

Changing Land use and Cropping Pattern in Budgam District of Jammu and Kashmir – A Spatio-temporal Analysis

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Abstract - Land has often been said to be the basic natural resource, since it is the main source of our food, shelter and clothing. An assessment of the land resources, their extent, distribution and utilization are of prime importance for rational exploitation and sustainable development. The present study is based on land-use and cropping pattern dynamics being experienced in District Budgam, which is located in the central part of Kashmir valley and is mostly dominated by agricultural occupation. The study is based mainly of secondary sources. A multi-temporal analysis was carried out in order to analyze the extent as well as direction of change. The study revealed that in district Budgam, there was a major change shown by Chadoora tehsil from rest of tehsils. The change was mainly because of shifting to horticultural activity which is economically beneficial and also due to increasing pressure of population resulting into a lot of residential and commercial developments. Therefore, it becomes imperative to develop a sustainable land management strategy that does not cause the degradation of such valuable resources. The present study identified not only the problems but also management strategies.

Key Words: - Land use, Cropping pattern, Dynamics, Multi-temporal.

Introduction

Land is a resource of prime importance in the economy of any country and agricultural resources have remained the principle occupation of man since hoary past. In early days population was less and necessities were limited. With the enormous increase in human population, their requirements increased and became complex. As a consequence of increasing

Pressure of population, changes are occurring in the land-use and cropping pattern. Owing to increasing pressure of human and livestock population on the land and ever growing demand of food and raw material, there is bare need of scientific, rational and economic use of every piece of land without disturbing ecological as well as socio-economic balance of the area (Mohammad N, 1981). In order to evolve an agricultural planning strategy for a

region, it is quite essential to know the type of crops grown, area having less or more concentration of a crop and the different association found in different areas of the region. Besides, it is equally important for a planner to know about the level of specialization or diversification of a region in terms of crop growing in it. Both land use and cropping pattern are dynamic aspects of an agricultural landscape, as they gradually undergo a change. It is perhaps more pertinent to take a sufficiently longer interval of time to study the changing pattern as it will help in detecting the change, as well as its magnitude and direction. Land is the ultimate asset in the agrarian economy of Kashmir valley. In such economies both the quantity and quality of land determines the process of development and general wellbeing of the people. Their economic prosperity, by and large, depends upon how best land is being utilized. For the study of agriculture land use and cropping pattern various methods have been used by scholars, scientists and geographers. Among them J.C.Weavers' method is selected in present investigation. Weaver in 1954 has applied least standard deviation technique for computing crop combination region.

Methodology and Data Base

In order to analyze the multi-temporal change in land use and Cropping Pattern, numbers of simple sophisticated statistical and cartographic techniques have been used. For preparing an inventory of land use at two points of time, simple method of working out percentage has been used. The study is mainly based on secondary sources collected from Agricultural departments of the District and from Directorate of Economics and Statistics, Srinagar. A selected category of land use and their change has been mapped by applying Choropleth and chorochromatic method, which is considered as the most suitable cartographic technique to represent spatial distributions. Varying shades have been used to show crop association region. For the present investigation, District is selected in general and tehsils in particular. Simple statistical method has been used to compute crop ranking and Crop combination has been worked out using Weaver's method, while L.Q techniques have been used to find crop concentration. In order to assess the crop combination, the following formula has been adopted.

$$d = \frac{\sum d^2}{n}$$

Where 'd' is the difference between the crop percentage in a given country (areal unit) and the appropriate percentage in the theoretical curve and 'n' is the number of crops in a given combination.

Area of study

Budgam district is located in the central part of Kashmir valley. Geographically, the district is located between 34° 42'-34° 50' N latitude and 74° 24'-74° 54' E longitude. Budgam is bounded by district Baramulla in North-West and Srinagar in the North-East and South-West. The district extends to both mountainous and plain areas of varying heights and has an average height of 528 feet. The district Budgam is sprawled over geographical area of 1371 square kilometers, constituting about 0.61 percent of the state area and supports 7.35 lakh

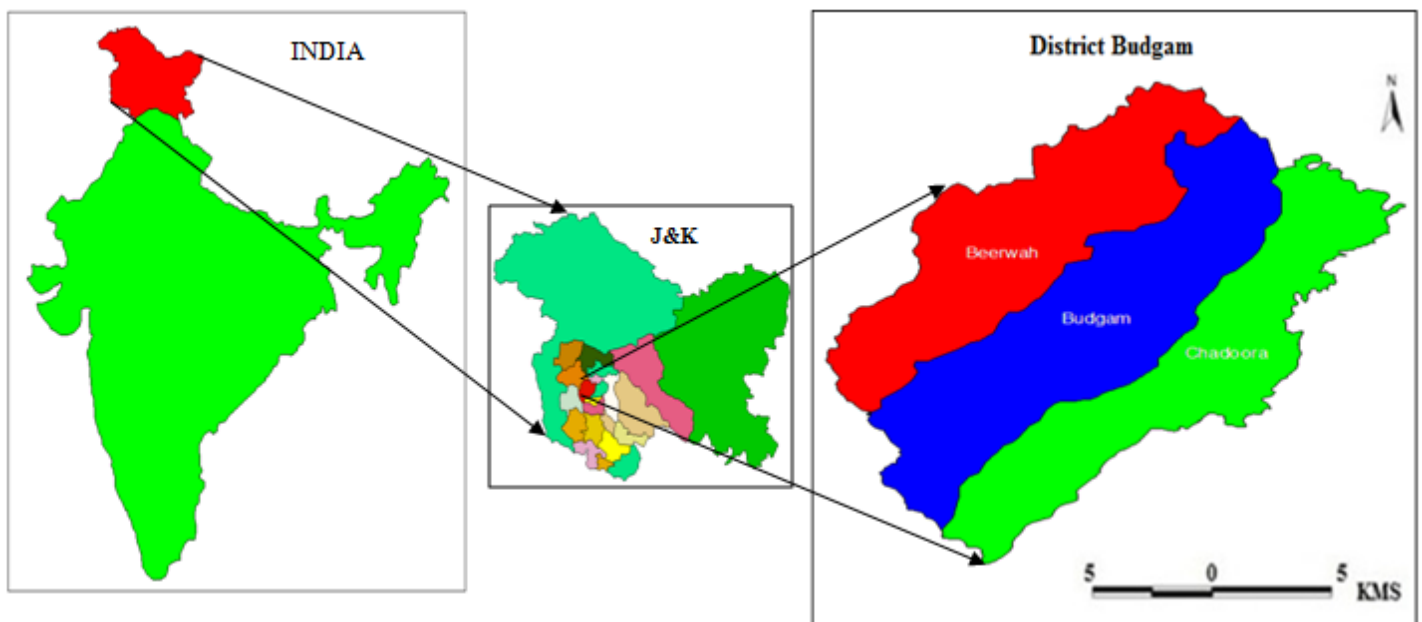
persons (2011 census).

The climate is of the temperate type with the upper-reaches receiving heavy snowfall in winter. The average annual rainfall of the district is 585 mm. A special physiographic feature of this district is the low elevated plateau type landform called karewas. This district covers some amount of land in the form of valley floor as well as rim lands.

Results and Discussions

Concept of Agriculture Land use

Agriculture land-use means land under net sown area, fallow land and uncultivable land excluding fallow land. The cultivated area is known as net sown area, which is also known as agriculture land. In short agriculture land-use means a cropping



pattern. Copping pattern means the proportion of area under various crops at a point of time or yearly sequence and spatial arrangement of crops and fallow on a given area. Cropping pattern is a dynamic concept as it changes over space and time. The cropping patterns of a region are closely influenced by the geo-climatic, socio-cultural, economic, historical and political factors.

The total forest area of District Budgam in 1987-88 was 721 hectares (0.92%) of the total reporting area 7783 hectare. During the span of about 25 years i.e. from 1987-88 to 2010-11 there was not much change in the %age of forests in the District. Tehsil Chadura continues to be high in the %age of forest area in 2010-11 of 295.42 hectares (1.06%) and Budgam Tehsil has low %age under forests having 231.08 hectares (0.82%).

Table 1: Land use Pattern and Change in District Budgam (1987-88 to 2010-11)

	Berwah			Budgam			Chadura			Dist. Budgam		
Reporting Area	21940.50			28085.79			27804.12			77830		
Year/change	1987-88	2010-11	Change (%age)	1987-88	2010-11	Change (%age)	1987-88	2010-11	Change (%age)	1987-88	2010-11	Change (%age)
Forest Area	186.56	194.65	+0.03	235.12	231.08	-0.01	299.47	295.42	-0.01	721	721.16	-
Land put to Non-agricultural area	2790.77	2642.65	-0.67	4695.26	3433.02	-4.49	1506.67	2135.57	+2.26	8992	8211.25	-1.00
Barren & uncultivated area	333.47	282.88	-0.23	18.21	656.00	+2.27	785.10	73.24	-2.56	1137	1012.14	-1.00
Permanent pastures & other grazing land	2222.98	2566.97	+1.56	2336.30	6542.69	+0.73	2112.50	2495.34	+1.37	6672	7605.01	+1.19
Land Under Misc. Tree crops not included in net area sown	134.35	215.29	+0.36	278.02	327.80	+0.17	924.32	800.89	-0.44	1336	1343.99	+0.008
Culturable waste Land	781.46	859.97	+0.35	1624.03	269.85	-4.10	1356.53	1886.28	+1.90	3762	3216.10	-0.70
Fallow Land other than current Fallow	-	40.46	-	-	24.81	-	-	24.61	-	-	307.97	-
Current Fallow	167.13	683.52	+2.35	445.16	527.31	+0.29	119.08	4625.25	+12.32 %	1805	5836.09	+5.17
Net Sown Area	15323.75	14930.39	-1.79	18453.66	18393.36	-0.21	19622.42	16252.93	-12.11	53398	49576.68	-4.91

Source: - Department of Economics and Statistics, Srinagar, J&K

Temporal Change in Land-use of District Budgam (1987-88 to 2010-11).

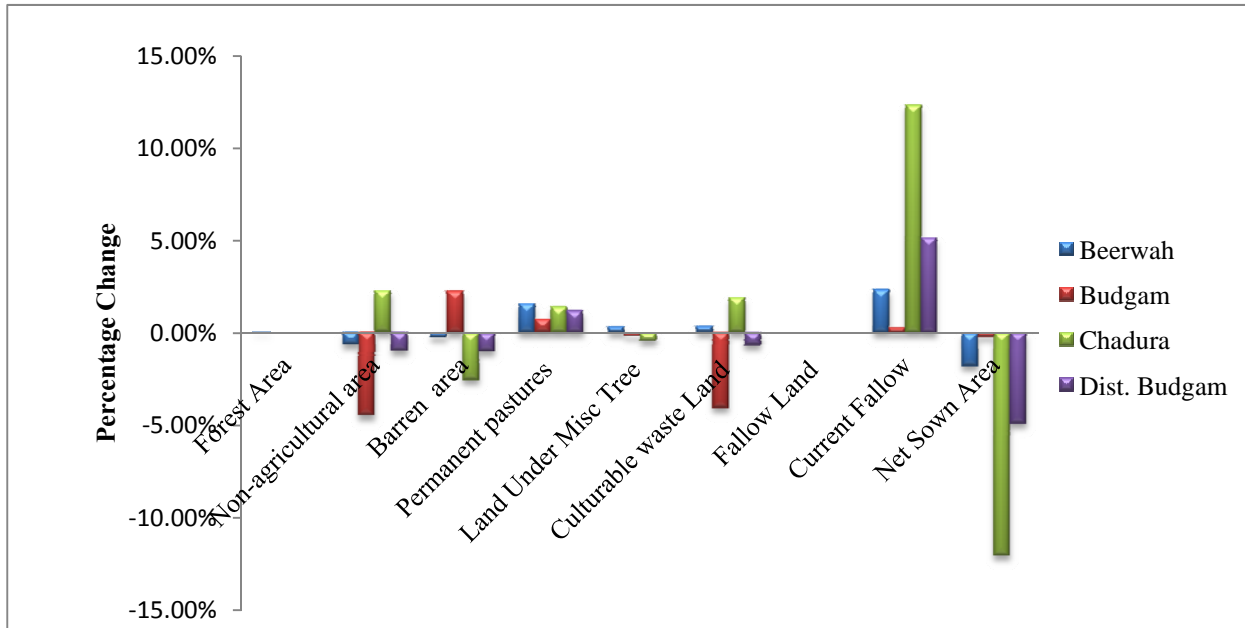


Fig. 1

During 1987-88 to 2010-11, the overall land under non agricultural use of the District has decreased to 781 hectares (1.00%) from 8992 hectares in 1987-88 to 8211 hectares in 2010-11. Among the Tehsils, Budgam showed the major decrease of about 1262.24 hectares (4.49%), followed by Beerwah Tehsil as 148 hectares (0.67%) while Chadura Tehsil showed an increase of about 628.90 hectares (2.26%) .

There was an increase in permanent pasture and other grazing land in District

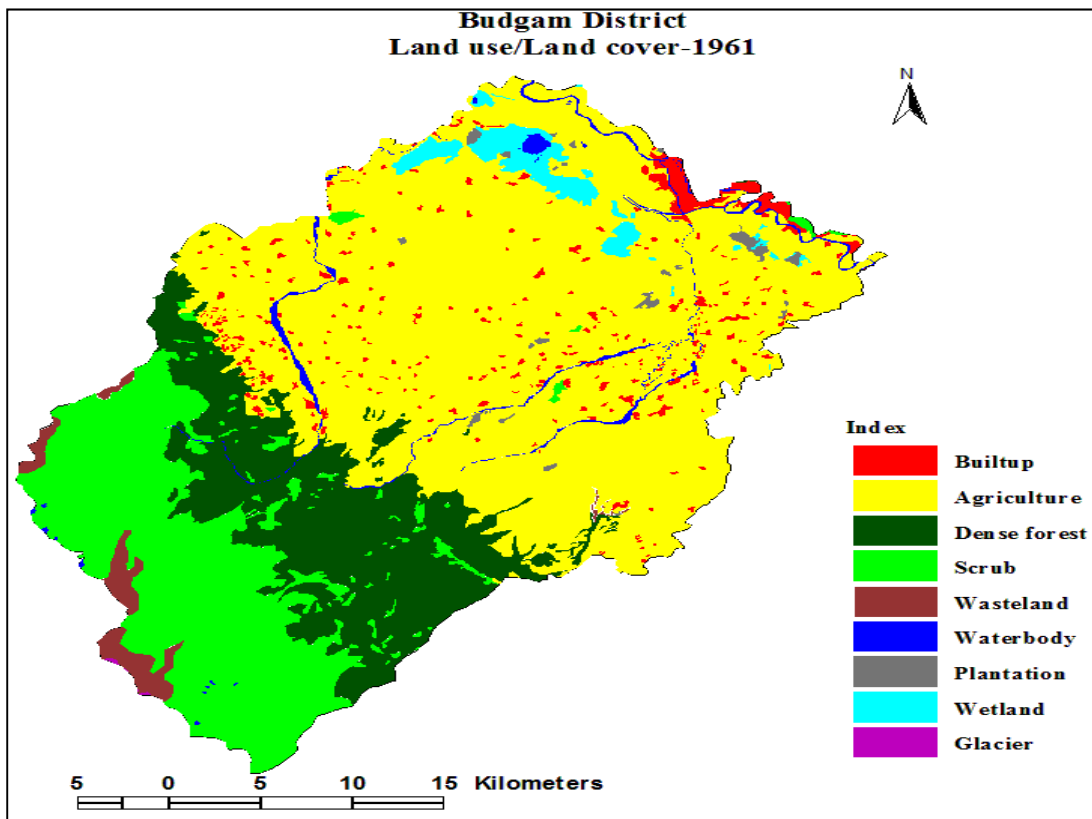
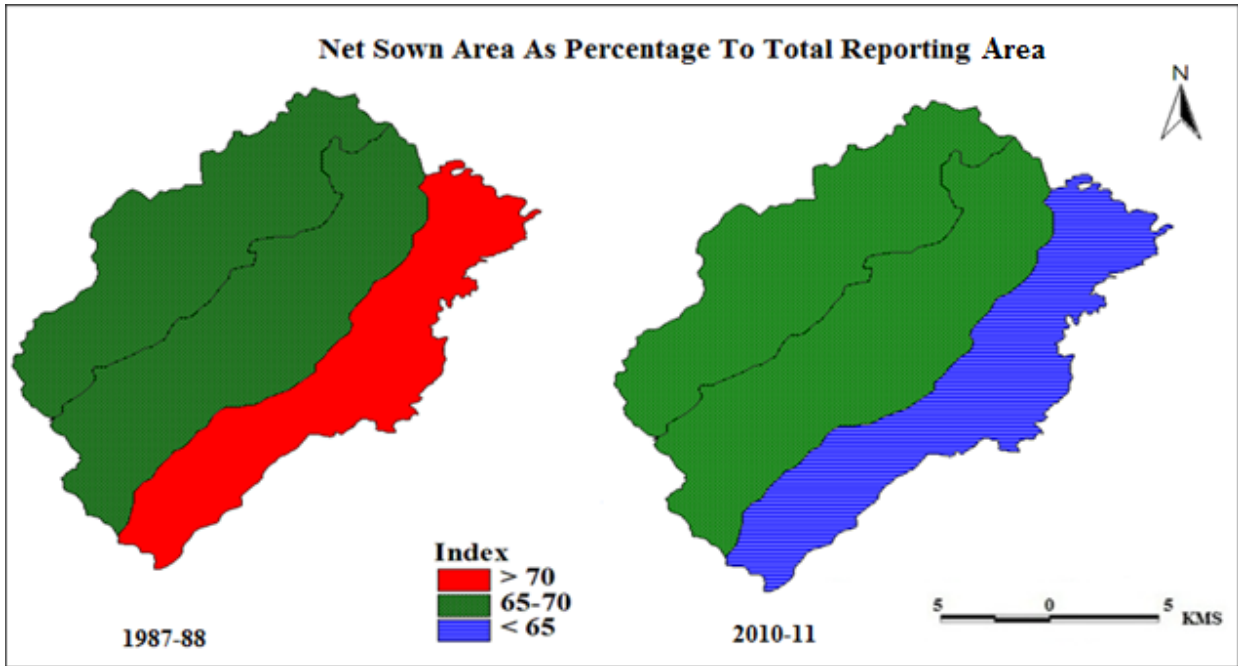
Tehsil as 382.84 hectares (1.37%), followed by Beerwah Tehsil as 343.99 hectares (1.56%) during 1987-2010-11.

During 1987-88 to 2010-11, District Budgam showed a decrease of about 546 hectares (0.70%) from 3762 hectares to 3216.10 hectares as a whole.

Among the Tehsils, Budgam Tehsil showed a decrease of about 1154 hectares (4.10%), but Tehsil Beerwah and Chadura showed the increase in Culturable waste as 78.51 hectares (0.35%) and 529 hectares (1.90%)

respectively. The highest area of current

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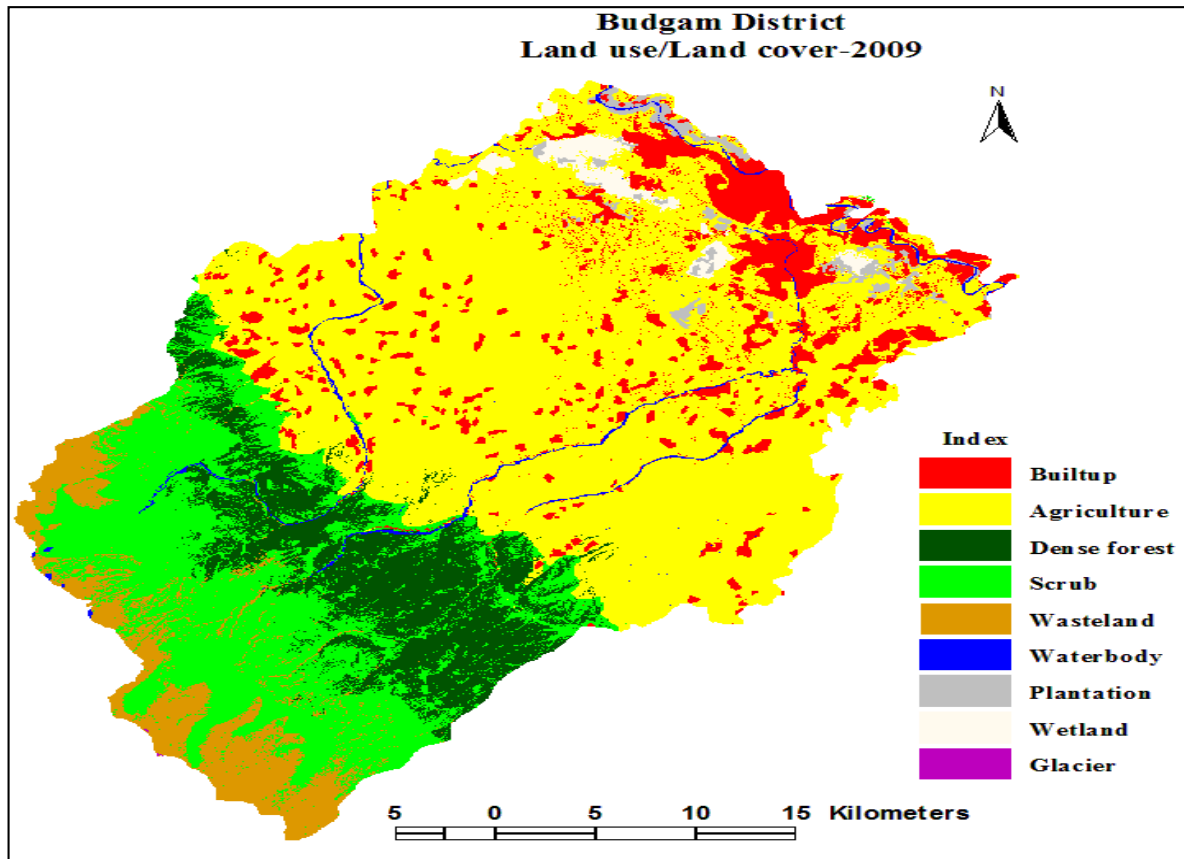
1197.08 hectares (4.30%), followed by Budgam Tehsil as 445.16 hectares (1.58%) while Beerwah Tehsil was having the area of current fallow as 167.13 hectares (0.76%).

The total Net Sown area of District Budgam was 53398 hectares (68.60%) in 1987-88. The highest area was under Chadura Tehsil as 19622.42 hectares (70.57%), followed by Beerwah Tehsil as 15323.75 hectares (69.84%) while Tehsil

Budgam was having 18453.66 hectare (65.70%). During the period of 1987-88 to 2010-11, District Budgam as a whole showed a decrease of about 3822 hectares (4.91%) from 53398 hectares (68.60%) to 49576.68 hectares (63.69%). The highest decrease was found in Chadura Tehsil as 3369.49 hectares (12.11%), followed by Beerwah Tehsil as 393.36 hectares (1.79%), While Budgam Tehsil showed a decrease of about 60.30 hectares (0.21%) during the period of 25 years.

Land use/Land cover of Budgam District- 1961

Land use/cover category	Total Area (km ²)	Percentage
Agriculture	710.5	55.54
Built-up	34.24	2.68
Dense forest	210.74	16.47
Scrub	250.8	19.61
Wasteland	20.90	1.63
Water body	18.61	1.45
Plantation	6.28	0.49
Wetland	26.87	2.10
Glacier	0.29	0.02
Total	1279.23	100.00



Generated from LISS-III, 2009

Land use/Land cover of Budgam District- 2009

Land use/cover category	Total Area (km ²)	Percentage to total area
Agriculture	608.2	47.54
Built-up	88.7	6.93
Dense forest	131.4	10.27
Scrub	290.88	22.74
Wasteland	82.4	6.44
Water body	10.8	0.84
Plantation	56.4	4.41
Wetland	10.3	0.81
Glacier	0.15	0.01
Total	1279.23	100.00

Rice has the distinction of being the most extensively cultivated crop of the District Budgam and of being the stable

Land use/Land cover Analysis of Budgam District- 1961- 2009

Land use Category	Area (1961)	Percent (1961)	Area (2009)	Percent (2009)	Absolute Change	Percentage change (1961-2009)
Agriculture	710.5	55.54	608.2	47.54	-102.3	-8
Built-up	34.24	2.68	88.7	6.93	54.46	4.25
Dense forest	210.74	16.47	131.4	10.27	-79.34	-6.2
Scrub	250.8	19.61	290.88	22.74	40.08	3.13
Wasteland	20.90	1.63	82.4	6.44	61.5	4.81
Water body	18.61	1.45	10.8	0.84	-7.81	-0.61
Plantation	6.28	0.49	56.4	4.41	50.12	3.92
Wetland	26.87	2.1	10.3	0.81	-16.57	-1.29
Glacier	0.29	0.02	0.15	0.01	-0.14	-0.1

Cropping Pattern

A wide variety of crops are grown in District Budgam which includes Rice, Maize, Wheat, Pulses, Cash crops, vegetables, Fruits etc. like other parts of valley, since agriculture is the substance in nature. Cropping pattern is dominant by food crops like Rice, but now the trend has changed a bit. Most of the population prefers horticulture as it is economically preferable.

Mostly high yielding varieties of seed are used in rice cultivation, which have boosted the yield over some past years. hectares (42.65%) to 24176.85 hectares (38.27%). Among the Tehsils, Beerwah Tehsil showed an increase of 53.01 hectares (0.32%), while Chadura showed a decrease of 2292.99 hectares (8.65%) followed by Budgam Tehsil as 526.91 hectares (2.57%).

The total area under Maize in District Budgam in 1987-88 was 16399 hectares (25.96%) of the total cropped area. The highest area under maize was founded

Despite the fact that a great variety of vegetables are cultivated in the District Budgam, Yet the area is deficient in vegetables particularly in winter season.

Table 2 : Cropping Pattern and its change in District Budgam (1987-88 to 2010-11). Unit in Hectares)

	Berwah			Budgam			Chadura			Dist. Budgam		
Cropped Area	16238.36			20447.59			26481.99			631767		
Year/change	1987-88	2010-11	Change (%age)	1987-88	2010-11	Change (%age)	1987-88	2010-11	Change (%age)	1987-88	2010-11	Change (%age)
Rice	9315.66	9368.67	+0.32	11058.27	10531.36	-2.57	6569.80	4276.81	-8.65	26943	24176.85	-4.38
Maize	3649.93	4061.91	+2.53	4811.00	6620.80	+8.85	7938.48	5936.86	-7.55	16399	16619.58	+0.34
Wheat	51.80	-	-	40.06	25.49	-0.07	1883.44	60.29	-6.88	1975	85.79	-2.99
Pulses	835.28	243.22	-3.64	446.78	302.30	-0.70	898.01	630.51	-1.01	2180	1176.04	-1.58
Fruits	817.88	861.59	+0.26	995.54	970.45	-0.12	1984.21	3033.25	+3.91	3798	4858.30	+1.67
Vegetables	424.92	512.34	+0.53	715.90	393.36	-1.57	841.76	767.70	-0.27	1982	1674.22	-0.48
Oilseeds	579.52	130.52	-2.76	992.31	623.22	-1.80	3031.16	2379.60	-2.46	4603	4185.35	-0.66
Fodder Crops	550.78	371.91	-1.10	1320.92	369.89	-4.65	3005.26	1702.14	-4.92	4877	2243.94	-3.85
Net Sown Area	15323.75	14930.39	-2.42	18453.66	18393.36	-0.29	19622.42	16252.93	-12.72	53398	49576.68	-6.04

Source: - Department of Economics and Statistics, Srinagar, J&K.

in Chadura Tehsil as 7938.48 hectares (29.97%), followed by Budgam Tehsil as 4811 hectares (23.52%). During 1987-88 to 2010-11, District Budgam as a whole showed an increase of 220 hectares (0.34%) under maize from 16399 hectares to 16619 hectares. The highest area under wheat was found in Chadura Tehsil as 1883.44 hectares (7.11%) followed by Beerwah Tehsil as 51.80 hectares (0.31%).

District Budgam had 1982 hectares (3.13%) under vegetables in 1987-88.

The highest area under vegetables was found in Chadura Tehsil as 841.76 hectares (3.17%) followed by Budgam Tehsil as 715.90 hectares (3.50%), the District as a whole showed a decrease of 308 hectares (0.48%). The highest area under vegetables in 2010-11 was found in Chadura Tehsil as 767.70 hectares (2.89%) followed

by Beerwah Tehsil as 512.34 hectares (3.15%).

Fruit has a special significance for the District owing to the best suited agricultural climatic conditions available in the valley for production of all kinds of temperate fruit. A wide range of fruit, spices with their innumerable varieties are present in District. However, the District is much famous for its apple orchards, some of the chief varieties of the fruits are Delicious, American, Maharaji, Kesri, Razakwari, Hazratbali, Fokla, Chamura, & Red gold other fruit produced in the District include Almond, Walnut, Cherry, Pear, peaches, Apricot etc. The area under fruits for the whole district in 1987-88 was 3798 (6.01%). The highest area under fruits among tehsils was found in Chadura as 1984.21(7.49%) while Budgam Tehsil has 995.54 (4.86%) least area under fruits. During 25 years Budgam district as a whole showed an increase of 1056 hectares (1.67%). The highest increase was found in Chadura Tehsil as 1038.04 hectares (3.91%). Beerwah Tehsil showed an increase of 43.71 hectares (0.26%) while Tehsil Budgam showed a decrease of 25.09 hectares (0.12%). Oil seeds in the District Budgam are important Rabi crops.

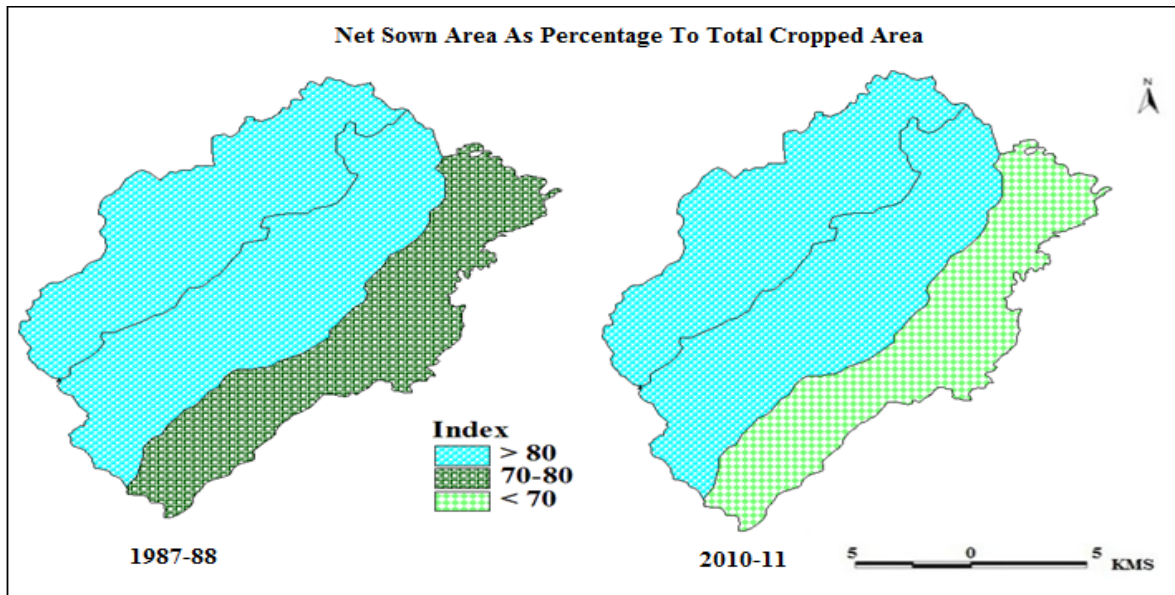
The total area under oil seeds for Budgam District in 1987-88 was 4603 hectares (7.28%). The highest area under oil seeds was found in Chadura Tehsil as 3031.16 hectares (11.44%) followed by Budgam Tehsil as 992.31 hectares (4.85%) while Beerwah Tehsil had an area of 579.52 hectares (3.56%) under oil seeds. But in 2010-11 the total area under oil seeds for the Budgam District was 4185 hectares (6.62%) the highest area was in Chadura Tehsil as 2379.60 hectares (8.98%), followed by Budgam Tehsil as 623.22 hectares (3.04%) while Tehsil Beerwah had an area of 130.52 hectares (0.80%) under oil seeds. During the period of 25 years, District Budgam as a whole showed a decrease in fodder crops, as the decrease was found to be of 2434 hectares (3.85%), from 4877 hectares in 1987-88 to 2443 hectares in 2010-11.

Out of the total reporting area, Budgam District had 53398 hectare in 1987-88 under net sown area. The highest area was found in Chadura Tehsil as 19633.42 hectares (74.09%), followed by Budgam Tehsil as 18453.66 hectares (90.24%). But in 2010-11 Budgam District had net sown area of 49576 hectares (78.48%) which showed a decrease of about 3819 hectares (6.04%). In 2010-11 the highest area under net sown area was found in Budgam Tehsil

as 18393.36 hectare (89.95%), while as Beerwah Tehsil had least area under net sown area as 14930.39 hectares (91.94%).

region in the District Budgam based on the technique put forward by weaver.

Weaver's method has been admirably accepted for the delineation of crop combination regions as its application



Source: - Compiled by Authors.

During the period of about 25 years from 1987-88 to 2010-11, Tehsil Chadura showed maximum decrease in net sown area as the decrease was found to be of 3369.49 hectares (12.72%), followed by Beerwah

Tehsil as 393.36 hectares (2.42%) while as Budgam Tehsil showed a decrease of 60.30 hectares (0.29%) under net sown area from 1987-88 to 2010-11.

Crop Combination

An attempt in the present paper has been made to delineate crop combination

The method, however, gives the most unwieldy combination for the units of high crop specification.

Crop Combination (1987-88)

The number combinations varied from a minimum of two to a maximum of eight.

Mono-Crop Combination: - No mono-crop combination has been found in Budgam District.

Two-Crop Combination:-Two-crop combination has been found in two Tehsils among the total of three. Tehsil Beerwah

and Budgam had two-crop combinations where Rice and Maize are dominant crops.

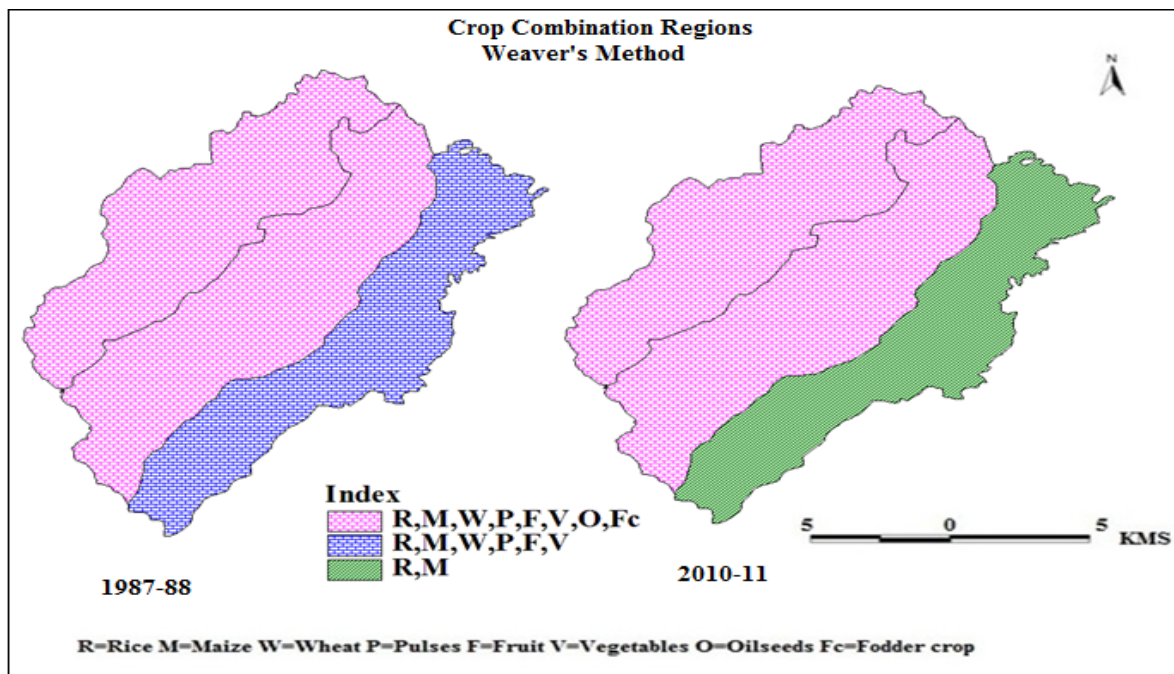
Six-Crop Combinations:- Among all the three Tehsils of the Budgam District, only Chadura Tehsils resembled as six-crop combinations where Rice, Maize, Oilseeds, Fodder crops, Fruits and Wheat were found to be the dominant crops.

found to be the dominant crops, which were Rice, Maize, Wheat, Pulses, Fruits, Vegetables, Oilseeds & Fodder crops.

Conclusion

Following are some of the main findings of the study

Demand of land for non-agricultural purposes: The activities in commerce, industry, transport, etc have risen with



Source: - Compiled by Authors

Crop Combination (2010-11):-

No mono crop combination was found in the Budgam District. However two-crop combination was found in Beerwah and Budgam Tehsils where Rice and Maize proved to be the dominant crops. While in Chadura Tehsils, all the major crops were

socio-economic conditions of the people. This increase has lead to rise in demand for land for construction of residential houses, shops, establishments, roads, etc. Since almost the entire available land in Budgam District was already under some economic

uses, the land required for non-agricultural activities had to be taken from cultivable areas.

Technological changes: Spread of high-yielding varieties of crops, use of pesticides and fertilizers, substitution of men by machines, shortage of skilled workers, etc have influenced cultivation practices and crop pattern.

Increase in pressure on land: Due to increase in population, agricultural farms got subdivided and very small-sized farms became the order of the day. Since small-sized farms are not viable, the owners of these farms turned to other occupations for their livelihood. For such cultivators farming is only a subsidiary activity. They preferred to cultivate crops that require less personal attention.

Neighborhood aspects: Changes in the farming practices and crop pattern in the neighboring areas induce other farmers to adapt to the changes. However, underlying all this has been the people's attitude to agriculture. For the older generation agriculture was a way of life; while for the present generation it is a commercial activity. The latter therefore, utilizes it to earn as much money as possible at the minimum cost and in the shortest time possible.

The study revealed that an increase of about 628 hectares has been found in non agricultural land in Chadoora tehsil mainly because of the construction of houses, markets, roads, complexes etc. resulted from increasing population. However district Budgam as a whole has shown a decrease of 781 hectares. Among the tehsils Beerwah has shown a decrease of about 50.58 hectares in barren and uncultivated land while Budgam tehsil showed an increase of about 637.79 hectares. The net sown area of Budgam district has decreased from 53398 hectares in 1987-88 to 46576 hectares in 2010-11, resulting in the decrease of about 3822 hectares (4.91%). The highest decrease was found in Chadoora tehsil as 3369 hectares followed by Beerwah tehsil as 1.79 hectares. Net area sown is directly proportional to the availability of irrigation. As distances from the valley floor increases and one moves to karewas and rim lands the intensity of net area sown declines steadily. The overall decrease in net sown area was found mainly because, the people of Budgam have now shifted to secondary and tertiary activities resulting in less interest towards the primary sector, particularly by the young generation. During the period of about 25 years there is also much change in the cropping pattern of the district. The area

under Fruits has increased from 3798 hectares in 1987-88 to 4858 hectares in 2010-11 showing an increase of about 1.56 hectares (1.67%). This is because the fruit plantation is economically viable and raises the carrying capacity of land. Due to latest machines and fertilizers used in the district, people have also shifted to horticulture for better financial strength. Some paddy fields have also been converted to the orchard plantation. Net sown area showed decreasing trend and the decrease was found to be of 3819 hectares (6.04%). Maximum decrease was found in Chadoora tehsil as 3369 hectares (12.72%), followed by Beerwah tehsil as 393 hectares (2.42%). In 1987-88 rice and maize were found to be the dominant crops in Budgam and Beerwah tehsils while in Chadoora tehsil 6 crops namely maize, rice, oil seeds, fodder crops, fruits and wheat were dominant crops. In 2010-11 there was not any change in the dominance of crops in Beerwah and Budgam tehsil as both rice and maize remained dominant crops, while in Chadoora tehsil 8 crops were found to be dominant namely rice, maize, wheat, pulses, fruits, vegetable, oilseeds and fodder crops. To fulfill the demands of increasing population, land and agricultural potential must be developed for the overall

development and to remove the regional disparities.

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