Natural Resources Utilization Pattern: A Study in Kangra District of Himachal Pradesh

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Abstract: The study on natural resources utilization pattern of Kangra district of Himachal pradesh have clearly brought out that the analysis of different categories of lands did not show much change over time periods. Increase was observed in the land put to non-agricultural uses. The barren land showed a decreasing trend. The net sown area has almost remained constant. Rice, wheat and maize were the three prominent crops of study area. The share of area under barley, pulses and oilseed was less and decrease over time and found that there was very high increase in vegetables during the period. The highest share of irrigated area was observed under potato followed by vegetables and paddy. Irrigated area under pulses and oilseed was very less and varied between 2 to 12% in different years. The Kuhls and lift irrigation were the two prominent sources of irrigation. Kuhls met the 81% of irrigation requirement in the district. Per cent increase in production and productivity was found in rice, wheat, potato and vegetables. The analysis of compound growth rate had shown that higher increase in production was in wheat (14.9% per annum) followed by vegetables (12% annum). Maximum positive significant growth rate was observed in case of present fallow land (1.81% per annum) and maximum negative significant growth rate was observed in case of barren land (4.71% per annum). The total gross cropped area and area had shown more than once showed negative rate of growth in the district. Maximum declining in area was observed in pulses (19% per annum), followed by barley and oilseed. Maximum positive growth was noticed in vegetables, wheat and paddy in the district.

Key words: Natural resources, land use, Kangra district, utilization pattern.

Natural resources play a significant role in economy, ecosystem and contribute to social equity (Lu, 1994). Land and water are the basic natural resources. The importance of natural resources is very critical to societies which are at low level of development. The sustainable use of natural resources to attained high level of human development has become imperative. Natural resources endowment of a country is a facilitator of its economic development. The livelihood of people depends directly or indirectly on natural resources. The degradation of quantity and quality of these resources increasingly becomes the focus of attention in recent years.

Over exploitation of natural resources by growing population has a great pressure on land and water for all sector of the economy. Natural resources of Himachal Pradesh have also a direct relationship with its physiographic condition including relief, drainage, climate and geology. These in turn influences the type of soil and kind of vegetation cover (Iyengar, 2003; Castle, 1982; Karki and Rasul, 2008).

Land is the scarce resource and basic input for agriculture. Land occupies a pre-eminent position among all the resources required for a modern economy (Ramasamy *et al.*, 2005). The situation of land is worst in hilly terrain where inaccessibility is other constraints forced the population to utilize whatever is accessible. In hill area, land is prone to degradation due to sloppy position and the distribution of cropped area may change temporally (Uchida, 1997; Kumar, 1988). Further, low operational holding, very low productivity of cereal crops in hilly area, unsustainable intensification in hilly area are the major force behind farm land degradation and productivity loss. In Himachal Pradesh about 11% of area is under cultivation and 82% cultivated area is rainfed. More than 90% land holding are small and marginal, scattered so, increasing population causes more pressure on the land (Gupta, 2007). Water is another vital natural resource of the state. The state is richly endowed with a hilly terrain having an enormous volume of water from the catchment of the rivers. These perennial rivers provide water for drinking, irrigation and hydropower. The state has enormous potential

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of water resources in the form of glaciers and rivers, but ground water resource is limited (Karam, 1978). About one-third of its cultivated area is irrigated because of physiographic constraints. The traditional sources of water harvesting include springs, Kuhls, boaries, ponds and ditches. These systems supplement the water requirement of the rural and urban areas. The demand for water is increasingly over the years. About one-fourth of the area in Kangra district is under irrigation. Major source of irrigation are Kuhls, tubewells and shallow wells.

Land and water management system is generally responsible for the progress of agricultural development. Management of these resources is important issue that affects all as everyone's depending directly and indirectly on natural resources (Awasthi *et al.*, 1989). Land and water resource make a significant contribution to food security. So, there is a need of thorough investigation of changes in land and water utilization pattern (Giri, 1966). It is with this background the present study on natural resources (land and water) utilization pattern was conducted in Kangra district.

Methodology

Study area

The study was carried out in Nagrota Bagwan block of Kangra district. It was purposely selected for the study because of its clear cut division of Palam (irrigated) area and Changhar (unirrigated) area as the study was divided into two strata (irrigated and unirrigated).

Sampling design

Using stratified random sampling, the Nagrota Bagwan block was divided in to two strata size, irrigated and unirrigated. A complete list of villages from irrigated and unirrigated strata under Nagrota Bagwan block was prepared. Five villages each were drawn at random from both the strata. A sample of 40 farmers was selected from each strata (i.e. from five villages) using proportional allocation method. After selection of 40 farmers from each irrigated and unirrigated strata, they were divided into two groups (marginal and small) based on the land holdings.

Data collection

Both primary and secondary data had been collected. The primary data for the present study were collected through a survey method by personal interview with the households. The secondary data for this study had been collected from secondary sources.

Analytical framework

To meet out the objectives of the present study, both tabular and statistical techniques were employed. Triennium averages and the statistical tools like computation of compound growth rates have been used in the analysis of this study.

The compound growth rates were computed from time series data (1999-00 to 2008-09). It was computed by using following formula:

$Y = AB^X$

The log linear form of this function is: Log Y= log A+ x log B

Compound Growth Rate (CGR) = (antilog b-1) 100

The standard error of growth rate was computed as:

$SE\ (CGR) = 100B/0.43429\ [\sum log\ y^2 - log\ b\ \sum x\ log\ y/(N-2)\ \sum x^2]^{1/2}$

$t^* = b/SE(b)$

where,

'Y' is various parameters like area in ha, production in MT, sources of irrigation in no.etc.

'A' is constant

'B' is regression coefficient

'x' is time variable in years 1, 2, 3……………

'SE' is standard error

Results

The share of different land use categories to the total geographical area for the three triennium averages 1999-02, 2002-05, 2005-08 and one single year 2008-09 were worked out to study the status of different type of lands and net sown area in Kangra district. Table 1 shows the share of different lands to total

Table 1. Land utilization pattern of Kangra district during different years (Per cent)

Land Categories	Years			
	1999-02	2002-05	2005-08	2008-09
Forests	40.21	40.10	40.15	40.25
Non agricultural land	13.12	13.42	13.46	13.44
Barren land	3.23	2.90	2.65	2.57
Permanent pastures	15.09	15.25	15.28	15.20
Land under miscellaneous tree crops, etc.	1.63	1.42	1.43	1.43
Agricultural barren land	4.51	4.77	4.90	4.88
Other fallow land	0.16	0.18	0.17	0.19
Current fallow	1.70	1.75	1.83	1.98
Net sown area	20.35	20.21	20.13	20.06
Total Geographical area ('000ha)	100.00 5,77,943.00	100.00 5,78,003.00	100.00 5,77,681.00	100.00 5,77,681.00

Source: District Statistical Office, Dharamshala.

geographical area was increased or declined; in case of forest it was around 40% in different years. It shows that the area remains almost same over the time mainly due to afforestation efforts. The analysis of different categories of land did not show much change over time. Net sown area, gross cropped area and area sowed more than once showed a declined trend during 2003-04 and 2008-09 over 1999-00.

Per cent share of different crops in gross cropped area in Kangra district

Table 2 elicits share of different crops in gross cropped area in Kangra district. Rice, wheat and maize were the three major crops accounting for about 17%, 43% and 27% of the gross cropped area during the year 2008-09. The per cent share of area under barley, pulses, oilseed was very less and varied between 1 to 4% during different period and declined considerably over the period under study showing the marginalization and losing

Table 2. Per cent Share of different crops in gross cropped area in Kangra district

(Triennium %)

Crops	1999-02	2002-05	2005-08	2008-09
Rice	16.42	16.32	16.28	16.93
Maize	25.30	25.46	25.64	26.55
Wheat	41.70	42.80	42.92	43.11
Barley	1.15	1.40	1.17	0.31
Pulses	4.15	3.20	1.58	0.39
Oilseed	1.56	1.49	1.71	1.20
Potato	8.25	7.29	7.73	8.21
Vegetables	1.47	2.04	2.97	3.30

relevance of these crops in the district. The observation reveals that cereals have come to dominate the cropping pattern (Pradhan, 2002).

Per cent irrigated area to total area

The scenario of crop wise irrigated area to the total area in Kangra district has been presented in Table 3 for the period 1999-00 to 2008-09. Maximum share of irrigated area was observed under potato followed by vegetables and paddy during different periods. Irrigated area under pulses and oilseed was very less as compared to other crops and varied between 2 to 12% in different years. This may be due to marginalization of these crops in hill farming.

Irrigation sources

The share of different irrigation sources has been presented in Table 4 for triennium average 1999-02, 2002-05, 2005-08 and 2008-09. The Kuhls, and tube wells were the two prominent irrigation sources accounting for 81% and 16% of the total number of irrigation sources during the different periods. Out of these two prominent sources, Kuhl was the major source of irrigation requirement (81%).

Compound growth rates of different land use categories

The scenario of growth rates over the period 1999-00 to 2008-09 of Kangra district has been examined through computation of compound growth rate (CGR) and presented in Table 5. It can be observed from the table that positive and significant growth rates were observed in case of forest land, permanent pastures,

Table 3. Per cent irrigated area to total area in Kangra district during different years

(Triennium averages)

Crops	1999-02		2002-05		2005-08		2008-09	
	Total area (ha)	Irrigated area (%)	Total area (ha)	Irrigated area (%)	Total area (ha)	Irrigated area (%)	Total area (ha)	Irrigated area (%)
Rice	36,967	66	37,348	67	37,453	66	36,855	69
Maize	56,529	10	58,307	11	57,647	12	58,455	10
Wheat	93,050	20	93,389	29	92,984	26	93,859	30
Barley	2,619	19	2,484	20	2,542	18	2,871	15
Pulses	12,267	2	8,762	2	3,095	12	3,042	3
Oilseed	3,680	3	3,263	4	3,681	2	2,600	3
Potato	2,097	85	2,654	64	2,118	75	1,915	80
Vegetable	3,271	75	4,532	74	6,599	80	7,322	85

Source: District Statistical Office, Dharamshala.

Table 4. Per cent share of different irrigation sources in district Kangra

Triennium averages	Different sources of irrigation (Number)				
	Wells/Tubewells	Kuhls	Lift irrigation	Tanks	Total
1999-02	903 (18.00)	4099 (81.75)	12 (0.25)	-	5014 (100)
2002-05	1033 (17.11)	4555 (78.89)	110 (2.30)	3 (1.90)	5701 (100)
2005-08	1095 (16.10)	5430 (76.80)	271 (7.33)	5 (0.07)	6801 (100)
2008-09	1152 (15.68)	5929 (80.57)	272 (3.69)	5 (0.06)	7358 (100)

Note: Figures in parentheses are percentages to total number.
Source: District Statistical Office, Dharamshala.

Table 5. Compound growth rates of different land use categories in Kangra district during 1999-00 to 2008-09

Particulars	Compound growth rate
Geographical land	-0.46* (0.71)
Forest land	0.35* (0.09)
Non agricultural land	0.56 (0.31)
Barren land	-4.71* (1.52)
Permanent land	0.41 (0.21)
Land under miscellaneous trees	-4.76 (2.30)
Agricultural barren land	0.97* (0.34)
Other fallow land	0.04 (0.13)
Present fallow land	1.81** (0.42)
Net area sown	0.94 (0.54)
Total cropped area	-0.19* (0.06)
Area sown more than once	-0.39* (0.13)

Note: Figures in the parentheses are standard errors.
Source: District Statistical Office, Dharamshala.
*Indicates significance at 5% level of probability.
**Indicates significance at 1% level of probability.

present fallow land and net sown area. The higher significant growth rate was observed in case of present fallow land (1.81% per annum). The declining significant growth rate was observed in case of barren land, land put under miscellaneous trees. The total cropped area and area sown more than once also showed significant negative rate of growth (Sharma and Gupta, 2010). The growth rate of net sown area was not significant.

Compound growth rates of area, production and productivity of crops

The growth rates of area, production and productivity of different crops in Kangra district are presented in Table 6. The growth of area under wheat, barley and pulses decelerated significantly over the years. The maximum decrease in area was observed in pulses wherein the area declined by 19% per annum. Maximum growth was observed in vegetables, wherein the area increased significantly by 11% per annum. Irrigated area under barley and

Table 6. Compound growth rates of area, production and productivity of major crops in Kangra District during 1999-2000 to 2008-09

Crops	Total area	Irrigated area	Production	Productivity
Rice	0.14	0.36	1.09	8.14**
	(0.06)	(0.30)	(3.14)	(1.75)
Maize	0.43**	1.98**	4.24**	6.45**
	(0.23)	(1.36)	(1.08)	(1.20)
Wheat	-0.05	11.48**	14.9*	8.47*
	(0.18)	(6.23)	(5.71)	(2.30)
Barley	-1.09**	-0.93**	- 6.12**	12.03*
	(0.73)	(0.55)	(0.19)	(1.61)
Pulses	-19.48*	19.25	- 0.30	17.24*
	(3.55)	(11.53)	(2.54)	(6.74)
Oilseed	2.79	-4.82	- 11.34**	- 10.29**
	(2.61)	(4.75)	(1.48)	(1.72)
Potato	0.46	0.01	2.96**	0.79*
	(2.37)	(0.92)	(0.69)	(0.001)
Vegetables	11.44*	13.39*	12.30*	0.66
	(0.58)	(0.94)	(0.65)	(1.11)

Note: Figures in the parentheses are standard errors.
*Indicate significance at 5% level of probability.
**Indicates significance at 1% level of probability.
Source: District Statistical Office, Dharamshala.

oilseed declined significant. The growth rate for production of rice, wheat and vegetables were recorded positive and significant growth rate, wherein highest production growth rate was observed in wheat at the rate of 14% per annum followed by vegetables (12% per annum) over the years, while, in other crops showed positive growth rate during the same period. The technical progress in crop production can be judged from the growth realized in productivity of different crops. Growth rate in productivity of rice, maize, wheat, barley, pulses and potato showed a significant positive growth rate over the period 1999-00 to 2008-09.

Table 7. Compound growth rate of different sources of irrigation in Kangra district during 1999-00 to 2008-09

Particulars	Compound growth rate
Kuhls	3.93**
	(0.73)
Lift irrigation	58.07**
	(12.14)
Wells /Tubewells	2.81**
	(0.28)
Tanks	26.37**
	(6.38)

Note: Figures in the parentheses are standard errors.
**Indicates significance at 1% level of probability.
Source: District Statistical Office, Dharamshala.

Compound growth rates of different sources of irrigation

Growth rate of different sources of irrigation have been shown in Table 7. Kuhls assisted by department IPH showing significant growth rate of 3.93% per annum during 1999-00 to 2008-09, while in case of lift irrigation growth rate per annum was observed to be 58%. The wells/tubewells grow at a rate of 2.81% and tanks at a rate of 26% per annum during the period 1999-00 to 2008-09.

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