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CHANGING LAND USE PATTERN IN RAJASTHAN

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ABSTRACT

Land is the basis resource for human activities. The pattern of landuse is complex and dynamic. Landuse studies, are important, as they are aimed to explain the occurrence of different uses in different areas. Present study is going to express the dynamics of the spatio-temporal pattern and inter-regional variation of landuse in Rajasthan during post-liberalization period. The analysis of Landuse pattern has been done with reference to 1991-92 and 2015-16. The general landuse pattern has been classified as net sown area, land not available for cultivation, cultivable waste land, fallow land and forest cover. The proportion of net sown area in the state has increased significantly from 45.22 percent in 1991-92 to 52.60 percent in 2015-16. Forest acreage has increased considerably from 6.92 percent in 1991-92 to 8.03 percent of reporting area in 2015-16 while barren & un-cultivable land declined from 8.04 percent to 6.99 percent over the period. Current Fallows and Fallow Land other than Current Fallow have significantly decrease in the same time period.

Keywords: Landuse, Spatio-temporal, Inter-regional, Net Sown Area

INTRODUCTION

The landuse pattern of a region determines the ecological balance in the region and it also helps to understand the environmental status. It includes the management and modification of natural environment in to build environment such as settlements, cultivated land etc. Land is the basis resource for human activities. Landuse studies, are important, as they are aimed to explain the occurrence of different uses in different areas. The pattern of landuse is complex and dynamic. The landuse pattern is different in different regions. The present pattern of landuse is a result of long continued operation of the whole range of environmental factors but modified by socio economic and historical elements (Shafi, 1951).

Landuse classification is the systematic arrangement of various classes of land on the basis of

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certain similar characteristics mainly to identify and understand their fundamental utilities, intelligently and effectively in satisfying the needs of human society. The general landuse pattern has been classified as net sown area, land not available for cultivation, cultivable waste land, fallow land and forest cover. The landuse analysis is an important aspect of geographical studies which provides proper guidelines for the regional planning and development and also for future orientation of agriculture. Therefore, the study of landuse and its change has been carried out by many researchers and geographers at national and international level.

STUDY AREA

The state of Rajasthan is located in the north-west of part of the country. Its geographical location is between 23° 3' to 30° 12' North latitude and 69° 30' to 78° 17' East longitude with the tropic of cancer passing through the southernmost tip of the state. The state came into existence on November 1, 1956 by the reorganization 19 princely states, varied in size, administrative efficiency and socio-economic development. The state now has divided into 33 districts for administrative purposes. It is known as India's desert state since 61 percent of its area, covering 11 districts inhabited by 40 percent of the population, is either desert or semi-desert (the Thar) has made the state vulnerable to droughts and famines.

Rajasthan is the largest state of India covering an area of 342,239 square kilometres. It constitutes 10.4 percent of the total geographical area of the country. It is bounded on the west and north-west by Pakistan, on the north and north-east by Punjab, Haryana and Uttar Pradesh, on the east and south-east by Uttar Pradesh and Madhya Pradesh and on the south-west by Gujarat. It is the largest State in terms of area (342.24 thousand sq. km) but only 8th in terms of population. Its total population in 2011 is 6.86 crore (Census, 2011 Provisional data) in 2011. At present, there are 7 Divisions and 33 revenue districts in the State.

There are 10 agro-climatic zones (Arid Western, Irrigated North Western, Hyper Arid Partial Irrigated Zone, Internal Drainage dry zone, Transitional Plain of Luni Basin, Semi-Arid Eastern plain, Flood Prone Eastern Plain, Sub humid Southern, Humid southern, Humid Southern Eastern Plain) identified by Directorate of Agriculture, Government of Rajasthan in the state. There are following ten agro- climatic regions have been identified.

- **IA-Arid Western Plain** (Barmer, Jodhpur)
- **IB-Irrigated North Western Plain** (Sri Ganganagar, Hanumangarh)
- **IC-Hyper Arid Partial Irrigated Zone (**Bikaner, Jaisalmer, Churu)
- **IIA-Internal Drainage Dry Zone** (Nagaur, Sikar ,Jhunjhunu)
- **IIB-Transitional Plain of Luni Basin** (Jalore, Pali, Sirohi)
- **IIIA-Semi-Arid Eastern Plain** (Jaipur, Ajmer, Dausa Tonk)

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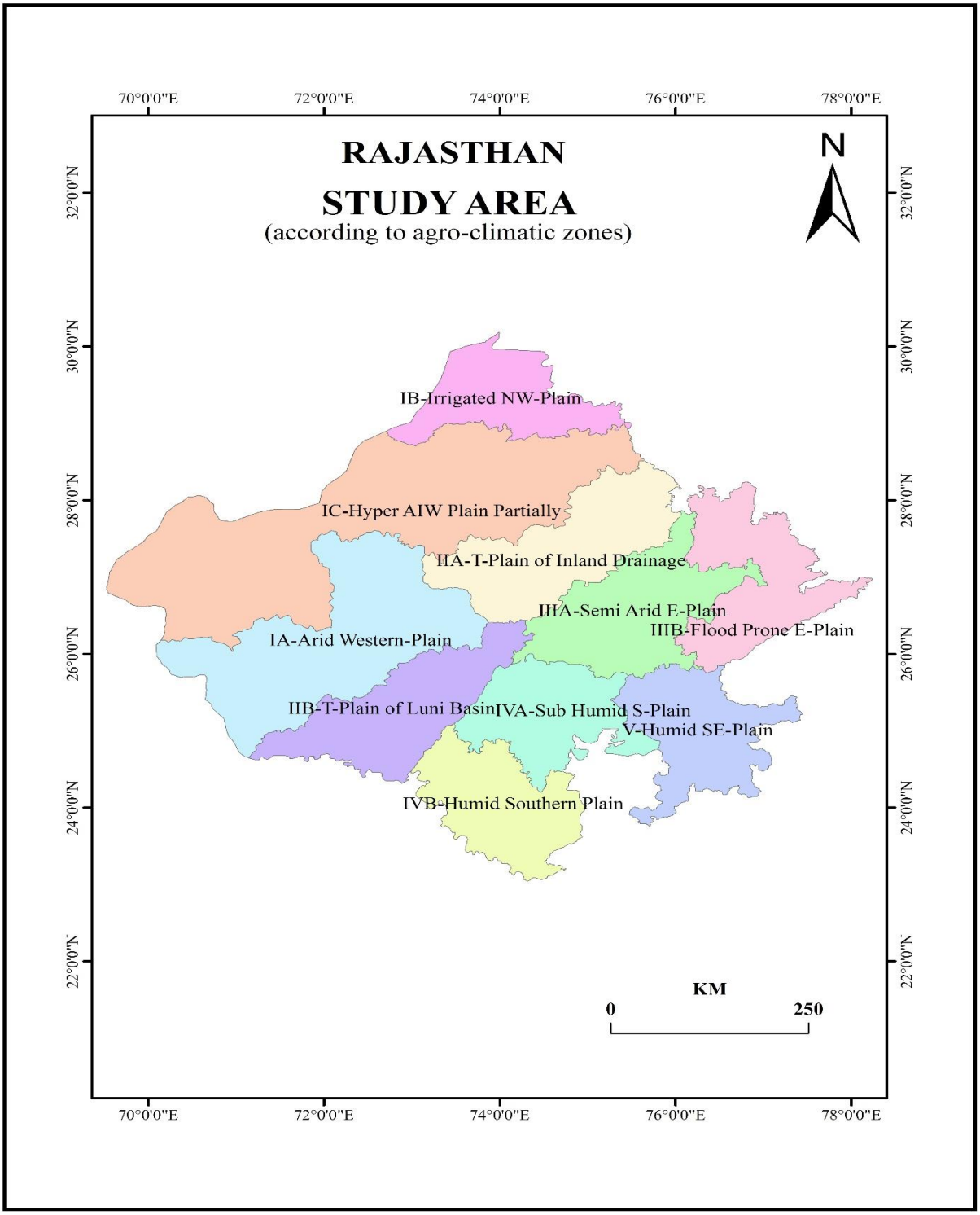

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- **IIIB-Flood Prone Eastern Plain** (Alwar, Dholpur, Bharatpur, S.Madhopur, Karauli)
- **IVA-Sub Humid Southern Plain and Aravallis** (Bhilwara, Rajsamand, Chittorgarh)
- **IVB-Humid Southern Plain** (Dungarpur, Udaipur, Banswara, Pratapgarh)
- **V-Humid South Eastern Plain** (Kota, Jhalawar, Bundi, Baran)

OBJECTIVES OF THE STUDY

The present study is aimed at the following objectives:

1. To study the spatio-temporal pattern of landuse in Rajasthan during post-liberalization period.
2. To analyze the changes that is taking place in landuse pattern in Rajasthan.
3. To find out the inter-regional variations in landuse pattern.

DATA SOURCES AND RESEARCH METHODOLOGY

The study is based on secondary data taken from Agricultural statistics of Rajasthan, Planning Department, Directorate of economics and statistics, Rajasthan. An attempt has been made to tabulate process, analyze and interpret the data by applying suitable statistical and cartographic techniques. Region-wise proportion of area under different landuse categories has been calculated and shown on map with the help of pie diagrams for both time periods.

RESULT AND DISCUSSION

Temporal Variation in Landuse Pattern

The comparative bar diagram shows the change in landuse pattern of the state during 1991-92 and 2015-16. The diagram shows the area under major categories which are play the main role in Rajasthan's landuse pattern. These categories are such as forest, non- agricultural uses, barren & un-cultivable land, permanent pastures & other grazing lands, land under misc. tree crops & groves, cultivable waste land, fallow land other than current fallow, current fallows, net area sown. The total reporting area was 34253 thousand hectares in 1991-92. It increased to 34267 thousand hectares in 2015-16. Despite the substantial increase in the total geographical area, net area sown are main Constituents of landuse pattern.

Table 1 and Figure 1 shows that net sown area accounted for about 45.22 percent of the total cropped area in 1991-92. Its proportion increased to 52.60 percent in 2015-16. Most of the decreasing trend has been seen in decreased to 11.37 percent in 2015-16. Area under forest has increased considerably from 2370 thousand hectares (6.92 percent of reporting area) in 1991-92

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Table 1. Landuse classification in Rajasthan

Landuse Classification	1991-92		2015-16	
Forest	2369537	6.92	2751867	8.03
Non- agricultural Uses	1638357	4.78	1945361	5.68
Barren & Un-cultivable Land	2754348	8.04	2394752	6.99
Permanent Pastures & other Grazing Lands	1787294	5.22	1671730	4.88
Land under Misc. Tree Crops & Groves	19739	0.06	20854	0.06
Cultivable Waste Land	5561093	16.24	3895251	11.37
Fallow Land other than Current Fallow	2174940	6.35	1965779	5.74
Current Fallows	2458369	7.18	1597408	4.66
Net Area Sown	15489514	45.22	18024363	52.60
Total Reporting Area	34253191	100.00	34267365	100.00

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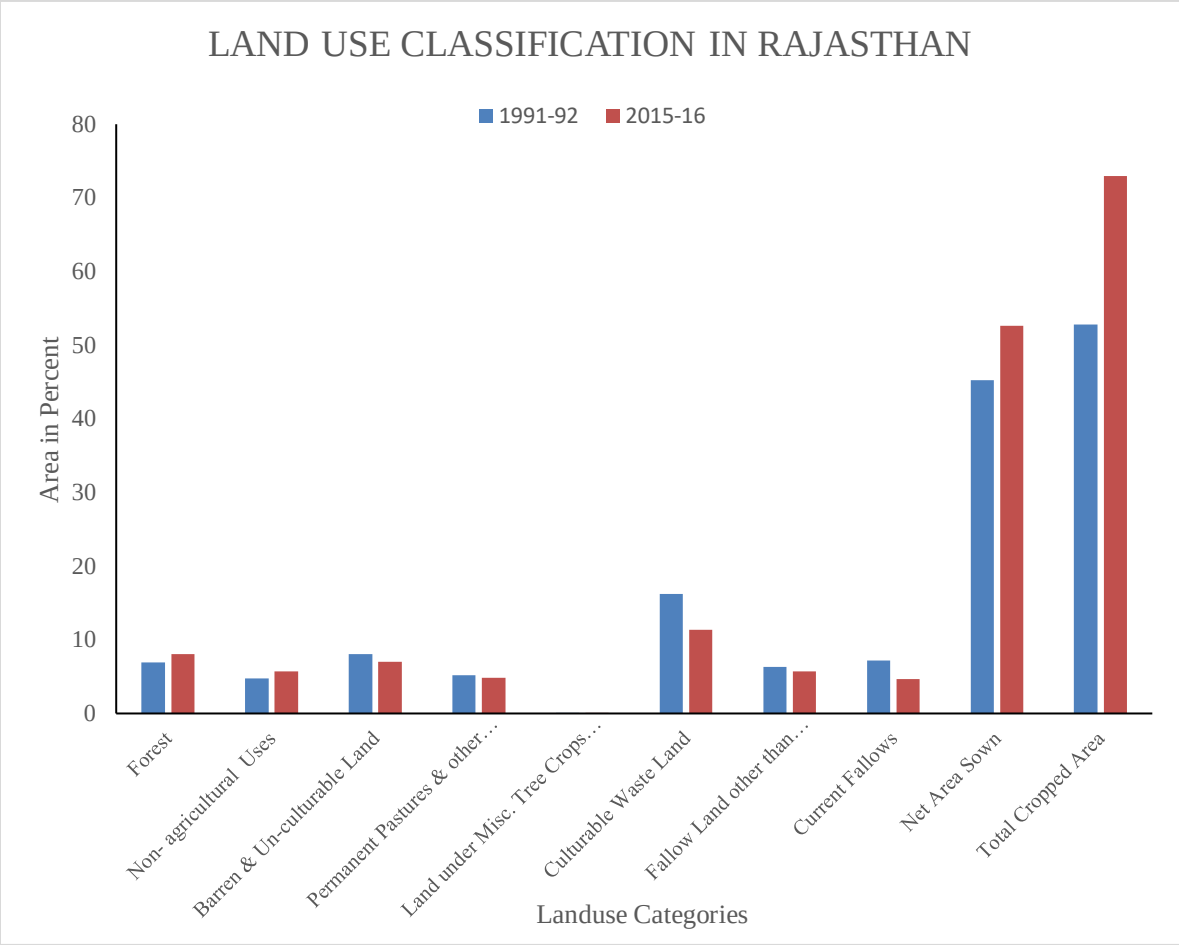
Figure 1.



to 1752 thousand hectares (8.03 percent of reporting area) in 2015-16 while barren & un-cultivable land declined from 8.04 percent to 6.99 percent over the period. During post reform period the area share of non-agricultural uses increased from 4.78 percent to 5.68 percent in the state. Current Fallows and Fallow Land other than Current Fallow have significantly decrease from 7.18 percent and 6.35 percent respectively to 4.66 percent and 5.74 percent in the same time period. Area under Permanent Pastures & other Grazing Lands also declined from 5.22 percent in 1991-94 to 4.88 percent in 2015-16. Land under misc. tree crops & groves has been almost found to be stable at 0.06 per cent of the state reporting area during both time periods. It is evident that area under forest and net sown area in the state.

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FOREST

This category of landuse includes all areas actually under forests whether state owned or privately owned and classed or administrated as forest under any legal enactment dealing with the forests. Besides, the forest area along roads, railways and canals is also included in this category.

The state of Rajasthan has a low area under forest i.e. it occupies about 6.92 percent in 1991-92 out of total geographical area. It is increased 8.03percent in current period (2015-16).
During 1991-92, maximum area under forest was recorded in in Humid South Eastern Plain (23.75 percent) followed by Humid Southern Plain (22.99 percent), Flood Prone Eastern Plain(12.33 percent) Sub Humid Southern Plain and Aravallis (9.38 percent). Transitional Plain of Luni Basin region occupied 8.86 percent area under forest. Rests of the regions have area under forests cover less than state average (5 percent).
Table 3 illustrates that this small proportion area under forests also show a considerable spatial variation. During 2015-16 maximum area under forests are found in Humid Southern Plain, Humid South Eastern Plain. Both are the regions covered one-fourth of the total geographical area respectively. Sub Humid Southern Plain and Aravallis, Flood Prone Eastern Plain, Transitional Plain of Luni Basin are other districts where the percentage of area under forest is above state average. Semi-Arid Eastern Plain of the Rajasthan occupied 6.45 percent of total geographical area. Remaining regions have less than state average (4 percent) of forest cover.

AREA UNDER NON-AGRICULTURAL USES

This category of landuse includes all lands occupied by human settlements, roads and railways or under water bodies, i.e., rivers, lakes, ponds, tanks, canals etc. A considerable increase has been recorded in the proportion of area under this landuse category. It is because of expansion of human settlements, developmental works such as, expansion of human settlements, developmental works, such as construction of roads, railways, canals, establishment of special economic zone (SEZ) and Industries. It is evident Table 3 and Figure 2, during 1991-92, highest proportions of area under non-agricultural uses was recorded in Humid Southern Plain (7.60 percent) followed by Irrigated North Western (5.90),Semi-Arid Eastern Plain (5.58 percent), Semi-Arid Eastern Plain (5.41 percent). Sub Humid Southern Plain and Aravallis, Hyper Arid Partial Irrigated Zone, Internal Drainage Dry Zone, Transitional Plain of Luni Basin had proportion of area under this landuse category between 4 to 5 percent.

Area under this landuse category shows spatial variation too. During 2015-16, highest proportion of area under non-agricultural uses is found in Humid Southern Plain (8.11 percent). Semi-Arid

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Eastern Plain, Hyper Arid Partial Irrigated Zone, Irrigated North Western have more than 6 percent of total area devoted to non-agricultural uses. Flood Prone Eastern Plain, Humid South Eastern Plain have also more than 5 percent area devoted to this landuse category. The remaining districts have proportions of area under non-agricultural uses less than 5 percent.

BARREN AND UNCULTIVATED LAND

This category of landuse includes barren and uncultivated lands in mountains and hill slopes, deserts, plateaus, rocky area and extremely degraded lands. These lands cannot be brought under cultivation unless at a very high input cost with possible low returns. So it is not beneficial to bring these lands under cultivation because it demands a very high input cost with possible low returns.

A slight decrease has been recorded in the proportion of area under this land-use category during this time period. In 1991-92, maximum proportion of area under this category was found in Humid Southern Plain (22.56 percent) followed by Sub Humid Southern Plain and Aravalli (16.27 percent). Transitional Plain of Luni Basin and Flood Prone Eastern Plain are the regions where proportion of area under this category was above state average (11 percent). Semi-Arid Eastern Plain, Humid South Eastern Plain, Arid Western Plain occupied between 5 to 8 percent. Irrigated North Western region had negligible barren land in 1991-92. Table 3 and Figure 2 shows that during 2015-16, highest proportion of area under this category is found in again Humid Southern Plain (18.69 percent) followed by Sub Humid Southern Plain and Aravallis (12.97 percent) and Transitional Plain of Luni Basin (10.38 percent). Flood Prone Eastern Plain is other region where the percentage area under this category is above state average (9.22 percent). Rest of the regions occupy less than state average of Barren and unculturable land.

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Table 2. Agro-climatic Region wise Landuse Pattern in Rajasthan during 1991-92

Regions	Forest	Area under non-agricultural uses	Barren and uncultura ble land	Permanent pastures and other grazing lands	Land under misc.tree crops and culturable waste land groves	Culturable waste land	Fallow lands other than current fallows	Current fallow	Net area sown
IA	0.62	2.94	5.38	6.55	0.01	6.95	14.18	13.73	49.65
IB	3.04	5.90	0.40	0.58	0.20	3.94	7.38	12.08	66.48
IC	1.10	4.80	4.80	2.55	0.03	48.03	5.78	5.91	27.00
II A	3.47	4.22	3.13	5.02	0.00	1.02	3.86	8.97	70.30
II B	8.86	4.20	11.24	6.04	0.05	2.69	8.25	8.48	50.17
III A	4.98	5.58	7.60	8.30	0.07	5.55	4.51	6.39	57.02
III B	12.33	5.41	11.83	4.17	0.08	2.29	2.20	3.31	58.38
IV A	9.38	4.92	16.27	10.16	0.03	19.34	3.88	3.15	32.86
IV B	22.99	7.60	22.56	7.03	0.14	7.28	4.33	2.75	25.32
V	23.75	4.50	7.56	5.23	0.11	6.62	3.34	3.45	45.44

Source: Agricultural statistics of Rajasthan

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Table 3. Agro-climatic Region wise Landuse Pattern in Rajasthan during 2015-16

Regions	Forest	Area under non-agricultural uses	Barren and unculturable land	Permanent pastures and other grazing lands	Land under misc.tree crops and culturable waste land groves	Culturable waste land	Fallow lands other than current fallows	Current fallow	Net area sown
IA	0.82	3.14	5.27	6.46	0.02	3.98	11.14	9.35	59.81
IB	3.85	6.25	0.12	0.23	0.17	0.83	4.07	4.07	80.42
IC	1.67	6.51	4.80	2.07	0.01	33.44	4.47	3.38	43.66
II A	3.83	4.77	2.86	4.82	0.01	0.91	6.18	7.80	68.83
II B	9.47	4.63	10.38	6.12	0.01	2.83	8.78	6.65	51.12
III A	6.45	6.95	6.25	7.28	0.05	5.22	4.41	4.94	58.46
III B	15.48	5.82	9.22	4.09	0.10	1.55	2.71	2.80	58.25
IV A	11.83	6.22	12.97	10.54	0.02	13.23	4.47	2.33	38.38
IV B	25.14	8.11	18.69	5.74	0.08	7.62	5.44	0.95	28.22
V	25.27	5.37	6.11	4.90	0.35	3.86	2.56	1.10	50.47

Source: Agricultural statistics of Rajasthan

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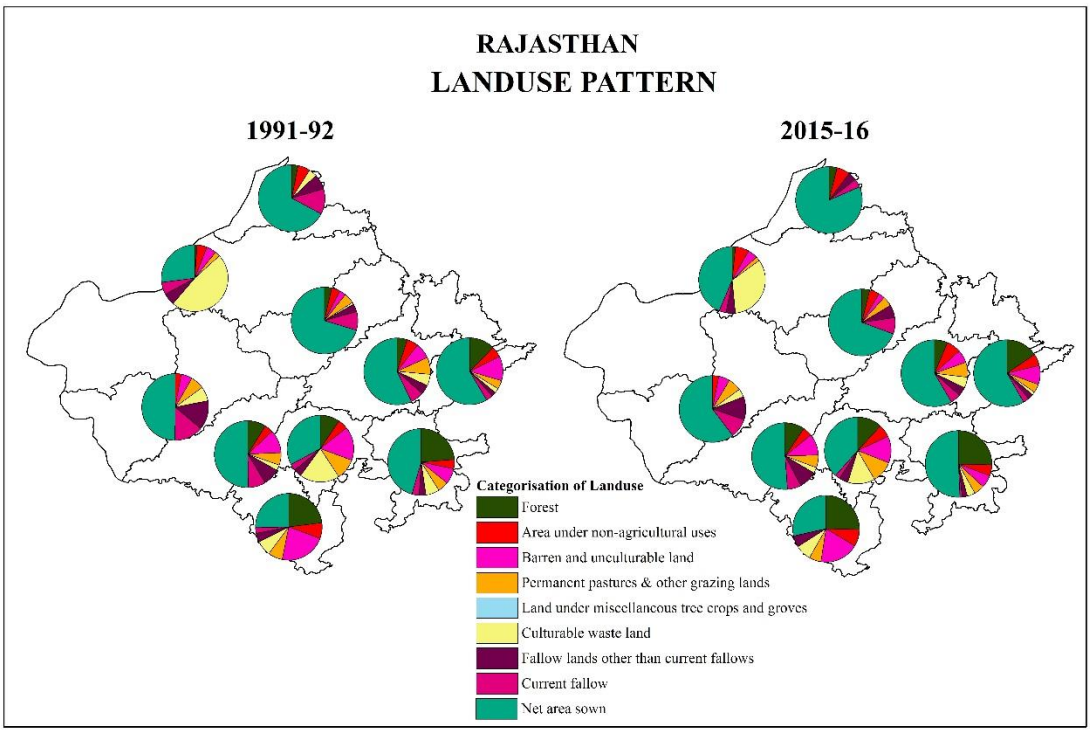
Figure 2



PERMANENT PASTURES AND OTHER GRAZING LANDS

The landuse category includes all grazing lands whether permanent pastures and meadows or not. The common land in the village and grazing land within the forest areas are included under this category. Figure 2 showing the highest percentage was recorded in the district of Sub Humid Southern Plain and Aravallis (10.16). The maximum area under this landuse category is found in Sub Humid Southern Plain and Aravallis (10.54 percent) followed by Semi-Arid Eastern Plain (7.28 percent), Arid Western Plain (6.46) and Transitional Plain of Luni Basin (6.12). There are four regions of rajasthan in which grazing lands occupy between 4 to 6 percent of total district area. In rest of the districts, grazing lands occupy less than 2 percent of total district area.

AREA UNDER MISCELLANEOUS TREE CROPS

This landuse category includes all cultivable land, which is not included under the net sown area, but is put to some agricultural uses other than seasonal cropping. During 1991-92, highest area under this landuse category was recorded in Irrigated North Western (0.20 percent) district followed by Sub Humid Southern Plain and Aravallis (0.14 percent). In 2015-16, highest

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proportion of area under this landuse category is found in the region of Humid South Eastern Plain, which is 0.35 percent of the total district area.

CULTURABLE WASTE LAND

The Wasteland Survey and Reclaimation Committee has defined "cultivable wasteland" as that land available for cultivation but not used for cultivation for one reason or the other." This land was used for cultivation in the past but is not being used (cultivated) at present or for last five years or more in succession because of physical, socio-economic and demographic limitations. During 1991-92, maximum area under this landuse category was recorded about half of total geographical area in Hyper Arid Partial Irrigated Zone, which is followed by Sub Humid Southern Plain and Aravallis (19.34 percent). Rest of the regions had less than state average (16.24) of total area under this landuse category. Comparatively high proportion of culturable waste land wasteland is found in Hyper Arid Partial Irrigated Zone (33.44 percent) in 2015-16 followed by Sub Humid Southern Plain and Aravallis (13.23 percent), Humid Southern Plain (7.62 percent). Remaining regions have less than 5 percent of total area under this landuse category.

FALLOW LANDS OTHER THAN CURRENT FALLOWS

This landuse category includes all that land which was used for cultivation earlier, but is currently out of cultivation. Fallowland is of two types- current fallow and fallow other than current fallow. Current fallow means the lands left unsown during the current agricultural year to regain fertility or some other reasons. Fallow lands other than current fallows include all lands which were cultivated earlier and are temporarily unsown for a period of not less than one year, and not more than five years. However, for the present study these two categories are grouped together. The main reasons for fallowing the land are low soil fertility, poor irrigation facilities, uncertainty of rainfall, and limited economic means of farmers.

During 1991-92, highest proportion of area under Fallow lands other than current fallows was found in Arid Western Plain (14.18 percent). It was followed by Transitional Plain of Luni Basin (8.25 percent), Irrigated North Western (7.38 percent). The remaining regions had proportion of fallow land less than state average (6.35 percent). As evident from table 3 and figure 2, during 2015-16 comparatively high proportion of area under Fallow lands other as current fallows is found in Arid Western Plain (11.14 percent) followed by Transitional Plain of Luni Basin (8.78 percent) and Internal Drainage Dry Zone(6.18 percent). Humid Southern Plain, Sub Humid Southern Plain and Aravallis, Hyper Arid Partial Irrigated Zone, Semi-Arid Eastern Plain and Irrigated North Western are the regions where found 4 to 5 percent area under Fallow lands other as current fallows. In rest of the regions, the proportion of Fallow lands other than current fallows is found less than (3 percent).

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CURRENT FALLOW

Highest area under current fellow found in Arid Western Plain and Irrigated North Western with more than 10 percent. There are two regions namely Internal Drainage Dry Zone and Transitional Plain of Luni Basin where around 9 percent acreage occupied by current fellow. Semi-Arid Eastern Plain and Hyper Arid Partial Irrigated Zone are the regions showing 5 to 6 percentage area under this landuse category. Rest of the regions are occupied about 3 percentage area of total geographical area. There is so much change found in all the regions of Rajasthan in 2015-16 in comparison to 1991-92. Highest area under current fellow found in Arid Western Plain (9 percent) followed by Internal Drainage Dry Zone (7.80 percent) and Transitional Plain of Luni Basin (6.65 percent).

NET AREA SOWN

Net sown area refers to that part of the cultivated land on which sowing is actually done at least once during a year (Dhian, 1991). The proportion of net sown area (NSA) is a very important indicator of level of agricultural development and agricultural production. Inter regions variation in NSA during both periods of time in Haryana has been shown in table 2 and figure 2. It is pointed out that lowest proportion (less than 30 percent) of NSA was observed in Sub Humid Southern Plain and Aravallis, Humid Southern Plain and Hyper Arid Partial Irrigated Zone during 1991-92. This is mainly due to rough surface and desert region. Humid South Eastern Plain, Arid Western Plain and Transitional Plain of Luni Basin were the regions where percentage of NSA was more than state average (45.22 percent). NSA accounted for 80 to 90 percent of total area in mostly regions of the state. Internal Drainage Dry Zone was the only region where NSA accounted for more than 70 percent of the total area. During 2015-16, highest proportion NSA is found in Irrigated North Western plain, which is occupy 80 percent of the total area. Lowest acreage found in Sub Humid Southern Plain and Aravalli (38.38 percent), Humid Southern Plain (28.22 percent). Most parts of the plain have more than 50 percent of area devoted to cultivation of crops. Overall there is not much spatial variation in terms of area devoted to crop cultivation in the plains.

CONCLUSION

The study concludes that a very high changes have occurred in agricultural landuse pattern during past decade in the state. Maximum increase has been seen in term of net sown area. The proportion of net sown area in the state has increased significantly from 45.22 percent in 1991-92 to 52.60 percent in 2015-16. Forest acreage has increased considerably from 6.92 percent in 1991-92 to 8.03 percent of reporting area in 2015-16 while barren & un-cultivable land declined from 8.04 percent to 6.99 percent over the period. During post reform period the

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