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Land Utilization Pattern in Sikkim: Spatial Distribution and Agricultural Dynamics

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Abstract

Land utilization reflects the dynamic relationship between the physical environment and human activities. In Sikkim, variations in topography, climate, vegetation, and socio-economic conditions have resulted in a unique pattern of land use. This study examines the classification, spatial distribution, and temporal changes in land utilization with special emphasis on agricultural dynamics. The findings indicate that a large proportion of Sikkim's geographical area is occupied by forests and mountainous terrain, leaving only limited land for cultivation. Agriculture remains the primary livelihood but faces constraints such as small landholdings, lack of irrigation, and difficult terrain. The study highlights the need for sustainable land use planning and efficient resource utilization. There are spatial variations in terms of the general land use pattern of the different areas because of the diversities in landform and rainfall in various regions. It is essential to shift from general to particular areas where agriculture plays a vital role as a means of livelihood for majority of the people in Sikkim.

Keywords: land utilization, dynamic, agriculture, cultivation, spatial distribution, climate, topography, livelihood

Introduction

Land use is an important subject particularly relevant to agricultural geography. According to J.L. Buck, land utilization is the satisfaction which the farm population derives from the type of agriculture; develop the provision for future production and contribution to national needs (Zuated, 1951). Land use is also related to conservation of land from one major use to another general use (Nanvati, 1951). Land use is a geographical concept since it involves specific areas. The study of land use forms a significant part of geography and has assumed a place of pride in the field of applied geography. According to Symons (1978) the land use study forms the spearhead for the advance of geography into the applied sciences as maps of land use have been recognized as essential tools of regional planning and development (shodhganga.inflibnet.ac.in).

The first scientific survey of land in Sikkim was carried out in 1950-58, using the British measurement system of acres and miles. The second, 1976-83 survey is till date the last land survey carried out after Sikkim became a constituent state of India. The metric system of

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hectares and kilometers was used, and the survey covered all the areas of Sikkim. This was a critical survey, because previous land records had undergone several changes due to partition, mutation, registration and acquisition by the government, private parties and others (Lama, 2001).

Realizing the need of land utilization statistics for the state, the village level survey was initiated in 1990-91 and the land utilization statistics of Sikkim was published in 1996 by the Department of Agriculture, Government of Sikkim. The land utilization statistics constitutes the basis of planning and development in agriculture and allied sectors. There are always crucial linkages do exist between the land utilization statistics and the economic growth of the state. Based on these data the potential land use plans could be drawn for more efficient and proper utilization to realize increased production of food, fodder, fuel, etc. in future. Obviously, the land is the most important natural resource, and requires a focused agenda encompassing the critical aspects of preservation, conservation and utilization for ever-growing needs and economic benefits of man (Bhutia, 2006).

According to the survey report of 1995-1996, published by the Department of Agriculture, Government of Sikkim, there are nine fold classification of land utilization was adopted to generate data on area distribution under various classification of land use viz., forest, land put to non-agricultural uses, barren and uncultivable land, permanent pastures and other growing lands, miscellaneous tree crops and groves not included in the net area sown, cultivable waste land, fallow lands other than current fallows, current fallows, and net area sown.

The following table highlights the old and new land classification of land in Sikkim.

Table 1: Old and New Classification of Land

Sl. No.	Old Five-Fold Classification	Sl. No.	New Nine-Fold Classification
1.	Forest	1.	Forest
2.	Area not available for cultivation	2.	Land put to non-agricultural use
3.	Other Cultivated land excluding current fallow lands	3.	Barren and Uncultivable land
4.	Fallow Lands	4.	Permanent Pastures and other Grazing Lands
5.	Net Area Sown	5.	Miscellaneous tree crops and groves not included in the Net Area Sown
		6.	Cultivable waste
		7.	Fallow land other than current fallows
		8.	Current Fallows

		9.	Net Area Sown

Source: Subba, 2008

From the above table it is seen that in the old classification land was classified into five categories only, viz. *Forest, Area not available for cultivation, Other cultivated land excluding current fallow lands, and Net area sown.* However, in the new classification of land, it has been increased to nine-fold i.e. *Forest, Land put to non-agricultural use, Barren and uncultivated land, Permanent pastures and Other grazing lands, Miscellaneous tree crops and groves not included in the net area sown, Cultivable waste, Fallow land other than current fallows, Current fallows and Net area sown.*

Sikkim being located in the Eastern Himalaya has a major chunk of its area under the snowy peaks and mountains ranges, including dense forests, the National Park and the restricted area for defense purpose. Hence, out of the total geographical area of 709,600 hectares, nearly 75 percent of the state's area (around 46 percent under the snowy peaks and ranges and about 29 percent under the dense forests) has not been taken into account in this survey of land utilization. Reporting area for land utilization statistics amounts to 24.58 percent of the total geographical area of Sikkim. The survey shows the distribution of reported area under various classifications of land use block-wise. The total arable land (the net area sown plus the current fallow and other lands) is estimated to be 95,136 hectares, i.e. 56.03 percent of the total reporting area. Around 50,708 hectares of land is under forests, constituting 29.74 percent of the reporting area. Land put to non-agricultural uses adds up to 2,607 hectares or 1.53 percent; barren and unculturable land 9,886 hectares, or 5.81 percent; permanent pastures and other growing lands 4,371 hectares or 2.56 percent; land under miscellaneous tree crops and groves 5,436 hectare, or 3.19 percent; and culturable land 2,389 hectare, or 1.41 percent of the total reporting area (Bhutia, 2006). It is the first attempt to come up with this extensive survey about land utilization pattern in Sikkim.

Agriculture is the backbone of Sikkimese economy. More than 65 percent of the population depends upon agriculture and related activities to maintain their livelihood. Prior to 1975, the uncertainties of land tenure rights, negligible public investment and over dependence on traditional technologies had made cultivation in Sikkim very expensive. The economy was further obstructed by low productivity, negligible marketable surplus and other institutional backwardness. This was further affected by shifting cultivation in some important geographical pockets and unsuccessful structure of agricultural administration. However, after merger with Indian Union, with limited area of cultivated land, smaller land holdings, difficult hilly terrain, varied agro-climate condition prevailing at short distances, low farm income and lack of adequate supportive infrastructures for agriculture expansion, the state has slowly yet indigenously, achieved sustenance to its food obligations.

The Fifth Plan (7976-77 to 1980-81) document of Sikkim mentioned, "agricultural stagnation is the main impediment on the rate of growth of the economy" which restricted the peoples' purchasing power and in addition such stagnation also limited the scope for industrialization (Economic Survey, 2006-07).

In spite of limited cultivated land in Sikkim, agricultural development could make considerable progress in the last three decades. Introduction of new crops such as wheat, rajma (beans), rape and mustard (oil seeds), extension of more areas under high yielding and improved varieties, increased use of fertilizers and pesticides, and expansion of area under double or multiple cropping have played crucial role in converting agriculture into a viable venture from a mere subsistence farming (DESME, 2006-07).

No definite systematized land utilization classification is being followed in Sikkim. The old system of land utilization is still being followed in the state. In this system, cultivable land has been classified into three broad groups:

1.) *Wet field* – comprises all paddy fields,
2.) *Dry field* – comprises all un-irrigated field
3.) *Banjo* – waste land, and
4.) *Cardamom field* – all fields under cardamom crop.

The paddy field and dry field is again divided into three circles as per the notification issued in 1974, depending upon the fertility of the land. The fertile field comes under 'A' circle, moderately fertile in 'B' circle and less fertile in 'C' circle. Cardamom field is again divided into 'A' 'B' and 'C' circle depending upon the fertility of the land, irrespective of slope and elevation, and land compensation are paid accordingly. The notification issued by the state is given below:

As per Notification No.156-Dated on 5thJuly,1974, it is notified for general public information and all concerned that in view of all round increase of the market value of the land and agricultural crops, the rate of the land compensation for acquisition has been revised as under with effect from 1st April,1974.

Table 2: Notification pertaining to agricultural land compensation

Kind of Land	**Circle 'A' Per Acre of Land**			**Circle 'B' Per Acre of Land**			**Circle 'C' Per Acre of Land**		
	I	I	III	II	III	II	III	II	III
Paddy Field	Rs.5000	Rs.3800	Rs.2500	Rs.4000	Rs.3000	Rs.2000	Rs.3200	Rs.2200	Rs.1600
Paddy Field	Rs.1800	Rs.1400	Rs.900	Rs.1600	Rs.1200	Rs.800	Rs.1200	Rs.900	Rs.600
Paddy Banjo	-	-	Rs.700	-	-	Rs.600	-	-	Rs.500

Source: Subba, 1984.

Cardamom: - I – Rs.6000/- II – Rs.4000/- III – Rs.2500/- IV – Rs.1500/-

The above table shows that the agricultural land has different values and price according to the productiveness, slope and elevation of land. Even the paddy field has been divided into three

different categories A, B and C according to market value/compensation. If the land is acquired by the government, then value/compensation is given to the villagers according to categories of land revised in 1974.

The last cadastral survey in Sikkim was done during the 1950-58: according to that survey the following table has been prepared. The particular survey is being updated now and some of the portions, which could not be covered earlier time, are being covered now. Sikkim however, has no permanent field agency to find out the data and up-date these data from year to year.

Table 3: Area under Different Land Use in Sikkim ('000 Ha)

Land Type	Area as per 1958-60 Survey Operation	
	Mean ± S.D.	**Standard Error**
Forest	262.14±40.0499	16.3503
Barren & Uncultivable	204.80±52.8469	21.5746
Permanent Pastures	102.40±33.3946	13.6332
Land under Misc. Tree crops and Groves	4.00±2.0976	.8563
Land Under cultivation	81.23±23.4861	9.5881
Other Including Unaccounted	69.39±14.2688	5.8252
Total	723.96±54.4683	22.2366

Source: Subba, 1984.

The table 3 shows area under different land use in Sikkim in Ha (Hectare) as well as in percentage, their significant mean ±S.D. and standard error. The highest available land type is under Forest, the mean ±S.D. 262.14±40.0499, percentage mean ±S.D. 36.20±21.7990 and its corresponding error is calculated as 16.3503 and 8.8994. The second highest available land type is barren & uncultivable and it has significant mean ±S.D 204.80±52.8469, percentage mean ±S.D 28.28±17.2394 and its corresponding error is calculated as 21.5746 and 7.0379. After forest and barren & uncultivable come permanent pastures with mean ±S.D 102.40±33.3946, percentage mean 14.14±13.4461 and its corresponding error 13.6332 & 5.4893. Land under cultivation (81.23±23.4861 & 11.20±8.1240 and 9.5881 & 3.3166) comes in fourth position which clearly indicates shortage of available land under cultivation.

Table 4: Land use Pattern under Operational and Non-Operational Holdings in Sikkim (1976-77 to 2000-01)

Sl. No.	Land Type	1976-1977		1980-1981		1990-91		1995-1996		2000-2001	
		Ha	%	Ha	%	Ha	%		%	Ha	%

1.	Net area sown	64,927	9.15	78,321	11.04	63,254	8.91	62,043	8.74	63,250	8.91
2.	Area under current fallow	501	0.07	4,428	0.62	3,906	0.55	5,078	0.71	3,910	0.55
3.	Other uncultivated area excluding fallow land	4,925	0.69	4,560	0.64	10,820	1.53	9,807	1.38	10,830	1.53
4.	Fallow other than current fallow	944	0.13	9,474	1.34	9,204	1.30	29,573	4.16	9,200	1.30
5.	Cultivable waste land	1,153	0.16	681	0.10	9,807	1.38	2,389	0.33	9,810	1.38
6.	Land not available for cultivation	6,613	0.93	11,604	1.64	14,300	2.02	1,2494	1.76	14,300	2.01
Total		79,062	11.14	109068	15.37	111301	15.96	121384	17.08	111300	15.68

Source: Pradhan, 1998, DESME, 2002& Gazetteer of Sikkim, 2013.

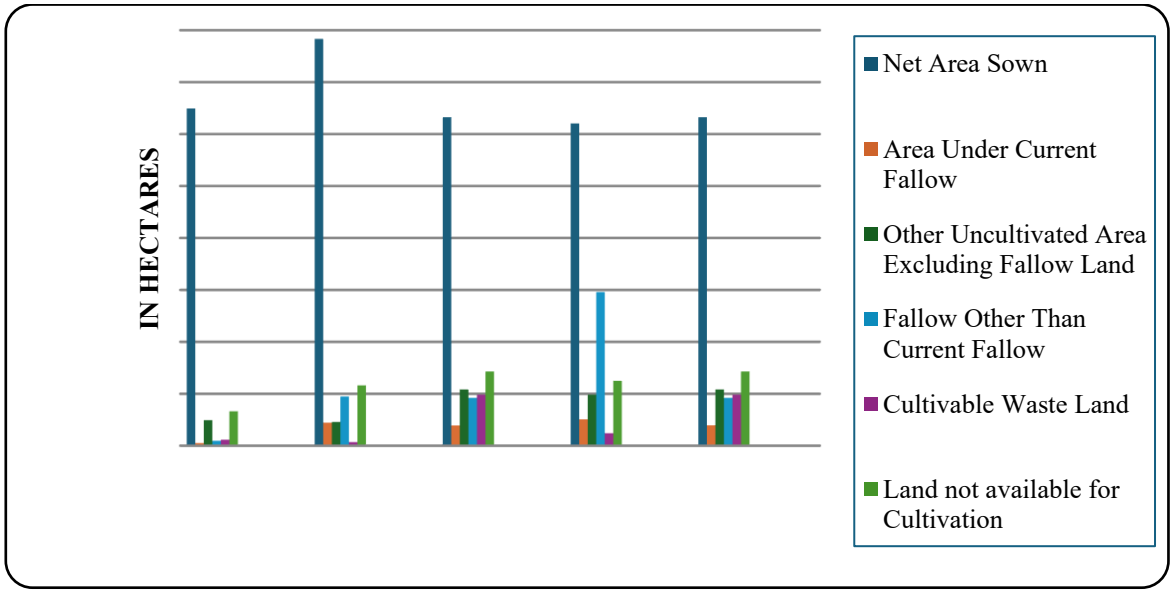

Figure 1: *Land use Pattern and Land under Operational and Non-Operational holdings*

The table and figure given above indicate that the net area sown initially gained some area in 1980-81 (11.04), but thereafter it remained almost stagnant in 1990-91(8.91), 2000-01(8.91) and 1995-96 (8.74). The fallow other than current fallow land increased sharply during the year 1995-96. The land not available for cultivation remained more or less same since 1980-81.

There has been a marginal decrease in net sown area since 1990-91 but almost threefold increase in fallow land other than current fallow. Due to lack of irrigational facilities, manpower etc. many farmers kept their land unutilized for more than one year. Between 1995-96 and 2000-2001 some progress has been seen in the utilization of fallow land other than current fallow because state government took initiatives and motivated farmers to convert such land for agricultural use.

Table 5: Land Use Pattern: East and West District of Sikkim 2005-06 (in Ha)

SL. No.	Particulars	East District Mean ± S.D.	Standard Error	West District Mean ± S.D.	Standard Error
1.	Irrigated Land	2532.14±15.2315	6.2182	2119.5±18.7082	7.6376
2.	Un-Irrigated Land	9475.46±22.6008	9.2267	10433.45±20.6203	8.4182
3.	Non-Agricultural Use	3277.15±20.8518	8.5127	1832.06±14.6013	5.9609
4.	Forest/Jungle/Bushes	9112.07±7.6941	3.1411	2433.31±18.9208	7.7244
5.	Grass Land	3795.76±25.0120	10.2111	4525.00±16.3340	6.6683
6.	Barren Land	1652.96±25.2982	103279	1219.74±22.3875	9.1396
7.	Uncultivated Fallow Land	8178.6±28.3125	11.5585	2529.11±20.1891	8.2421
8.	Cardamom Field	787.21±29.4006	12.0027	840.16±26.1839	10.6895

	Total	38811.35±19.9599	8.1486	25932.33±19.5448	7.9791

Source: DESME, 2006-07.

Table 6: Land Use Pattern: North and South District of Sikkim 2005-06, (in Ha)

SL. No.	Particulars	North District Mean ± S.D.	Standard Error	South District Mean ± S.D.	Standard Error
1.	Irrigated Land	886.97±29.1890	11.9163	2104.62±23.8914	9.7536
2.	Un-Irrigated Land	3959.84±22.9172	9.3559	15435.74±18.3738	7.5011
3.	Non-Agricultural Use	1903.13±25.9306	10.5861	2754.33±24.5519	10.0233
4.	Forest/Jungle/Bushes	2383.77±28.2772	11.5441	2519.7±23.1948	9.4692
5.	Grass Land	6752.15±20.8710	8.5205	4515.00±26.0537	10.6364
6.	Barren Land	63.29±19.2249	7.8485	1209.11±29.0860	11.8743
7.	Uncultivated Fallow Land	1023.01±20.5621	8.3944	2086.54±29.1273	11.8911
8.	Cardamom Field	1030.21±20.3666	8.6146	1003.67±21.2602	8.6794
	Total	18002.37±2.0816	9.0148	31628.71±20.9666	8.5596

Source: DESME, 2006-07.

The above tables (5 & 6) illustrate the significant Mean ± S.D. and standard error in the land use pattern in different districts of Sikkim. The significant mean clearly indicates that most of the cultivated land in all the districts of Sikkim is un-irrigated. The South district has highest un-irrigated land as compared to other districts of Sikkim. It seems that South district is drought prone area due to scanty rainfall. Similarly, the irrigated land, non-agricultural use, barren land,

cardamom field are in the same level in South district. As per the above table the West and North districts have variable land use pattern. The North district has maximum area under grass land, while the East district having the highest share of uncultivated fallow land. The existing pattern of land use of Sikkim has been shown in figure.

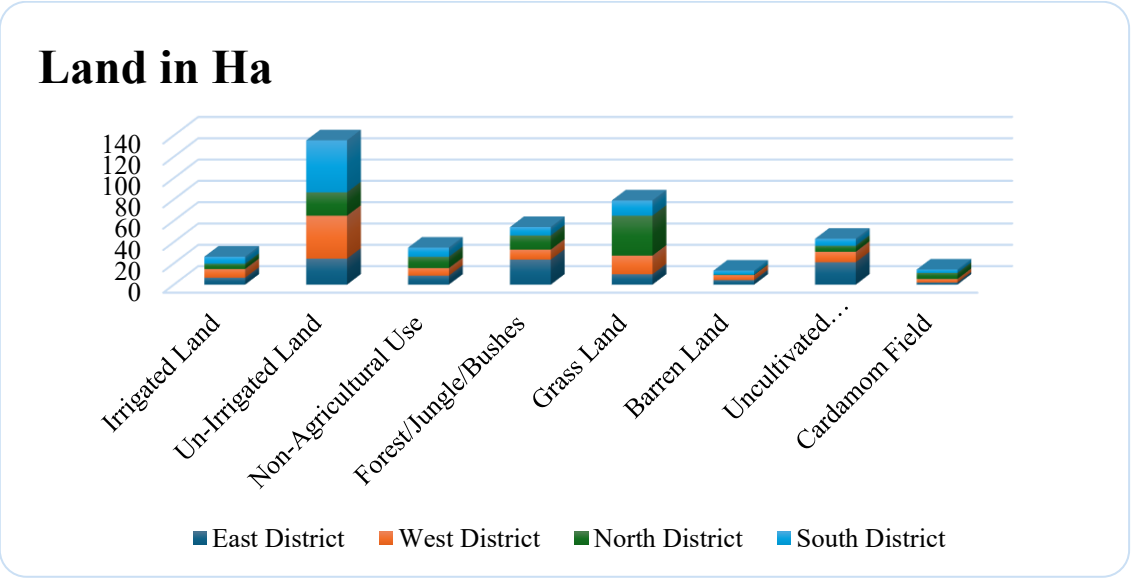

Figure 2: *District-wise Distribution of Land Use Pattern, Sikkim 2005-06, (in Percent)*

Out of total geographical area of 7096 sq. km, in Sikkim, almost 82.31 percent is under the administrative control of the Forest, Environment and Wildlife Management Department, Government of Sikkim. The land available for cultivation was 12.3 percent in 1990-91 including current and fallow land. But in 2010, the net cultivated area was around 79,000 ha (11.13 percent) including the large cardamom plantations. The state is yet to develop a comprehensive land use policy. Since 2000 the net cultivated area decreased significantly due to conversion of agricultural land into non-agricultural use for development activities, such as establishing pharmaceutical industries and hydropower project infrastructures etc. (Gazetteer of Sikkim, 2013).

Table 7: Land Use in Sikkim, 2016

Sl. No.	Land Use	Area in (ha
1.	Forests	5,84000
2.	Not available for cultivation	11,000
3.	Permanent pastures and other grazing lands	0
4.	Land under Misc. Tree crops and groves	8,000
5.	Culturable wasteland	3,000
6.	Fallow land other than current fallows	4,000

7.	Current fallows	5,000
8.	Net area sown	77,000
	Total	6,92,000

Source: State of Environment Report Sikkim (Draft) -2016.

The State of Environment Report Sikkim 2016 has mentioned eight types of land use pattern in Sikkim viz. forests, not available for cultivation, permanent pastures and other grazing lands, land under misc. tree crops and groves, culturable wasteland, fallow land other than current fallows, current fallows and net area sown. The highest land use has been seen in forests because of '*green mission as well as ten minutes to earth'* which encourage the people for the plantation of different trees in every physical surrounding in Sikkim, that's why Forests covers large area of land. Among the other land use pattern net area sown has occupied 11.13 percent of land in Sikkim. But the permanent pastures and other grazing lands seem to be zero due to ban of grazing of animals in Sikkim in 1998.

Conclusion

The analysis of land use pattern in Sikkim clearly reflects a strong relationship between the physical environment and human activities. The state's rugged topography, limited accessibility, and diverse agro-climatic conditions have significantly influenced the distribution and utilization of land. A major proportion of land remains under forests and mountainous terrain, leaving only a small fraction available for cultivation. The reporting area for land utilization is relatively low, highlighting the constraints imposed by natural factors.

The classification of land use has evolved from a simple five-fold system to a more comprehensive nine-fold classification, enabling better understanding and planning of land resources. Despite this advancement, the traditional system of categorizing agricultural land into wet, dry, banjo, and cardamom fields continues to play an important role in local practices, especially in determining land value and compensation.

Agriculture remains the backbone of Sikkim's economy, supporting more than 70 percent of the population. However, the sector faces multiple challenges such as limited irrigated land, small and fragmented holdings, and dependence on traditional methods. The data reveals that most of the cultivated land in Sikkim is un-irrigated, with districts like South Sikkim experiencing acute water scarcity. At the same time, there has been a noticeable increase in fallow land and a marginal decline in net sown area over the years, indicating underutilization of agricultural resources.

District-wise variations further emphasize the uneven distribution of land use. While North Sikkim has extensive grasslands, East Sikkim shows a higher proportion of fallow land, and South Sikkim is dominated by un-irrigated agriculture. The expansion of non-agricultural activities such as infrastructure development, hydropower projects, and industrial growth has also contributed to the reduction of cultivable land.

Temporal analysis indicates that although some progress has been made in bringing fallow land under cultivation through government initiatives, the overall trend points towards stagnation or decline in agricultural land use. The increase in cardamom cultivation suggests a shift towards cash crops, reflecting changing economic priorities.

In recent years, environmental policies and afforestation drives have further increased forest cover, while restrictions such as the ban on grazing have altered traditional land use practices. Although these measures contribute to ecological sustainability, they also impact rural livelihoods and land utilization patterns.

Land use in Sikkim is characterized by limited cultivable area, dominance of forest cover, and increasing pressure from developmental activities. There is an urgent need for a comprehensive land use policy that balances agricultural development with environmental conservation. Improving irrigation facilities, promoting sustainable farming practices, and optimizing the use of fallow land can enhance agricultural productivity and ensure long-term socio-economic stability in the state.

Land use planning in Sikkim should prioritize integrated watershed management, expansion of micro-irrigation like (drip/sprinkler), and terrace stabilization to enhance productivity on limited cultivable land. Promoting agroforestry, organic farming, and climate-resilient crops (including improved large cardamom systems) can balance income generation with ecological conservation. Additionally, zoning regulations to control unplanned infrastructure expansion and targeted reclamation of fallow land will support sustainable and equitable land utilization.

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