distributions in districts in 2001

Interestingly, 14 districts out of 20 have very high population growth rate more than 2.5 percent per annum which is quite greater than national average (2.25 percent per annum) between 1991-2001. Five districts have population growth rate near or below the national average. Jhapa has lowest growth rate of 1.48 percent per annum and Kailali, Kanchanpur, Banke, and Rupandehi have greater than 3 percent per annum. Moreover, high in-migration rate of more than 10 percent of district population has found in 12 districts. These districts are also richest in natural

resources. The highest in-migration rate has observed in Chitwan followed by Kanchanpur, Kailali, Rupandehi Jhapa, Sunsari and Morang with 34, 33, 27, 27, 26, 26, and 22 percent respectively.

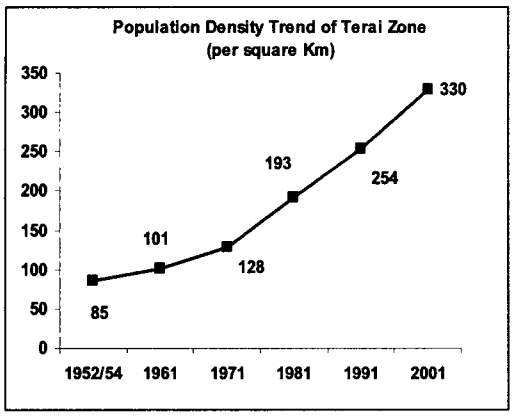

Figure 3. Population density trend in Terai, Nepal

3.2 Poverty status

Data revealed that poverty level is relatively low in Terai than in Hills and Mountain. However, still 27 percent of general poverty exists in the Terai. Moreover, there is significant reduction in head count poverty level by 12.7 percent in Terai since 1995/96 to 2003/04. But, the distribution of poor is still remains same. Figure 4 shows that poverty in Central and Eastern Terai is significantly lower than Far, Mid and Western Terai by 13 percent.

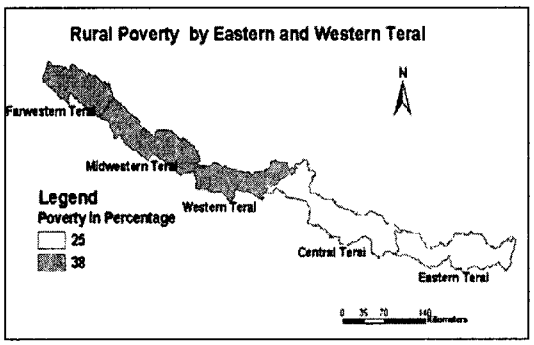

Figure 4. Incidence of rural poverty by Eastern and Western region of Terai

Data further revealed that 41 percent households out of total households have more than 0.5 ha land. Only 12 percent households have more than 2 ha holding size in Terai. In national perspective, the incidence of high head count poverty, and the low availability of the land is coinciding in Nepal. It also shows the poverty, distribution of poor and number of household are very high with low and marginal land holding size. 56 percent households have land size 0.2-1 hectare and poverty and distribution of poor is 38 percent and 51 percent respectively.

3.3 Sources, types and place of fuel wood collection in Terai

Almost 66 percent of households out of total households in Terai use fire wood for cooking followed by 26 percent cow dung. There is nominal use of Liquid Propane gas, kerosene and biogas for cooking. Forest, own land and markets are the main sources of fire wood in Terai. Nevertheless, preference of local people or users mostly goes to the forest because of easily available without compensate and restriction. So, data also revealed that 68 percent of fire wood collection source is forest base followed by 17 percent from own land and 10 percent is purchased from the markets. Only 5 percent of fire wood source is other. Similarly, almost 52 percent of households collect fire wood from the forest. This includes community as well as government forest. 25 percent households collect fire wood from other sources while 23 percent collects from their own land.

4. DISCUSSION

This study has empirically analyzed with interlink of poverty tendency, population growth and forest dependency at regional level. Our results showed that population distribution is unexpectively high in Terai compare to other region (Figure 1) of Nepal. Population density accelerated in 1961's and increased more than four fold within fourty seven years since 1952/54 (Figure 2). Terrain, infrastructure, fertile soil and resource availability could be the major reason. Conway et al (2000) explained that population densities and settlement intensification could be contributed to rapid deforestation in Terai. Similarly, lack of off-farm opportunities, low levels of welfare, and limit access of land also exacerbate the impacts on forests (Tole, 2003). Malaria control program and in-migration could also play a vital role in this matter. Darsi & Pradhan (1990) mentioned that Terai region was barely populated and densely forested until 1950's because of malaria. Further, malaria infection rate in the Terai reduced from almost 90 percent in the early 1950's to much lower levels in the 1970's (Joshi, 2006). Similarly, the infant mortality rate has reduced from 70 percent (1957) to zero in the early 1970's (Jung 2001,

Guyatt and Snow 2004 in Joshi, 2006). The highest in-migration rate noted in Chitwan could be caused by malaria control and Rapti Valley Development Project such as 7,759 ha forest land distributed to 5,233 families (Guneratne, 1994 in Joshi, 2006). The control of malaria in the Terai was followed by rapid in-migration from the higher parts of Nepal (Ghimire, 1992 in Joshi, 2006).

Moreover, in Nepal 31 percent of the people live below the poverty line (CBS, 2005). Poverty is general phenomenon in rural areas. The direct relationship could hard to be observed, however low level of welfare in the rural areas may creates pressure on forest resources. Tole (2003) mentioned that resources deficiency and poverty play a key role in driving deforestation. The high poverty incidence could lead continued pressure on the natural resource hence further degradation of forests (ADB, 2004). Poverty incidence is also related to the land holding size and is always higher with small land holdings (MDG, 2004). We also agree with this view that 56 percent households have the land size 0.2-1 ha in Terai. So, land policy, rights and reform are the key factors for poverty reduction in the developing world (DEFID, 2002). Agriculture and forestry are the major source of livelihood in Nepal. Almost 66 percent of households' are still using fire wood for cooking followed by 26 percent cow dung. About 68 percent of fire wood source is forest base and 52 percent households collect fire wood from the forest which includes government and community both forest. This indicates the degree of forest dependency has undoughtly higher in Terai. This has raised concern about the future supply of fuel wood, other tree products and further environmental degradation in Terai.

Historical evidence of forest biometric shows the Terai forest has deforested by 1.3 percent annually during recent decades (DFRS, 1999). About 70,256 ha areas have estimated as encroached forest area in twenty five Terai and inner Terai districts i.e. 3.28 % of Terai forest (Acharya *et al*, 2003; GIDA, 2003 in Bampton and Cammaert, 2006). Similarly, MFSC (2005) has reported the net change in forest covers of 8,821 ha with 0.06 percent annual deforestation rate in Terai between 1990/91-2000/01. More recent research has been summarized by Joshi (2006) states that forested area reduced from 21,774 km^2 in 1958 to 12,649 km^2 in 2000 corresponding to a declining annual rate of 1.38 percent in Terai.

With these scenarios, Community Forest (CF) management strategy, on the other hand, has long been practiced in Nepal since 1970. Kanel (2004), Kanel and Niraula (2004) quoted by Gilmour *et al* (2004) have reported that since 1980, about 1.1 million ha of forest have been handed over to nearly 14,000 Forest User Groups (FUGs) where about 1.2 million households are involved. Hence the overall evidence of marked improvement has realized in conservation of forests (both increased area and improved density) and enhanced soil and water management through this approach in Nepal. Contrary, Nepal Terai forest has started to deforest since 1987 till 2001 with annual rate of 1.3 %, 3.28 %, 0.06 % and 1% (DFRS, 1999; Bampton and Cammaert, 2006; MFSC, 2005; Joshi, 2006). This evidence could be open the forum for further discussion? Similarly, Kanel *et al* (2004) also realized that Community Forest is the main thrust on building institutions and poverty alleviation in Nepal. Further, Bampton *et al* (2004) reported that "approximately 220,000 households member are involving with about 1,000 Community Forests (CFs) covering around 138,000 ha area in the 20 districts of Terai and inner Terai". Nevertheless, previously many authors and more recently Bampton and Cammaert (2006) contrary argued that landless and poor are still frequently excluded, are not even members of Community Forest User Groups (CFUGs) if any case are listed under the CFUGs, but unable to benefit sufficiently in Terai. However, poverty incident across the country remains same and still 27 percent poverty exists in the Terai (CBS 2005).

Therefore, notable population growth, migration tendency, high poverty incidence and high degree of forest dependency with decreasing trend of forested area in Terai in recent decade could further support to confirm their influence in deforestation and forest degradation. So, more studies in forest resources integrate with socioeconomic factors are needed in Terai. Over several decades a number of research initiatives, measures and concerns on Terai forest have been increased, however consistency in data, reliable document and facts are still insufficient. In this study, available data was the optimum level of survey data. However, lack of finer (district level) data was the major constraint. So, our analysis did not consider other possible potential underlying factors that are driving the deforestation in Terai.

5. CONCLUSION

Under these circumstances, Terai forest is undoughtly susceptible with complex socioeconomic invaders. The interrelated association of population escalation, poverty incidence, and forest dependency has great influence on deforestation and forest degradation. Such type of issue has long been the subject of debate and concern in policy level. However, common trend to date, Nepal government has primarily focused on formulating policies, renovating acts and regulations rather immediately executing of it. Similarly, Nepal has long been experienced for policy formulation mechanisms, but, process is still conventional, resulted, an excessive delay in translating policies into legislation and then into operational guidance.

Recently, the subject of concerns has shifted on seeking innovative policies and institutional arrangements for sustainable forest management. Legislation aiming to conserve forest and biodiversity has already been introduced across the country and has increasingly stretched. Nevertheless, addressing socioeconomic concern in mainstreaming is still limited and forest management situation remains fragile in Terai. Mapping and monitoring forest resource, enforcement of Terai forest management laws, regulations, and democratic transference of user's right exercise at local level could be insufficient. Moreover, there are significant differences in socioeconomic structure between one Terai district to another district, and within districts too. Poverty reduction and equitable sharing of benefits and traditional rights to forest access are major issues in Terai. So, wide-ranging approach of planning and policy reform may not workout to grasp large ramification for sustainable forest development especially in heterogeneous societies. Therefore, such type of conflict and complexities could be realistically better resolve at micro- institutional level, considering with narrow down approach and collaborative mechanism. Similarly, systematic analysis of most probable socioeconomic invaders and accordingly planning and scientific forest management that addresses the concerns of all stakeholders could be more pragmatic to overcome the situation. Despite these measures, fine restructuring, understanding of multiple dimensional interaction, fundamental mechanism and consequences of socioeconomic indicators are prerequisites and desire. Detail studies on deforestation, forest degradation intertwined with socioeconomic variability are crucial, in Terai, where these linkages are still unravelled.

ACKNOWLEDGEMENTS

We thanks to BK 21 (Brain Korea) project from Korean Government for their financial support. We also would like to thanks anonymous reviewers of this paper and Dr. Sony George from Inha University for his invaluable comment on the first draft of this manuscript.

REFERENCES

Achard, F., H. D. Eva, S. Hans-Jürgen, P. Mayaux, J. Gallego, T. Richards, and M. Jean-Paul. 2002. Determination of deforestation rates of the world's humid tropical forests. Science 297:999 - 1002.

ADB, 2004. Asian Development Bank. Country Environment Analysis for Nepal. Asian Development Bank report 2004.

Bampton J., & B. Cammaert, 2006. How can timber rents better contribute to poverty reduction through Community Forestry in the Terai region of Nepal? Presented at International Conference on Managing Forests for Poverty Reduction: Ho Chi Minh City, Vietnam.

Bampton J, B Vickers, B Rana and J. Statz. 2004. Community Forestry in the Terai region of Nepal. Final Version 13/08/2004

Conway D., K. Bhattarai, & N. R. Shrestha. 2000. Population–environment relations at the forested frontier of Nepal: Tharu and Pahari survival strategies in Bardiya. Applied Geography 20 (2000) 221–242

CBS. 2001. Statistical year book of Nepal 2001. Central Bureau of Statistics, Kathmandu, Nepal.

CBS. 2003/04. Nepal living standards survey 2003/04, Statistical Report (Volume One). Central Bureau of Statistics, Kathmandu, Nepal.

CBS. 2005. Poverty Trends Nepal (1995-96 and 2003-04). Central Bureau of Statistics, Kathmandu, Nepal.

DFRS. 1999. Forest Resources of Nepal (1987 – 1998). HMGN, Department of Forest Research and Survey, Ministry of Forests and Soil Conservation, HMGN, Kathmandu.

DFID, 2002. Better livelihoods for poor people. The role of LAND POLICY, DISCUSSION DRAFT. ISSUES PAPER.

Darsi Jr, R. F., and S. P. Pradhan. 1990. The mosquitoes of Nepal: Their identification, distribution and biology. Mosquito Systematics 22:69-130.

FAO. 1997. Forests in a global context. In The state of food and agriculture 1997, FAO, Rome, 50-58p.

Gilmour, D A and R J. Fisher. 1991. Villagers, Forest and Foresters: The Philosophy, Process and Practice of Community Forestry in Nepal. Kathmandu: Sahayogi Press.

Gilmour *et al.* 2004. Linkages between Community Forestry and Poverty. Regional Community Forestry Training Center for Asia and the Pacific Bangkok, Thailand, October 2004

Hobley, M. 1996. Participatory Forestry: The process of change in India and Nepal. Overseas Development Institute, London, UK.

Joshi C. 2006. Mapping cryptic invaders and invasibility of tropical forest ecosystems: Chromolaena odorata in Nepal. PhD Dissertation, ITC, Enschede, The Netherlands.

Kanel, K. & D. Niraula. 2004. Can rural livelihoods be improved in Nepal through CommunityForestry? Banko Janakari Vol. 14(1): 19-26.

Mackenzie, F.T. 1998. Our Changing Planet: An Introduction to Earth System Science and Global Environmental Change. Prentice Hall. Upper Saddle River, NJ.

MPFS. 1988. Master Plan for Forestry Sector in Nepal, Main Report: Ministry of Forest and Soil Conservation, Kathmandu , Nepal, 292p.

MFSC. 2005. FOREST COVER CHANGE ANALYSIS OF THE TERAI DISTRICTS (1990/91 – 2000/01). Published by Department of Forest, Babarmahal, Kathmandu, Nepal

MDG. 2004. Millennium Development Goals. Monitoring Report of Civil Society, Nepal. Published by Nepal Forum of Environmental Journalists (NFEJ).

Poudel, M. P. 2002. Assessment of sustainability of community forestry through combined analysis of field and remotely sensed indicators. Unpublished M.sc-thesis, ITC , Enschede, The Netherlands.

Panta, M., 2003. Analysis of Forest Canopy Density and Factors Affecting It Using RS and GIS Techniques. Unpublished M.sc Thesis, ITC, Enschede, The Netherlands.

Tole L. 2002. Population and poverty in Jamaican deforestation: Integrating satellite and household census data. GeoJournal **57:** 251–271, 2002. © 2003 Kluwer Academic Publishers. Printed in the Netherlands

UNDP. 2002. Linking Poverty Reduction and Environmental Management, Policy Challenges and Opportunities. United Nation Development Program