IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 2 Issue 4, April 2015.
www.ijiset.com
ISSN 2348 – 7968

Comparative Study of Landuse Pattern in the Hilly Area of Kinnaur District, Himachal Pradesh, India

Renu Lata[1], Madhuri, S.Rishi[1,] Dinesh Talwar[2] and Konchok Dolma[1]

[1]Department of Environment Studies, Panjab University, Chandigarh, India
[2] Department of Chemistry, DAV-College, Sec-10, Chandigarh

Abstract

Inappropriate landuse is one of the main reasons for soil erosion and nutrient loss in the hilly loess area. The main objective of this study is to provide the comparative landuse pattern of Kinnaur district for the years 2003 and 2011 which indicates that the area under all landuse and land cover classes has changed in the due course of time. Collected data shows that there is an increase in barren and un-culturable land (0.38%), permanent pastures and other grazing land (0.72%), current fallows (0.007%), total cropped area (0.13%) and area sown more than once (0.07%) in the year 2012 as compared to the year 2003.

Keywords: Soil Erosion, Nutrient, Landuse Pattern, Temporal Changes and Grazing Land

1. INTRODUCTION

As human demands increase, the sustainable use of land becomes more important. Better land management involves identifying landuse changes, understanding current landuse patterns or features and assessing economic and ecological benefits and costs that arise from landuse practices, as well as finding the best alternatives for each area (Wu et al., 2001). Successful agriculture requires the sustainable use of soil resource, because soils can easily lose their quality and quantity within a short period of time for many reasons. Agricultural practice therefore requires basic knowledge of sustainable use of the land. A success in soil management to maintain the soil quality depends on the understanding of how the soil responds to agricultural practices over time. Recent interest in evaluating the quality of our soil resource has therefore been simulated by increasing awareness that soil is critically important component of the earths biosphere, functioning not only in the production of food and fiber, but also in the maintenance of local, regional, and worldwide environmental quality (Negassa, 2001).

Physicochemical properties of soils depend on both natural and anthropogenic factors, together acting over different spatial and temporal scales. Natural pedological processes (rock weathering and organic matter decomposition) are related to parent material, geomorphology of the area, presence of vegetation, the climatic conditions and other interactions with the environment. The effects of these processes are strictly time-dependent and exposed in a quite complex structure of soils. In contrast, soil management practices significantly affect pedological properties by changing soil structure mechanically due to agricultural and urban activities, and by changing chemical composition through pollution load. The presence of any element in a fatal concentration in the soil could be due to both natural and anthropogenic factors; therefore it is often quite difficult to discriminate among the different causes. The parent material largely influences heavy metal content in many soil types, with concentration sometimes exceeding the critical values (Palumbo et al., 2000; Salonen and Korkka-Niemi, 2007).

According to Wang et al. (2001) climate and geological history are importance factors to affecting soil properties on regional and continental scales. However, landuse may be the dominant factors of soil properties under small catchment scale. Landuse and soil management practices influence the soil nutrients and related

ISSN 2348 – 7968

soil processes, such as erosion, oxidation, mineralization, and leaching, etc (Celik, 2005; Liu et al., 2010). As a result, it can modify the processes of transport and re-distribution of nutrients. In non-cultivated land, the type of vegetative cover is a factor influencing the soil organic carbon content (Liu et al., 2010). Moreover, soils through landuse change also produce considerable alterations (Fu et al., 2000), and usually soil quality diminishes after the cultivation of previously untilled soils (Neris et al., 2012). Thus, landuse and type of vegetation must be taken into account when relating soil nutrients with environmental conditions (Liu et al., 2010).

Landuse in general reflects the activities of human being on land thereby changing the land cover. The conversion of agricultural lands to non agricultural uses is almost inevitable and irreversible. So, comprehensive information on the spatial distribution of agricultural landuse and pattern of their change is prerequisite for planning, utilization and management of the land resources (Sharma et al., 2014).

Landuse change may affect many natural phenomena and ecological processes (Turner, 1989), including water runoff, erosion (Burel et al., 1993; Fu et al., 1994) and soil conditions. It can drastically modify resistance of soil to environmental changes in particular; it can increase the vulnerability of semi arid ecosystems (Fernandez et al., 1995). Inappropriate landuse is one of the main reasons for soil erosion and nutrient loss in the hilly area (Fu et al., 2000).

II. DESCRIPTION OF THE STUDY AREA

Kinnaur, located on the Indo-Tibetan border, is very scenic; and is surrounded by the Tibet on the east, Garhwal Himalaya on south, Spiti Valley on the north and Kullu on the west. It lies between North latitude 31°35’40” to 31°34’42” and East longitude 77°52’38” to 78°51’28”, covered in the Survey of India toposheet No. 53E/14/3, 53E/14/6. Kinnaur is about 235 kilometers from Shimla. The religious Shivlinga lies at the Peak of Kinner Kailash Mountain. The old Hindustan-Tibet road passes through Kinnaur valley along the bank of river Satluj and finally enters Tibet at Shipki La Pass.

III. LAND ENVIRONMENT OF THE STUDY AREA

Studies of landuse aspect of ecosystem plays an important role in identifying sensitive issues and to take appropriate action by maintaining ecological balance in the initial stages of development of the project. The Himalayan regions characterized by varied physiographic and climatic conditions are endowed with a variety of landuse types and agricultural systems. Fig. 1. (a & b) gives the comparative status of landuse/ land cover of Kinnaur in year 2003 and 2012. Over 80% area comprises forests and wastelands; the cultivated area was hardly 12%. The per capita availability of land was only about 0.17 ha. Notwithstanding small arable land resource, the agriculture remains to be main source of livelihood to the people of mountainous regions (Directorate of Agricultural Census, H.P, 2003). The natural vegetation comprised of grasslands with an area of 31.04%. Forests, excluding orchards and other cultivated trees comprised of 10.24%, and scrublands accounted for the least area (2.95%). More than half (51.91%) of the total area of the district is represented by bare rocks and area under perpetual snow (Chawla, *et al*., 2012).The major food crops of the region are cereals, pulses, oilseeds and potato (Sharma and Minhas, 1993).

ISSN 2348 – 7968

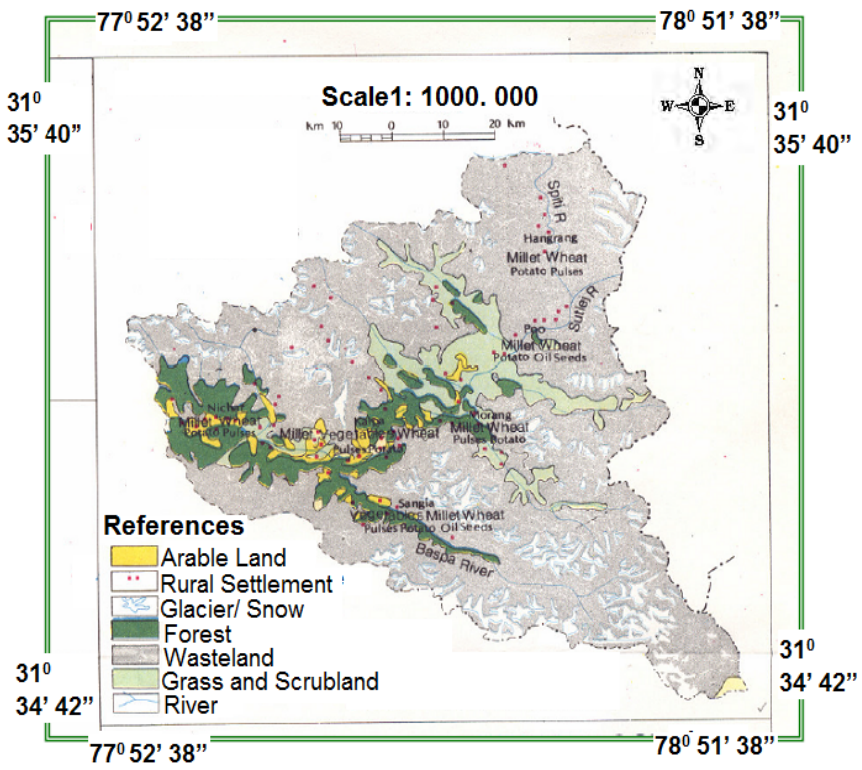

Fig. 1. (a) Landuse/ Land Cover Map of Kinnaur in 2003

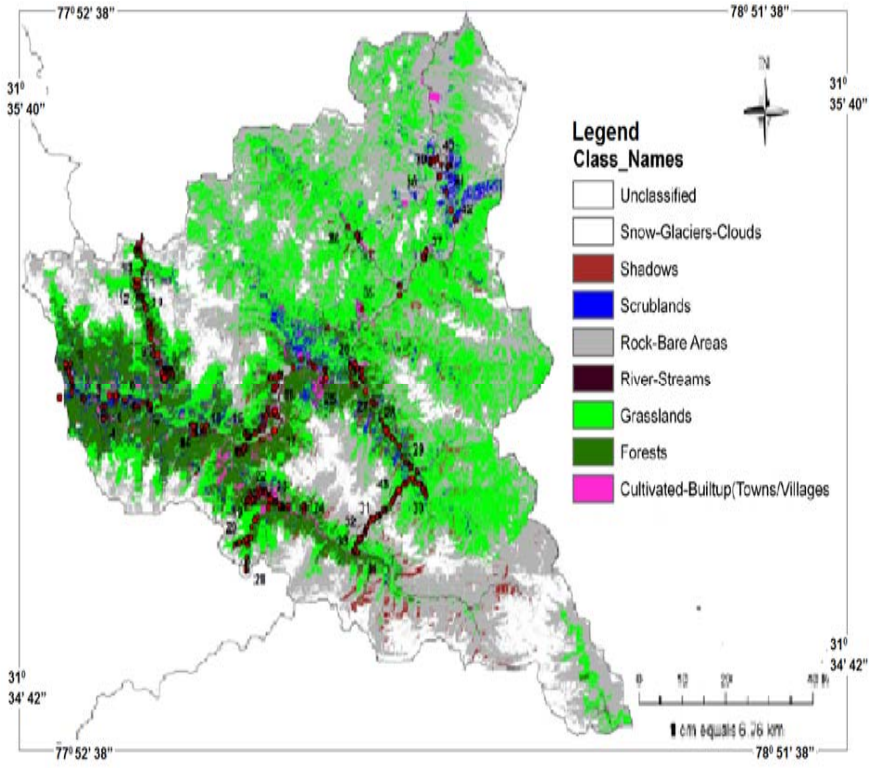

Fig. 1. (b) Landuse/ Land Cover Map of Kinnaur in 2012

(Source: After, Directorate of Agricultural Census, H.P, 2003)
(Chawla, et al., 2012)

ISSN 2348 – 7968

The agro-climatic conditions of the region are suitable for the production of temperate to sub-tropical fruits such as apple, pear, plum, peach, apricot, kiwi, strawberry, grape, cherry, almond and walnut.

IV. LANDUSE PATTERN

Landuse and land cover patterns are important in environmental impact assessment studies, landuse describes the present use such as agriculture, settlement and land cover describes the material on it such as forest, vegetation, rocks or building (Jerzy, 1983). The temporal changes in the landuse clearly reflects the magnitude of anthropogenic activities, such as submergence of large areas, permanent modifications to upstream and downstream water levels, water flows, other types of induced development associated with regulation flows and the creation of large reservoirs. Important mitigation measures include the establishment of local or regional development plans as well as resource management, monitoring programmes, emergency preparedness, warning procedures on sudden flow variations, establishment of alternative areas for agriculture and fisheries for local people, clean water supply, irrigation, planning to minimize farm, forest and other resources loss, maximizing recovery of valuable resources prior to inundation. The comparative landuse pattern of Kinnaur district for the year 2003 and 2011 has been summarized in Table 1.

Table 1. Landuse Pattern of Kinnaur

S. No.	Land Utilization	Area(Ha) 2003	Area(Ha) 2011	Changes (%Increase/ Decrease)
1.	**Forest**	37,579	37,612	+36 (0.0056 %)
2.	**Net available for cultivation**			
	i. Barren and un-culturable land	1,30,859	1,33,335	+2476 (0.38%)
	ii. Land put to non-agriculture uses	1,24,602	1,17,794	-6808 (1.06%)
3.	**Other cultivated land**			
	i. Permanent pastures and other grazing land	3,17,697	3,22,344	+4647 (0.72%)
	ii. Culturable waste	3,610	3,289	-321 (0.05%)
	iii. Land under misc. tree crops and graves not included in net area sown	84	98	+14 (0.0021%)
4.	**Fallow land**			
	i. Current fallows	1,770	1,821	+51 (0.0079%)
	ii. Other fallows	57	56	-1 (0.00015%)
5.	**Net area sown**	7,484	7,866	+382 (0.06%)
6.	**Total cropped area**	8,745	9,619	+874 (0.13%)
7.	**Area sown more than once**	1,261	1,753	+492 (0.07%)
8.	**Total Area**	6,40,100	6,40, 100	6,40,100

(Source: Statistical abstract, 2003 and Census, 2011)

A perusal of table shows that there is an increase in barren and un-culturable land (0.38%), permanent pastures and other grazing land (0.72%), current fallows (0.007%), total cropped area (0.13%) and area sown more than once (0.07%) in the year 2012 as compared to the year 2003. Whereas, the decreasing trend was found in the land put to non-agriculture uses (1.06%), culturable waste (0.05%) and other fallows (0.0001%) in the year 2011.

V. CONCLUSION

The comparative landuse pattern of Kinnaur district for the year 2003 and 2011 shows that there is an increase in barren and un-culturable land (0.38%), permanent pastures and other grazing land (0.72%), current fallows (0.007%),

ISSN 2348 – 7968

total cropped area (0.13%) and area sown more than once (0.07%) in the year 2012 as compared to the year 2003. This may be mainly due to construction of hydroelectric power projects in the area which involves blasting and tunneling. There is an imbalance in groundwater regime in the form of drying up of springs in upper reaches and generating new springs in lower reaches which affects the landuse pattern and hence the overall ecological system. Apart from this some of the villagers cut the forest for fuel wood and others for sale in small industries and left the land nude after cutting the trees. As a result the upper fertile soil runoff with rainfall. Quality of soil has decreased and these lands converted into barren lands. Whereas, the decreasing trend was found in the land put to non-agriculture uses (1.06%), culturable waste (0.05%) and other fallows (0.0001%) in the year 2012.

VI. REFERENCES

[1] Anonymous, **"**Environment Impact Assessment Report of Sorang Hydroelectric Power Project, District Kinnaur, Himachal Pradesh," Unpub. Report, 2006 pp. 20-140.

[2] F. Burel, J. Baudry and J.C. Lefeuvre, "Landscape Structure and the Control of Water Runoff. In: Landscape Ecology and Agro Ecosystems." (Eds.:R.G.H. Bunce, L. Ryszkowski, M.G. Paoletti). Lewis, Boca Raton, FL.,1993, pp. 41-47

[3] I. Celik, "Land-use effects on organic matter and physical properties of soil in a southern Mediterranean highland of Turkey," Soil Tillage Res. Vol. 83, 2005,pp. 270–277.

[4] A. Chawla, O. Parkash, V. Sharma, S. Rajkumar, B. Lal, Gopichand, R.D. Singh and A.K. Thukral, "Vascular Plants, Kinnaur, Himachal Pradesh, India," Journal of Species Lists and Distribution, vol 8, no. 3, 2012 pp. 321-348.

[5] Directorate of Agricultural Census, " Report on Agricultural Census, Government of Himachal Pradesh, India, 2003,pp. 1-49.

[6] M. J. Fernandez, L. F. Bermudez and R. A. Diaz, "Landuse and Soil Vegetation Relationships in a Mediterranean Ecosystem," E1 Ardal, Murcia, Spain. Catena, vol. 25, 1995, pp. 153-167

[7] B. Fu, L. Chen, K. Ma, H. Zhou and J. Wang, "The relationships between landuse and soil conditions in the hilly area of the loess plateau in northern Shaanxi, China," Catena vol. 39, 2000, pp. 69-78.

[8] B. Fu, H. Gulinck and M.Z. Masum, "Soil Erosion in Relation to Landuse Changes in the Ganspoel Catchment, Central Belgium," Land Degradation and Rehabilitation, vol. 54, 1994, pp. 261-270.

[9] K. Jerzy, "Impact on Environment, an Attempt at a Classification," Advances in Spatial Research, vol. 2 no.8 1983, pp. 209-215.

[10] X.L. Liu, Y.Q. He, H.L. Zhang, J.K. Schroder, C.L. Li, J. Zhou and Z.Y. Zhang, "Impact of landuse and soil fertility on distributions of soil aggregate fractions and some nutrients," Pedosphere vol. 20, no.5, 2010, pp.666–673.

[11] W. Negassa, "Assessment of Important Physicochemical Properties of Nitosols under Different Management Systems in Bako Area, "Western Ethiopia. M.Sc. Thesis, Alemaya University, Alemaya, 2001, pp. 109.

[12] J. Neris, C. Jiménez, J. Fuentes, G. Morillas and M. Tejedor, "Vegetation and land-use effects on soil properties and water infiltration of Andisols in Tenerife (Canary Islands, Spain)," Catena, vol. 98, 2012, pp.55–62.

[13] B. Palumbo, M. Angelone, A. Bellanca," Influence of inheritance and pedogenesis on heavy metal distribution in soils of Sicily, Italy," Geoderma vol. 95 no. (3-4), 2000, pp. 247-266.

[14] V. Salonen and K. Korkka-Niemi, "Influence of parent sediments on the concentration of heavy metals in urban and suburban soils in Turku, Finland," Appl. Geochem, vol. 22, 2007, pp. 906-918.

[15] P .D. Sharma and R.S. Minhas, "Landuse and the Biophysical Environment of Kinnaur District, Himachal Pradesh, India,"Mountain Research Development, vol. 13, no. 1, 1993, pp. 41 -60.

[16] R. Sharma, M. S. Rishi, A. S. Ahluwalia, and R. Lata," Comparative Change in Landuse/Landcover in the Buffer Zone of Kashlog Limestone Mines, Darlaghat, Himachal Pradesh, India using Remote Sensing and Gis Tools," International Journal of Remote Sensing

ISSN 2348 – 7968

& Geoscience (IJRSG), vol. 3 Issue 6, 2014, pp.27-30.
[17] Statistical abstract ," Prepared by District Statistical Office, Rekong Peo, Kinnaur, Himachal Pradesh," 2003.
[18] M.G. Turner, "Landscape ecology: The effect of pattern on process," Annu. Rev. Ecol. Systematics, vol. 20, 1989, pp. 171-197.
[19] J. Wang, B. Fu, Y. Qiu and L. Chen, "Soil nutrients in relation to landuse and landscape position in the semi-arid small catchment on the loess plateau in China ,"J. Arid. Environ, vol. 48, 2001, pp.537–550.
[20] J. Wu, M.D. Ransom, G.J. Kluitenberg, M.D. Nellis and H.L. Seyler, "Landuse Management using a Soil Survey Geographic database for Finney County, Kansas," Am. J. Soil Sci. Soc., vol. (2001). 2001, pp. 169-177.