

LAND-USE AND LAND-USE CHANGES IN RAJASTHAN

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INTRODUCTION

Planning of land development requires in the first instance collection of available information on land-use and trends of its variation with time. In the state of Rajasthan, because of vast arid tracts the resources have not as yet been fully assessed and whatever information is available has not been rationally utilised to upgrade production. The paper deals with the land-use in different districts of the State during 1963-64 and also the land-use changes from 1957-58 to 1962-63. The object is to find out the land-use in different categories and the trends of variations so that the characteristics of land utilisation may be analysed for future planning.

MATERIALS AND METHODS

Data on land-use and changes were collected from the Table 4.1 of the statistical abstracts (1959-65) published by the Directorate of Economics and Statistics of the Government of Rajasthan. The land-use data for 1963-64, are summarised in Table I. Taking in view the practical aspects and cartographical care of work, land-utilisation units as given by the Directorate of Economics and Statistics have been modified and reclassified as follows :

- (1) Forest
- (2) Settlements and other non-agricultural lands. These include land put to non-agricultural land as indicated in the statistical abstract (columns 8 and 9) and also roads, railways, public buildings, water features, mountains, rocky area, etc.
- (3) Land not available for cultivation includes permanent grazing land, orchards, barren land and tree groves as per columns 10 to 15 of the abstract.
- (4) Fallow land, available for cultivation. This includes the culturable waste, fallow land other than current fallow and current fallow of the abstract (Columns 16 to 21).
- (5) Cultivated lands which include total cropped area. This is further classified as double cropped area and single cropped area.

For land-use changes the data from 1957-58 to 1962-63 have been considered. For this purpose the figures of alternative years have been compared on the assumption that most of the cultivated lands of one year are converted into fallows in the

TABLE 1

Land utilisation in Rajasthan 1963-64

Districts	Forest	Settlements and other non-agricul- tural lands	Land not available for cultiva- tion	Fallow land	Cultivated land		
					Single cropped	Double cropped	Total
Ajmer	4.44	5.16	20.64	27.00	36.73	6.00	42.73
Alwar	2.73	4.16	22.75	8.58	48.76	13.46	62.22
Banswara	7.69	1.18	34.12	20.11	25.83	11.04	36.87
Barmer	0.31	2.41	12.24	40.94	43.35	0.10	43.45
Bharatpur	2.22	4.57	22.39	16.59	53.46	9.77	54.23
Bhilwara	1.24	3.63	24.84	46.74	16.06	7.26	23.32
Bikaner	0.36	3.27	1.28	77.82	16.23	—	16.23
Bundi	5.16	4.62	40.56	13.51	33.45	2.67	36.12
Chittorgarh	5.04	3.36	25.93	35.40	21.94	7.41	29.35
Churu	0.05	5.51	1.17	28.86	63.30	0.06	63.36
Dungarpur	1.24	4.45	42.99	16.23	19.74	15.28	35.02
Ganganagar	0.14	3.97	0.27	29.02	54.46	21.80	76.36
Jaipur	2.85	4.78	16.99	33.26	46.57	5.35	51.91
Jaisalmer	0.48	1.21	44.60	50.25	3.49	—	3.49
Jalor	0.37	3.12	13.92	24.91	56.06	1.98	57.98
Jhalawar	2.74	4.36	26.95	21.45	38.77	5.64	44.41
Jhunjhunu	2.86	1.51	14.83	5.72	71.68	3.37	75.05
Jodhpur	0.04	3.37	12.00	41.18	43.18	0.17	43.35
Pali	4.90	4.09	19.71	28.97	40.84	1.55	42.39
Sawai- Madhopur	5.59	2.08	37.25	11.47	39.22	4.27	43.49
Sikar	1.03	2.83	14.83	12.89	66.32	2.06	68.38
Sirohi	7.91	4.05	40.34	17.36	26.83	3.47	30.30
Tonk	1.39	3.19	16.96	22.79	52.01	3.61	55.62
Udaipur	6.50	2.99	46.27	20.28	11.29	6.28	17.57
Kota	18.00	3.50	18.20	16.63	40.70	1.80	42.50
Nagaur	—	4.19	8.11	26.32	604.9	0.22	60.71

next year. To also visualise changes of the successive years, two consecutive years 1959-60 and 1960-61, have also been taken into account.

The data compiled have been cartographically analysed and a map has been prepared to show the land-use in 1963-64 by pie graph and land-use changes between the years 1957-58, 59-60, 60-61 and 62-63 through rise and fall line graphs (Map 1). The map is cartographed on 1 : 2 million scale and the conditions of different districts are separately represented. The total district areas are also given in the map.

DISCUSSION

The map gives the vivid expression of the land-use and its variations in the different districts of Rajasthan. These are discussed separately in the following paragraphs.

(A) Land use

The map indicates that Rajasthan is predominantly an agricultural state where 58.2% of the total area on an average is cropped land. Different land-uses and variations of land utilization under different categories are as under:

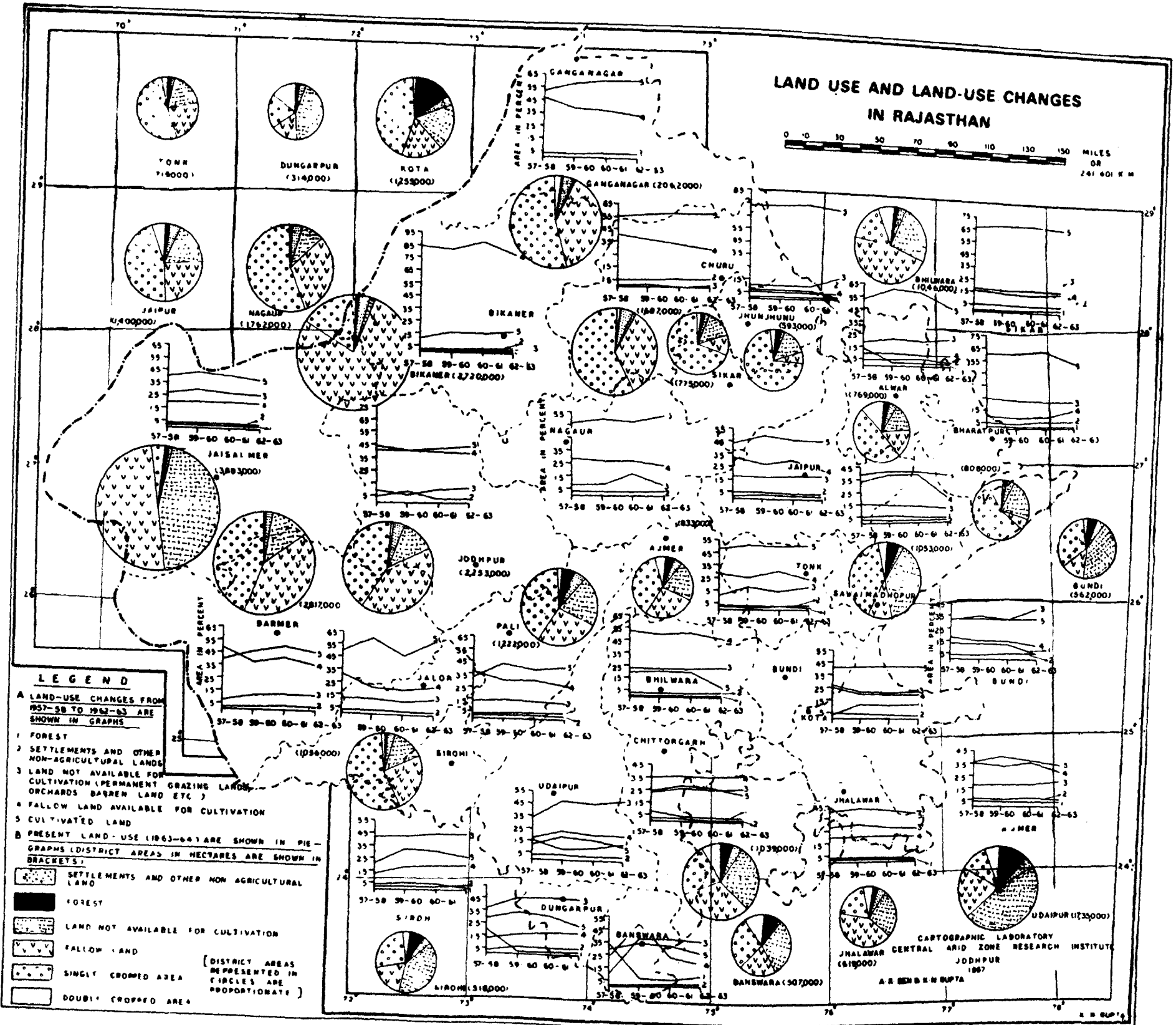
(1) *Forest* : Area under forest in Rajasthan is small, the concentration of forests being more in the districts adjoining Aravallis — like Ajmer (4.44% of total area), Banswara (7.69%), Bundi (5.16%), Chittorgarh (5.04%), Pali (4.90%), Sawai Madhopur (5.59%), Sirohi (7.91%), Udaipur (6.50%) and Kota (18.00%). Due to low rainfall and aridity forest areas are few and almost negligible in the arid zone districts of Barmer (0.31%), Bikaner (0.36%), Churu (0.05%), Ganganagar (0.14%), Jaisalmer (0.48%), Jalor (0.37%) and Jodhpur (0.04%). In rest of the districts the area under forest varies from 1 to 2% and are concentrated in the favourable locations of foothill slopes. In Udaipur region considerable areas are under Northern tropical dry deciduous forest with *Anogeissus latifolia*-*Terminalia tomentosa* species. Southern tropical dry deciduous forests with *Tectona grandis*-*Anogeissus latifolia* occur as patches in Banswara, Kota, Dungarpur, Chittorgarh, Udaipur and Jhalawar districts. In Mt. Abu sub-tropical evergreen forests are found in a small area. In Sirohi and Udaipur district along Aravallis, subsidiary edaphic type of forests with *Boswellia serrata* are found. Other subsidiary edaphic type forest with *Anogeissus pendula*-*Acacia senegal* are distributed over the hilly areas of eastern Rajasthan. In arid regions degraded thorn forests consisting of species like *Capparis decidua* and *Zizyphus nummularia* occur in Jaisalmer and Barmer districts and northern tropical thorn forests with *Prosopis spicigera*. *Salvadora oleoides* occur scattered in the district of Jodhpur, Jalor, Pali, Barmer and Bikaner.

To prevent the shifting sand dunes and extension of the desert a large scale programme on afforestation in the arid zone is the immediate need.

2. *Settlements and other non-agricultural lands*: These include settlements, building, roads, other lands appropriated for non-agricultural use — like mountains and shifting dunes, etc.

The forms, types and pattern of the settlements and their accessibilities in terms of the network of the existing communication patterns have been worked out earlier

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by Sen (1966, 67). In Western Rajasthan scattered settlement pattern with scattered villages dominates in the dune country and foothill regions. In both cases, the family forms the core of the settlements and the village as a unit is less significant. The influence of caste is also important but is stronger in the rocky desert than in the sandy desert. Deserted and temporary villages are common in the dune country. In the interdune areas and desert piedmont (rocky desert) settlements are compact. The sites are controlled by relief. Protection given by the Jagirdars often led to the development of settlements in adverse locations in the districts of Ajmer, Jodhpur, Bikaner and Sirohi. Caste, kinship and lineage are important factors which have led to the development of compact form. There is a tendency in the rocky desert to shift the site of the settlements along the sides of the roads or railway lines. Settlements are mostly unplanned in the desert. Along the Aravallis, in Udaipur, Chittorgarh, Tonk, Ajmer, Bundi, Banswara, Dungarpur, Sirohi and Pali districts, settlements are located on the top of the hillocks or along the valleys. The settlements are mostly scattered and inaccessible with meagre resources. In the eastern Rajasthan plains, both scattered and compact forms of settlements prevail. With the diversification of economy where the population has increased rapidly, the entire structure of the settlement pattern has changed. The settlements of eastern Rajasthan as also the eastern part of western Rajasthan are easily accessible. The interior parts of the desert are inaccessible with poor infrastructure.

3. *Land not available for cultivation*: This includes barren lands, inclusive of gravelly lands, extensive sandy tracts, shifting dunes, permanent pastures and lands under miscellaneous tree crops and grasses. There are some possibilities to put certain portions of this land under cultivation. This is now being practised in some of the districts like Jodhpur. There are three distinct intensities of this land-use in Rajasthan. There is high concentration over 30% in Banswara, Bundi, Dungarpur, Sawai Madhopur, Sirohi, Udaipur and Jaisalmer districts. Secondly in districts of Ajmer, Bhilwara, Chittorgarh, Jhalawar and Pali the concentration of such land is between 20-30%. In all these districts along Aravallis, this is due to the rugged terrain and mountainous tracts that prevail here. The high concentration is noticed in Jaisalmer district (44.60%) due to extensive rocky barren land and sand dunes. Third part of this land-use—20% is in the districts of arid zone; Barmer (12.41%), Bikaner (1.28%), Churu (1.17%), Ganganagar (0.27%), Jodhpur (12.00%) and Nagaur (8.11%). This is because of extensive agricultural practices in the adverse climatic conditions in arid zone. Although the land sown every year is small, land fit for cultivation is fairly large and long fallows are the current practices in cultivation.

(4) *Fallow land*: In arid regions, except in the districts where irrigation is practised the extent of such fallow land is very high; Barmer (40.94% of the total area), Bikaner (77.8%), Churu (28.86%), Ganganagar (29.02%), Jaisalmer (50.25%), Jalor (24.51%), Jodhpur (41.18%), Pali (28.97%) and Nagaur (26.3%). This almost follows the pattern of rainfall, more fallow land in west with low rainfall and comparatively less fallow land in districts adjoining Aravallis with more rainfall. Similarly due to undulation, rugged topography, stoniness and low water table the area under fallow remains considerably high in the districts of the Aravallis like

Ajmer (27%), Banswara (20.11%), Chittorgarh (35.40%), Jaipur (23.26%), Jhalawar (21.45%), Tonk (22.79%), and Udaipur (20.28%). In other districts it varies from 5.72% in Jhunjhunu to 16.23% in Bundi and 17.36% in Sirohi.

The map and the figures indicate that some more land can be put still under cultivation and there is a scope to increase the cultivated land to at least 10 to 20% in different districts.

Lands not available for cultivation and fallow lands combined constitute the grazing ground of Rajasthan (Raheja & Sen, 1964). In the dry districts of Jaisalmer and Bikaner nearly 80% of the area is available for grazing. The area available for livestock grazing in Barmer, Jodhpur, Nagaur, Jalore and Sirohi, Churu and Ganganagar is less than 30% of the area for grazing of the livestock. The extent of grazing land is also high in the districts along the Aravallis in Udaipur, Bhilwara, Sawai Madhopur, Chittorgarh, Dungarpur and Banswara (50-80%). In other districts of eastern Rajasthan it ranges between 30 and 50% of the total area of the districts concerned. The predominating grass land type covering eastern Rajasthan is *Sehima-Dichanthium-Themedra pseudenthirtiria* type occurs in districts of Bhanswara, Jhalawar and Kota. *Themedra pennisetum hohenackeri* type grassland occur in Mt. Abu area predominantly. *Cenchrus ciliaris* type grasslands cover vast areas in the northern district while *Dichanthium-Lasiurus* type cover districts west of Aravalli including Nagaur, Pali, Jodhpur and Jalore. The western arid districts are largely covered with *Lasiurus*, *Cymbopogon-jawarancusa* type grassland.

(5) *Cultivated lands*: In Rajasthan, as a whole, 58.2% of the area is cultivated, but the density of cultivation is however not uniform (Table I). The high density (above 50%) districts are Alwar (62.22%), Jaipur (51.91%), Bharatpur (54.13%) and Tonk (55.62%) in eastern Rajasthan, Churu (63.36%), Jalor (57.98%), Jhunjhunu (75.05%); Sikar (68.38%), Nagaur (60.71%) and Ganganagar (76.21%) in western Rajasthan. The high density in the four eastern Rajasthan districts is mostly due to deep alluvial soil, moderate rainfall and good irrigation potentialities (Sen, 1967). In Jaipur and Bharatpur districts, 11.40% and 15.40% of the total area respectively are irrigated. In Alwar and Tonk the total area irrigated is 5.40%, 6.90% respectively. The high percentage of cultivated land in Ganganagar district is also due to irrigation where 15.40% of the total area receives irrigation. The density is high also in Churu, Jhunjhunu, Sikar, Nagaur and Jalore districts, as these are the transitional districts between arid and semi-arid, receiving annual rainfall between 300 and 500 mm (Sen, 1972a, b). The irrigation potentiality of Jalor district is also high.

There are other 12 districts (Table I) in the state where the density of cultivated land is moderate (30 to 50% of the total area). Ajmer (42.73%), Pali (42.39%), Sawai Madhopur (43.49%), Kota (43.49%), Chittorgarh (30%) and Sirohi (42.50%) have irrigational facilities. The moderate density in Banswara (36.87%), Bundi (36.12%), Dungarpur (35.02%), Jhalawar (44.41%) and Kota (42.50%) is due to high rainfall (750 mm) and the districts fall under sub-humid zone (Sen, 1972a). In arid zone, Jodhpur (43.35%) and Barmer (43.45%) districts fall under this group where extensive cultivation is practised by the growing population by making use of all the available lands for want of subsidiary occupation.

The density is low in Bikaner (16.23%) and Jaisalmer (3.49%) due to dunny tract and extreme aridity. Udaipur (17.57%) and Bhilwara (23.32%) districts show low density of cultivated land because of extreme rockiness of land area.

Extensive areas grow only a single crop in a year. Double cropped area are small, being the highest in Ganganagar (21.80%), Banswara (11.06%) and Alwar (13.46%). In other districts this is less than 10 per cent of the total area. The intensity of cropping is high in the districts of Chambal valley due to irrigation facilities and high rainfall and in Dungarpur, Udaipur and Bhilwara districts due to high rainfall. It is very low in the districts like Bikaner, Jaisalmer, Barmer, Jodhpur and Churu (Sen & Abraham, 1966). The geographical distribution of crops reveals the predominance of cereals *bajra*, *jowar*, as compared to barley, maize and wheat. But in case of yield the condition is reversed (Sen, 1968). This is because the latter has the benefit of intensive cultivation either under the good rainfall conditions or irrigation. Average yield of barley in Rajasthan is 1122 kg/ha., maize 1028 kg/ha., Wheat 900 kg/ha., *jowar* 299 kg/ha. and *bajra* 217 kg/ha.

(B) Land-use Changes

The graphs in the map show the land-use changes in different districts of Rajasthan. These are as under :

(1) *Forest*: The changes in area under forest in different districts is not so striking except between 1957-58 and 1959-60 in Alwar, Banswara, Chittorgarh, and Dungarpur districts where there is a marked decrease during the period. The green revolution campaign in 1957-58 and 1959-60 has diverted many of such lands to cultivation resulting in a fall in area under forests. There is, however, increase of forest area in Kota district during this period; this is due to additional afforestation programme.

(2) *Settlement and other non-agricultural lands*: The graphs in the map show no striking changes except in the arid districts of Jodhpur (—25%) and Barmer (—11.7%). The fall in these areas is due to reclamation of many sandy areas. In general the settled areas have increased but in relation to population growth it has not been significant (Raheja & Sen, 1964).

(3) *Land not available for cultivation*: Three trends have been observed :—

- (i) Increase in area is marked in Ajmer (25%), Banswara (100%), Bhilwara (20%), Bundi (32%), Dungarpur (16.6%), Sawai Madhopur (12%), Tonk (23%) districts along the Aravallis probably because of putting more lands for grazing purposes. In arid districts like Barmer (50%), Jhunjhunu (70%) and Jodhpur (33.3%), the increase in such lands is due to recurrent drought and high wind erosion hazard.
- (ii) Fall in area (below 20%) in districts of Bharatpur (8%), Jaipur (17%) and Kota (19%) may be attributed to putting more lands under crop by means of irrigation and reclamation.
- (iii) Other districts show no striking changes in variation of areas under this class.

(4) *Fallow land*: In general a fall of area under this class is noticed in almost all the districts due to putting more lands under cultivation for grow more food campaign. Following regional characteristics are noticed.

- (i) Fall in fallow lands in the arid districts of Bikaner (10%), Churu (28%), Ganganagar (25%), Barmer (21%), Jaisalmer (15%), Jalor (29%), Jodhpur (12%), Nagaur (17%), Pali (25%) where more lands are recently being reclaimed for agriculture.
- (ii) Fall of area in Sirohi (31%), Ajmer (18%), Jaipur (26%), Tonk (26%), Bundi (25%) and Kota (24%) where more land is put under crops by means of irrigation particularly by the Chambal project in the last three districts.
- (iii) Rise of about 90% fallow land in Bharatpur district between 1960-61 and 1962-63 because of the heavy flood when many of the land could not be put under plough.
- (iv) In other districts the area remain more or less the same.

(5) *Cultivation*: In general there is an increase in total area under cultivation in all the districts. Following characteristics have been noted.

- (i) There is a fall of area under almost every district between 1960-61 and 1962-63 due to the failure of rainfall during the period.
- (ii) Significant increase is recorded in the districts of Banswara (64%), Bikaner (50%), Jaisalmer (100%), Udaipur (41%), Sirohi (40%), Dungarpur (39%); the increase being due to the reclamation of fallow lands.
- (iii) Increase is seen in Ajmer (18%), Bhilwara (15%), Chittorgarh (18%), Tonk (13%), Bundi (13%), Alwar (15%), Ganganagar (21%), Jaipur (20%) is due to increased irrigation potential. Barmer (19%), Nagaur (21%) and Jalor (18%) have also recorded increase in cultivated area largely to extension of cultivation in normally long fallows.
- (iv) In other districts the increase is below 10%. In Jodhpur it is 9%, Churu it is 8% and in Sikar 5% (for the reclamation of arid lands) Jhalawar 5%, Sawai Madhopur 8%, Kota 8% (due to irrigation and reclamation of rocky areas)
- (v) In Jhunjhunu the rise is lowest (1 per cent) and Pali (3 per cent). It appears that most of the available land here have been under plough.

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