

Socio-Economic Factors Responsible for the Degradation of Forest in Sherani District, Balochistan

MUHAMMAD IMRAN

Divisional Forest Officer

Institute of Biochemistry University of Balochistan

Quetta, Pakistan

MUHAMMAD ANWAR PANEZAI

Director Biochemistry

Institute of Biochemistry University of Balochistan

Quetta, Pakistan

ASHIF SAJJAD

Institute of Biochemistry, University of Balochistan

Quetta, Pakistan

Abstract:

The most challenging problem in Sherani district is the protection of forest resources, due to underprivileged condition of the area. The socioeconomic factors are the key indicators for the degradation of natural resources. The literacy rate of Sherani district is very low (less than 20%) and the Local inhabitation of the area are unaware of deforestation; which causes many problems like soil erosion, flooding and degradation of natural resources for livelihood. The data indicate that poverty is a wide spread phenomenon. The income per months is very low. Sherani district is mainly a rural area, where the income resources are very low. For income generation many inhabitants migrate and work in urban areas like moving toward Dubai and Arab Emirate. In the light of different observations it can be easily seen that the Government has not contributed in the development of the district. There is no clear cut policy for the conservation of forest resources at Sherani district. The residents of

Sherani district are utilizing the forest trees as to satisfy their energy demand. Peoples are having great number of livestock which is grazed on the forest land/range land throughout the year. These livestock damage the land cover and also damage the regeneration within the area.

Key words: Sherani; livestock; socioeconomic; climate; olive; deforestation

1. STUDY AREA

Sherani District was the second biggest tehsil of Zhob District until 2005. In 2006, It was officially graded as district with the name of "Sherani" (Sherani is the name of the largest tribe of the area). Sherani district is situated in the higher elevation of Balochistan, and forming the north eastern corner of the province. It is situated between 29°30'N 65°40'E / 29.5°N 65.667°E.

Its borders are attached to District Zhob, Dera Ismail Khan and District Musa khel. The centre of the district is named as "Stano Raaghah".

1.1 Population

The population was 83,771 (census 1998).

1.2 Tribes

There is a tribal system in the district. The main tribe of Sherai district is named as Sherani (Marani). And another tribe of the district is named Harifal. The Sherani tribe living in Sherani district is divided into two main branches, the Hasan Khel and the Oba Khel, and one small branch, the Kapip. Hasan Khel is further divided into Muhammad Zai, Haizai, Ranaizai, etc. Muhammad Zai is the biggest clan with respect to population.

1.3 Villages

A reasonable population of the Sherani tribe lives in the neighboring district Zhob. But the big part of the population of the tribe live in Sherani district in some large villages and many small villages. There are the following well known villages in the district:

- Kaza Malizei
- Stano Raaghah
- Chachobi
- Mir Ali Khel
- Mani Khwah
- Sur Lakai
- Shna Ponga
- Ahmadi Darga
- Lawara
- Mraghbal
- Tor Raghah
- Dab Sheikhan
- Sheen Ghar

1.4 Education

Balochistan is the lowest literate province of Pakistan. But the literacy rate of Sherani district is unfortunately very low with respect to other districts of Balochistan such as Pishin, Qila Abdullah, and Loralai etc. There are only two high schools for thousands of boys and girls of the district. There are only three middle standard schools in the whole district. There is no a single girls school in all over the district. The literacy rate of the women of the district living in villages is approximately 3%. Even the literacy rate of the males in the district is not higher than 15%. As the majority of the population of the district is religious so they admit their children in religious schools named as "Madarsa" in local language. As there is no college in

the whole district, so the students have to go to other cities, like Quetta, D.I.Khan, Islam Abad etc to study.

1.5 Income resources

The majority of the people in the area are poor due to limited resources of income. The most reliable sources of income are.

- Government jobs.
- Agriculture
- As the mountains of the district are full of "Chalghoza Trees" (a kind of dry fruits). So the families living near the mountains such as Qaisa Ghar and Sheen ghar pluck the fruit from the trees and then sell them.
- A huge part of the population of the district works in UAE especially in Dubai.
- Large part of the population is having livestock. They get meat and milk from their cattle. They sell these animals to fulfill their household necessities.

1.6 Flora and fauna

Flora of Sherani district, is having hundreds of species of some pretty indigenous plants like; gerardiana, pistachios, wild olives, wild ash and wild almonds. Shrubs like; barberry, wild cherry, and makhi, herbs like; Ephedra intermedia are present throughout.

Fauna of Sherani district has a wide variety of mammals like Markhors, "Gad" (wild sheep), wolves, jackals, rabbits, wild cats, wild goats and deer. While birds include species of partridge, warblers, shikras, blue rock pigeon, golden eagle, sparrows, hawks, falcons and bearded vultures.

1.7 Topographic feature of area.

The general characteristic of the Sherani consists of barren hills, mountain ranges and vast open plains. Rocks and stones varying in size from huge gigantic boulders on the mountain

soil to small pebbles and shingles of the strands of the dry torrent beds cover the greater part of the area.

The rocks belong to the age of Pliocene. There are extensive intrusions of coarse grained gabbro serpentine and dolerite of early tertiary age.

In general the soil is high in calcareous material and with the continued depletion of plant cover by the grazing animals there is a very little organic matter and "A" horizon is poorly represented.

In the mountainous region soil has lost through successive decades of grazing. Soil is largely composed of re-weathered parent material with no profile differentiation and a high degree of periodicity due to erosion and deposition.

1.8 Climate and precipitation

District Sherani is having extreme condition of climate; winter is cold and summer is very hot accompanied by hot winds especially the months of June and July. The rain is received in July and August and again in January and February but it is erratic. It is continued in few storms followed by droughts. Water is scarce throughout the area. It is widely believed that the water supply in this area is tending to diminish. It is due to reduction of vegetation cover caused by large scale grazing, browsing, lopping and indiscriminate cutting of trees.

2. SIGNIFICANCE OF THE STUDY:

Over the course of human development they successfully learned how to exploit ecological system for sustenance. Nature has been shaped and contorted to channel a few products human find useful, but while ecological systems are supply they can snap viciously when bent too far. The lands ability to serve human can be noticeably and sometime permanently, exhausted.

A far deadlier annual toll and perhaps an even greater threat to future human welfare, than that of pollution of our air and water is that exacted by the undermining of the productivity of the land itself through accelerated soil erosion, creeping desert, increased flooding, and declining soil fertility. Homo sapiens are out of description ignorance, shortsightedness, or greed destroying the basis of their own livelihood as they violate the limits of natural systems. Not surprisingly, the principal victims of these trends are the world's poor, who in their quest for food and fuel, are often forced by circumstances and institutions beyond their control to serve as the agents of their own undoing.

Balochistan, the biggest province of Pakistan has an area 34.72 million hectares out of which 15.63 million ha. is unclassified land and 1.09 million ha. is the forest area under the control of forest department which forms 3.1 % of the total area (Amjad & Khan 1987). The province is badly suffering from the scarcity of timber and fuel wood. Existing production of forest cannot fulfill the demand of the growing population. More than 84% of the total population resides in the rural areas of the province and totally depends on agriculture and livestock.

As no productive forest exists in the province, the demand of the fuel wood and timber is met from the import of these items from other areas of the country and partially from Afghanistan.

Sheep and goats obtain 90% to 95% of their feed from range and forest lands of the province. The date, without exceptions livestock production has been on traditional lines. Considering the limited resource of feed available it is evident that poor forest and range resource will soon be exhausted, the number of sheep and goat flocks in Balochistan has reached its maximum, if no measures for increasing feed availability are taken soon it will not only affect the animal health but also it

will be disastrous to the ecology of the area. Nomadic grazing is also the main feature of the area. Big flocks in the summer season in the quest of food enter in the province from Afghanistan and cause heavy damage.

Rural people with low income level have to collect firewood for their daily use as there is no other option for them because of high prices of fuel wood in the market. Day by day the local people have to travel more and more to collect not only wood to burn but also water to drink because of the drying of the natural springs due to deforestation.

This is an overall blurred picture of the province. But if we compare the Sherani district with other parts of the province, we see that hills and slopes have some sort of vegetation on it. At certain places where the green colour was dominating in the pictures are gradually becoming smaller and smaller and now terraces are left which will be washed out if certain measures will not be taken immediately to protect and preserve the fragile ecosystem of the area.

One can find patches of olive forest in the Sherani district. Vegetation is present mostly in valleys in depressions and on cooler aspects where some sort of moisture is present. But the forest is mostly open, may be due to heavy grazing and illicit felling by the local people to meet the requirement of fuel wood, building material and lopping for fodder. These all factors have very bad effect on the natural reproduction of forest. Regeneration is very low and is disturbed by grazing, lopping and ultimately leading to heavy soil erosion and loses of top fertile soil.

People are mostly poor having very small land holdings. Only those lands are under cultivation where some water is available and soil is present. Mostly cultivation is carried out in plain areas in valleys and not on slopes. Farmers usually go for fruit trees, wheat, vegetable etc.

When I interviewed the senior persons of the area they told me that there used to be heavy snow fall and forest were thick and one could find lot of springs but now environments are changed and snow fall is occasional only on hills, once in two or more years, springs are gradually drying up and the area under forests is decreasing rapidly.

3. METHODOLOGY

Due to poor socio-economic condition, the forests are being heavily destroyed by the people in the whole country. It is prerequisite for the success of any forestry activity to study the socio-economic condition of the people. The success of any programme can not be predicted unless studying culture, customs, social, political and economic condition of the people.

1. Sampling design

With different sampling techniques, multistage sampling has carried out that is random sampling and incidental sampling. With the help of above sampling techniques, survey was conducted in the area.

2. Tool for data collection

A questioner was prepared by the author, in order to collect socio-economic data of the people living in district Sherani.

4. RESULT AND DISCUSSION

Literacy rate of an area play a vital role especially in the management of forest. The literacy rate in Sherani district is very low and the peoples do not understand the phenomenon related to forest destruction and its effect on our daily life. Our analysis showed that majority of peoples are uneducated i.e. more then 80-85%. Nearly 10-15% are matric or below matric

5% are above matric among which less than 1 % get to higher education.

4.1 Size of respondent family.

The population of Sherani district is growing very fast. The rapid growth has great influence on the existing forest and range land resources.

Table 2: Size of respondent family.

Family size	Respondents	
	No	Percentage %
1-6	7	14
7-12	16	32
12 and above	27	54

The peoples of Sherani district are having combine family system. Majority of the respondents i.e. more than 54% are have the family above the 12 members. 32% are having family below 12 members. The respondents having family 1-6 members are only 14%. The data show that the family size is bigger than that present in the country. As the population is increasing in the district the locals are now changing their way from combine family system toward single family system.

4.2 Occupation

Agriculture and livestock are the main resource of income in Sherani district. The majority of the people in the area depend upon these resources to fulfill their daily needs.

Table 3: Occupation

Occupation	No. of respondents	Percentage %
Agriculture	16	32
Livestock	21	42
Business	7	14
Employee	2	4
Student/Retired	4	8

Majority of respondents are engaged in agriculture and livestock. The percentage of agriculture 32% and that of livestock is 42%. 4% are employed in government sector and 14% are doing their own business. Only 8% are student.

4.3 Source of income

The respondents were asked about their resources of income in the study area. From 50 respondents following data was collected and then the percentage was worked out.

Table 4: Source of income

Source of income	No. of respondents	Percentage %
Agriculture	41	41
Livestock	37	37
Business	11	11
Employ	7	7
Foreign	4	4

7 % of the respondents are engaged in employment. While 41% are in agriculture. 37% belonging to livestock while the peoples belonging to Business and foreign are having 11% and 4%. So, the people get main income from agriculture and livestock.

4.4 Livestock.

Peoples of the area are mostly poor and one of the main resources of income is the rearing of livestock. The range land/ forest are degraded due to grazing of huge number of livestock beyond its carrying capacity. The livestock are grazed on these lands throughout the year, which cause degradation of forest in the Sherani district.

Sheep, goat and cattle are reared in the area. The population of livestock for the purpose of analysis is divided into different classes.

Table 5: Sheep, goat and cattle population

Classes	No of sheep and goat	Percentage %	No of cattle	Percentage %
> 30	21	42	-	-
15-30	12	24	-	-
1-15	13	26	27	54
Nil	4	8	23	46

From the data it is cleared that peoples are having great number of livestock. The peoples are mainly rearing sheep and goats. The population of cattle is low. The 8% do not have sheep and goats while 26% are having (1-15) number of sheep and goats. 24% respondents are having the seep and goat population in the range of 15-30. 42% had more than 30 sheep and goats, while on the other hand the rearing of cattle on commercial scale is not done in the area. Peoples of the area get milk and meet for their daily use. From data we get following results i.e. 54% are having cattle ranging 1-15. While 46% do not have any cattle.

4.5 Fodder trees

Different forest trees are used as source of food for livestock. The utilization of the trees by livestock tends to degrade the forest in Sherani district. Different trees have different palatable value. So, the data shows the utilization of different trees as shown in table.

Table 6: Fodder trees.

Trees	No. of respondents	Percentage %
Poplar	3	6
Mulberry	21	42
Khinjik	14	28
Olive	9	18
Others	3	6

The data shows that olive, Mulberry and Khinjik is mainly used as fodder trees which are being heavily lopped by the people of Sherani district. This lopping results in the decrease of trees

growth and seed production. With low seed production the natural regeneration will also be affected. The livestock affect the small seedlings of these trees severely.

4.6 Source of feeding livestock

It is matter of fact that grazing the land beyond its carrying capacity will be degraded in vegetation cover. So the land of Sherani district is facing the same problem i.e. huge number of livestock is grazed throughout the years. This grazing degrades the forest and range land resources.

Table 7: Source of feeding livestock

Source	No. of respondents	Percentage %
Purchased	13	16
Grazing forest	29	35
Grazing rangeland	33	40
Others	7	9

From the above fig. it is clear that majority of respondents (75%) utilize the forest and rangeland area form feeding their livestock. Only 16% of the respondents purchase fodder from market to feed their livestock for commercial use. 9% of respondents get the food for their livestock from agriculture fields.

4.7 Fuel used in Sherani district.

Fuel wood collection in the forest has very great effect on forest species.

Table 8: type of fuel used in Sherani district.

Type of fuel	No. of respondents	Percentage %
Wood	50	45
Gas	6	5
Coal	11	10
Cowdung	9	8
Agriculture waste	22	20
Electricity	13	12

The people of Sherani largely depend upon fuel wood which they collect and harvest from forest area. All the respondents responded positively in the use of wood. Other major fuels in use are agriculture waste, electricity and cowdung. Gas and coal are rarely used in the area.

4.8 Utility of forest

People of Sherani district exploited the forest to optimum level, to get maximum benefits in the form of fuel wood, grazing animals, logs for construction purposes etc. the percentage of respondents to different categories is given below.

Table 9: Utility of forest.

Purpose	No. of respondents	Percentage%
Fuel wood	50	35
Grazing	37	26
Construction	13	9
Selling	7	5
Fruit	12	9
Timber	22	16

All the respondents respond positively to the fuel wood. People of the area mainly cut trees for the purpose of fuel wood and for timber wood. Only 5% of respondents cut the trees for selling purpose. The grazing percentage is also very high which is (26%).for fruit i.e. Chalghoza from *Pinus gerardiana* is only 9%. The rest of respondents (9%) think of constructional use. So, the forest degradation in Sherani district is mainly due to fire wood.

4.9 Encroachment and conversion of forest land to agriculture

The forest land is converted to agriculture land is practiced all over Pakistan. The land is always utilized to get maximum income from the land resource. The forests have very long rotational age that is why people do not have any interest in

afforestation. They always go for agriculture to get maximum income in very short period of time.

Table 10: Conversion of forest land to agriculture land.

View	No. of respondents	Percentage %
Yes	3	6
No	47	94

From the data it is shown that small area has been converted to agriculture land i.e. only 6% responded positively and the rest of 94% responded negatively. This show this problem has a little effect on the degradation of forest in the area.

4.10 Impacts of forest Degradation

The literacy rate of the area is very low but the people of the area were aware of the drastic effect of forest degradation on human life and resource. Different questions were asked to know the level of knowledge about forest degradation.

Table 11: Impacts of forest Degradation.

Effect of deforestation	No. of respondents	Percentage %
Soil erosion	37	27
Soil degradation	13	10
Low water quality/quantity	42	31
Water logging	5	4
Aesthetic value	32	23
Environment	7	5

Majority of respondents 27% have with the view that the soil erosion is on very high scale due to the removal of vegetation, this erosion has affected the aesthetic value of the forest area.10% with a the view that the soil is degraded due to forest degradation. Some respondent (5%) raised the environment and told that environment is badly damaged due to forest degradation. The water quality is deteriorating and the recharge is also affected because of runoff of the water without

interception by vegetation it was the view of 31% and 4% of respondents also highlighted the water logging.

4.11 Failure of natural regeneration.

Heavy logging, grazing and soil lose in the forest have damaged the natural regeneration on high scale and the local species do not tend to regenerate easily. Heavy grazing in the area compact the soil and destroyed the seedlings is the main problem in natural regeneration. Seeds from the trees are also damaged by the livestock. The respondents have given following data regarding failure of natural regeneration.

Table 12: Failure of natural regeneration.

Reasons	No. of respondents	Percentage %
Grazing	33	36
Seeds collection and damage	5	6
Wild animals	15	16
Environment	27	30
Others	11	12

The data from 50 respondents were collected; the respondents mainly gave stress on grazing which have damaged the natural regeneration. 30% said that the environment in the area has been changed and the regeneration is failed due to low rain and hot climate. Some of the respondents (16% and 6%) made wild animal and seed collection liable for the failure of natural regeneration.

4.12 Trees planted on agriculture lands.

Farmers' plant poplar, mulberry and fruit trees on their lands and in the courtyard of their houses. Major species planted are poplar and mulberry.

Table 13: Trees planted on agriculture lands.

Species	No. of respondents	Percentage %
Fruit	42	72
Poplar	5	9
Mulberry	11	19

72% respondents told that they have planted fruit trees. While 9% respondents planted poplar and 19% planted mulberry on their lands.

4.13 Depletion of forests

While asking about two major factors which cause depletion of forest the respondents told us that grazing and felling for firewood are the major causes in the degradation of forest in the Sherani district.

Table 14: Depletion of forest.

Factors	No. of respondents	Percentage %
Grazing	37	47
Felling	42	53

4.14 Suggestion to improve socio-economic condition.

Major demand of the people is for school, roads, hospital and drinking water. In some villages school buildings are erected but there is no teacher in that school. Some educated respondents told that forest department can actively take part in the uplifting of socio-economic condition by establishment plantation on communities lands. Basic Facilities are not present in the area. There are only two high schools for boys and no high school for girls. The condition of the area is not good at all. All the respondents were asking for basic facilities. They demanded for different facilities which can bring drastic change in their lives. The demands of the respondents are given in the following table.

Table 15: Suggestion to improve socio-economic conditions.

Suggestions	No. of respondents	Percentage %
School	45	18
Roads	43	17
Hospital	32	12
Telephone	17	7
Vet. Hospital	22	9
Water	29	11

Electricity	37	14
Agriculture health	19	7
Community planting	9	4
Others	3	1

5. CONCLUSION

The basic objective of the study conducted in Sherani district province of Balochistan can be described as under.

- a- Socio-economic condition of the Sherani community.
- b- Bring out forest benefits to the community.
- c- Determination of population & livestock pressure on the Sherani forests.

The data collected from 50 selected respondents through questioners and this data was organized in tabulated form.

The data determines that more than 80% of the people lack education and most of them are attached with livestock and agriculture profession. The family size in the area is comparatively larger to the other parts of the Balochistan which are 12 members/family.

92% people graze their livestock in the forest / rangeland. Extensive lopping of trees carried out to feed their livestock. *Olea ferruginea*, *Pistacia Khinjuk* and *Mulberry* are the prominent fodder species.

The residents of the Sherani district are stench followers of religion and highly conservatives of their values.

The land holding is small most of the respondents were having less than 10 acres. Main crops of the area are wheat primarily for domestic use.

For the fire wood and timber some areas have also been noticed to be planted with mulberry and poplar on the margin of their crops.

Major socio-economic factors which cause forest degradation are.

- 1- Illiteracy.

- 2- Huge family size.
- 3- Extreme poverty.
- 4- Livestock as occupation.
- 5- Lack of jobs.
- 6- Dependence on agriculture.
- 7- Considering forests as their property.
- 8- Collision with timber mafia.

7. RECOMMENDATION.

Some of the recommendations that will assist to illustrate the deteriorating forestry situation in Sherani.

- i- Awareness to the local community about the importance of forest and the national resource found in the area.
- ii- Educating the local inhabitants which might help in conservation of forests.
- iii- Extensive programme should be started for the community awareness in order to involve the people in conservational activities.
- iv- Soil conservation and stabilization are required in the severely degraded range and forest areas.
- v- Job opportunities to the local community.
- vi- Alternative source of energy. Many areas of the district Sherani lack the facilities of electricity and gas. The government should provide gas and electricity to conserve the valuable forest of Sherani.
- vii- Range land improvement by providing care and palatable species.

REFERENCES

1. Abrams, E.M. rue, D.J. the causes and consequences of deforestation and the prehistoric maya. *Human Ecology*. New York 1988, 16: 4, 377-395.
2. Amadou Sidibé. Demand for Soil, Water and Forest Conservation in Burkina Faso, Doctoral Thesis Swedish University of Agricultural Sciences Umeå 2010
3. Amjad, M. and Nadar Khan. *The State of Forestry in Pakistan*. P.F.I. Peshawar 1987.
4. Armitage, D., R. Plummer, F. Berkes, R. Arthur, A. Charles, I. Davidson-Hunt, A. Diduck, N. Doubleday, D. Johnson, M. Marschke, P. McConney, E. Pinkerton, and E. K. Wollenberg. 2009. Adaptive co-management for social-ecological complexity. *Frontiers in Ecology and Environment* 7:95-102
5. Ashraf, M. M. and Ghulam Akbar. Status of deforestation in Pakistan *Journal of Forestry*. 1989, 39: 2. 79-87.
6. Bannister, M. E. and P. K. R. Nair. 2003. Agroforestry adoption in Haiti: the importance of household and farm characteristics. *Agroforestry Systems*, 57: 149–157.
7. Burgess, J.C. 1993. Timber production, timber trade and tropical deforestation. *Ambio*, vol. 22, pp. 136–43.
8. Chowdhury, R.R. 2006. Driving forces of tropical deforestation: The role of remote sensing and spatial models. *Singapore Journal of Tropical Geography*, vol. 27, pp. 82-101.
9. Chowdhury, R.R. Driving forces of tropical deforestation: The role of remote sensing and spatial models. *Singapore Journal of Tropical Geography*, 2006. (vol. 27): pp. 82-101.
10. Conway, D., Bhattarai, K.N., Shrestha, R. 2000. Population–environment relations at the forested

- frontier of Nepal: Tharu and Pahari survival strategies in Bardiya. *Applied Geography*, vol. 20, pp. 221–242.
11. F.A.O. Rosition paper “ Implementing Forestry Progarmmers for local community development” Forestry for rural communities by Forest Department F.A.O. U.N. Rome. Halty. 8th world forestry Congress Jakarta. 16-28 Oct 1978. pp 833-842.
 12. FAO, 1999. Annotated Bibliography, Forest cover change, Nepal. Forest Resources Assessment Programme (FRA), Forest Resources Division (FRD), FAO Rome.
 13. FAO, 2001. State of the World's Forests. Food and Agriculture Organization of the United Nations, Rome.
 14. FES, 2007. Friedrich Ebert Stiftung. Political Development in Nepal: 2000. Social and Economic Development Indicators. http://www.fesnepal.org/reports/2000/political_reports2000.htm
 15. Fitzgerald, K. Management and regeneration of degraded catchments and eroded pastoral lands with particular reference to range reseeding. In F.A.O. conservation guide No 3 U.N. (1978) pp. 41-60.
 16. Geist, H.J., Lambin, E.F. 2002. Proximate causes and underlying driving forces of tropical deforestation. *Bioscience*, vol. 52, pp. 143–150.
 17. Gilmour, D. A. 1995. Rearranging trees in the landscape in the middle Hills of Nepal. In: Arnold, J.E.M. and P. A. Dewees, (eds.), Tree management in farmer strategies: Responses to agricultural intensification. Oxford University Press. pp. 21-42.
 18. Kalaghe, A.G. Mrngi and T.H. Johansson, L. Conservation of catchment forests in U.S Ambara Mountains. *Journal of the Tanzania Association of foresters*, 1988. Vol. 6. pp. 137-47.

19. Kasperson, J.X., Kasperson, R.E., Turner, B.L. (eds) 1995. *Regions at Risk: Comparisons of Threatened Environments*. UN University Press, Tokyo.
20. LADA. 2008. *Land Degradation Assessment in Drylands (LADA) - Assessing the status, causes and impact of land degradation*. Food and Agriculture Organization of the United Nations (FAO).
21. Lambin, E.F., Geist, H.J., Lepers, E. 2003. Dynamics of land-use and cover change. *Annual Review of Environment and Resources*, vol. 28, pp. 205–41.
22. Le. Houerou, H.N. *can desertization be Halted? (conservation in arid and semi arid Zones)*. Forest Conservation and Wildlife Branch, Forest Resource Division Forestry Department, Food and Agriculture Organization of the United Nations, Rome 1978. F.A.O. Conservation guide No.3.
23. Leemans, R., Lambin, E.F., McCalla, 2003. Drivers of change in ecosystems and their services. In Mooney H, Cropper A, Reid W (eds) *Ecosystems and Human Well-being: A Framework for Assessment*, 85–106. Island Press, Washington, DC.
24. Maertens, M., Zeller, M., Birner, R. 2006. Sustainable agricultural intensification in forest frontier areas. *Agricultural Economics*, vol.34, pp.197–206.
25. Millennium Ecosystem Assessment. 2005. *Ecosystems and human well-being: Synthesis*. Reid WV, editor. Washington (DC): Island Press. 137 pp.
26. Ojima, D.S., Galvin, K.A., Turner, B.L. 1994. The global impact of land-use change. *Bioscience*, vol. 44, no. 5, pp. 300–304.
27. Ostrom, E., Burger, J., Field, et al. 1999. Sustainability – revisiting the commons: local lessons, global challenges. *Science*, vol. 284, pp. 278–282.

28. Pal, B.P. Environmental Conservation and Agriculture Production. *Indian Farming* (1989). 39(7). pp 3-7.
29. Prasad, V. K., Badarinath, K.V. 2005. Assessing Forest Cover Sustainability and Deforestation Risk from Socio-economic and Biophysical Indicators- a Case Study from Rampa Forests, South India. *Sustainable Development*, vol.13, pp. 102–114.
30. Puigdefábregas, J. 1998. Ecological impacts of global change on drylands and their implications for desertification. *Land degradation & development* 9, 393-406.
31. Sheikh, M.I. United States – Pakistan Workshop on arid lands development and desertification control P.A.R.C. Islamabad. (1987).
32. Shukla, J., Nobre, C., Sellers, P. 1990. Amazon deforestation and climate change. *Science*, vol. 247, pp. 1322–132
33. Sunderlin, W. D., Angelsen, A., Belcher, B., Burgers, P., Nasi, R., Santoso, L., Wunder, S. 2005. Livelihoods, Forests, and Conservation in Developing Countries: An Overview. *World Development*, vol. 33, no. 9, pp. 1383–1402.
34. The Gazetteer of Balochistan Zhob District, (2nd edition). Published for Government of Balochistan Goshae-e-Adab Quetta 1986 pp. 1, 23, 175-184.
35. Thoms, C.A. 2008. Community control of resources and the challenge of improving local livelihoods: A critical examination of community forestry in Nepal. *Geoforum*, vol. 39, pp. 1452–1465.
36. Turner, B.L., Skole, D., Sanderson, S., Fischer, G., Fresco, L., Leemans, R. 1995. Land-use and land-cover change, Science/Research plan. IGBP/HDP Report 35/7, 132 pp.

37. Viswanath, S., P. K. R. Nair, P. K. Kaushik and U. Prakasam. 2000. *Acacia nilotica* trees in rice fields: A traditional agroforestry system in central India. *Agroforestry systems*, 50: 157-177.
38. Warner, K. 1995. Patterns of tree growing by farmers in Eastern Africa. In Arnold, J.E.M. and P. A. Dewees, (eds.), *Tree management in farmer strategies: Responses to agricultural intensification*. Oxford University Press. pp. 90-137.
39. WWF, 2004/05. WWF for living Planet. WWF Nepal Program Annual Report 2004-2005. World Wildlife Fund.
40. Cundill, G and Fabricius, C. 2009. Monitoring in adaptive co-management: Toward learning based approach. *Journal of Environmental Management* 90, 11: 3205-3211.