

Spatio Temporal Analysis of Agriculture Land - Use in Tonk District Rajasthan



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Abstract

The development history of many advanced countries reveals the common thesis that their economic development had been preceded by the development of agriculture. Agriculture is one of the oldest basis for the sustenance of man. Since his origin man has tried to cultivate soil and produce some eatable. It is the mostly widely distributed economic activity on earth's surface, man has adopted agricultural practices specially according to differing environment conditions, which are reflected in variety of crops produced by different techniques and methods and also the raising of livestock. A revolutionary change occurred in agriculture with the introduction of new technologies and modern methods of agriculture practices. Green revolution was a major breakthrough in Indian agriculture in which emphasis was put on high yielding varieties of seeds, good quality of fertilizers and pesticides, mechanization and irrigational facilities. These innovations resulted into multifold increase in agriculture production.

Keywords: Tonk District Land Use Planning, Green Revolution.

Introduction

Tonk district a part of Dundadi region lies in central eastern part of Rajasthan. Total reporting area for land utilization purpose is 717960 hectares. Net cultivated area of the district is 397385 hectares which is 55.35% whereas total cultivated area is 467395 hectares which 65.10% the total geographical area of Tonk district, In the district 26048 hectares for forest, 73425 hectares for non agricultural use, 89825 hectares cultivable land and 131277 hectares Padats land (fallow land) is available.

Canals, Wells and Tube wells are the main source of irrigation in the district. The total area irrigated in district is 322778 hectares out of which 140584 hectares is irrigated by wells and tube wells. Kharif and Rabi crops are the main crops in the district. The important crops in the district in order of production are mustard. Wheat, Barley, Bajra, Jowar, Gram and Maize. pulses total cultivated area of the district under Kharif crops is 245373 hectares and under Rabi crops is 415426 hectares. as per (land record Tonk district 2013-14)

Bislpur Dem is one of the major project in Rajasthan being constructed on river Banas by the irrigation department. Govt. of Rajasthan. for water supply for domestic and irrigation present time as per project the total catchment area will be 27726 sq km. with gross storage capacity of 1095mcm. about 240mcm water will be utilized for drinking purposes and about 425mcm (Tantative) for irrigation use.

Presently the production of pulses and oilseeds has diminished leading to the changed living condition and other socio economic conditions. For the estimation of these temporal change in the Tonk district this study has been undertaken.

In the present paper an attempt has been made of study the spatio temporal analysis of agricultural land use in the Tonk district for centuries the people of semi arid ecosystem have been depended on rain to carry out their agricultural practices. Even those years of deficient rains were frequent they still somehow managed to cope with it as their agricultural practices and lifestyles were adopted with these conditions. But population explosion in the 20th century led to decrease the size of land holding.

Study Area

Tonk District is located in North, Eastern part of the state between 75° 07' 00" to 76° 19' 00" East longitude and is covered 25° 41' 00" to 26° 34' 00" North Latitude and is covered in the survey of India degree sheets 45N, 45-0, 54B and 54C. The total geographical area of the District is 7194 sq. kms. The district Tonk is situated on national highway

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no. 12 at the distance 100 Km from jaipur. It is bounded on the North by jaipur district; in the East by swai Madhopur district and in the west by the Ajmer district in the south Bhilwara district. The District comprises of 7 sub division, Tonk, Niwai, Deoli, Uniara, Malpura, Todaraysingh and Piplu. it has at tehsil viz. Tonk, Niwai, Deoli, Uniara, Malpura, Todaraysingh, Piplu, and Duni There are six panchayat samities viz. Tonk, Niwai, Deoli, Uniara, Malpura and Todaraysingh. Total Number of villages in the district 1214 (2011 census). Rural and urban population of the district is 1103653 and 717723 respectively total population of 1421326 census 2011 areas is decennial growth of population in the district is 17.3% since 2001 or 24.27% since 1991.

Rainfall and Climate

The climate of the area is semiarid type. The normal annual rainfall (1901 - 70) of the district is 598 mm whereas the average mean annual rainfall (1979 - 2008) is 622mm as per 2016-17 normal annual rainfall 559mm. Whereas the average mean annual rainfall (2016-17) is 754mm. It is evident that rainfall in the district has significantly increased in the recent past. The coefficient of variation of average annual rainfall of the district is 25.4%. Total annual potential evapotranspiration computed by penman's method is

1725.0mm. The potential evapotranspiration is highest (255.0 mm) in the month of may and lowest (68.0 mm) in the month of December.

Methodology

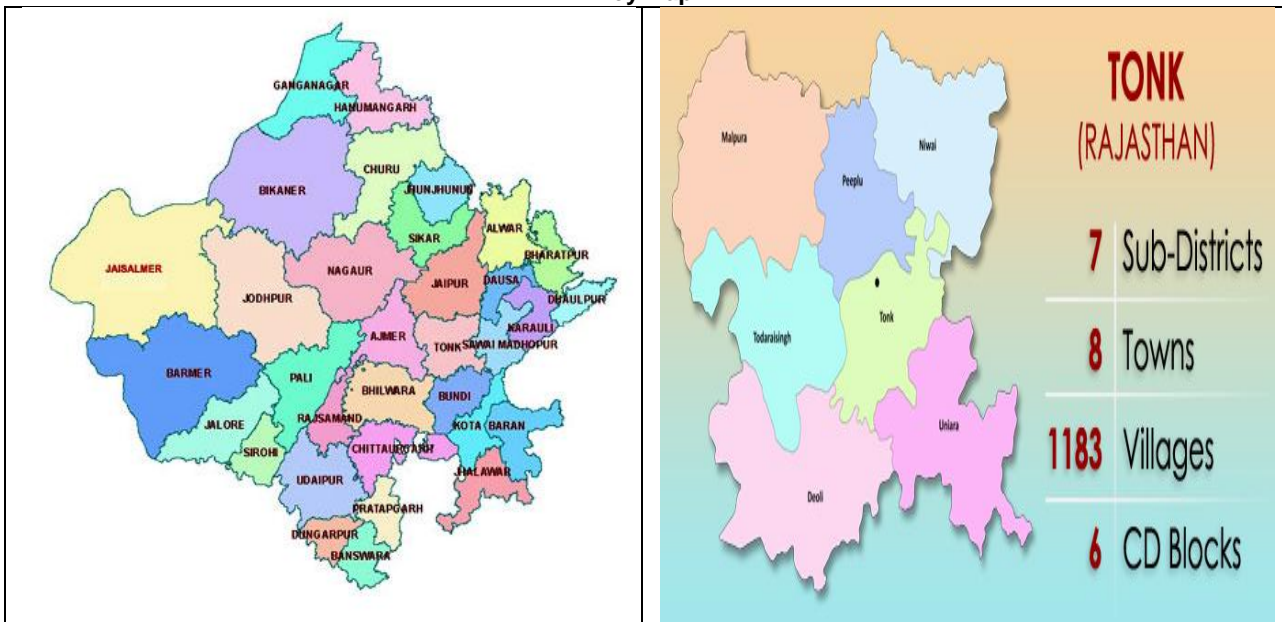
The data for the present analysis have been obtained from the secondary source like census of Rajasthan. Directorate of economics and statics Jaipur, socio-economic abstract Tonk District Govt. of Rajasthan. District land record department the study is primarily based on land use spreading over all eight tehsil to analysis the land use pattern of production area at Tonk district this study paper compare data of four and five years from 2011-12 to 2015-16. Compare from data production area as Tehsil viz. The data have been analyzed and inferred.

Objectives of the Study

The objectives of the research paper are as follow:

1. To study the magnitude and extent of change taking place in the agricultural land use and cropping pattern.
2. To study the relationship between the types of crops grown and the resulting economic conditions.
3. To suggest the land use planning and rational cropping pattern for safety and conservation.

Key Map



Temporal Analysis of Agriculture Land Use

The economy of the Tonk District is agro-based and the majority of the working population derives its livelihood from agriculture. Tonk district forms the shape of like kite or rhombus with its eastern and western sides binding somewhat inward and the south eastern portion protruding between Sawai Madhopur and Bundi Districts the district is flat at general elevation of about 214.32 meters above sea level with rocky but scrubby hills. The soils are fertile but somewhat sandy and the subsoil water is united. The distinguishing feature of Tonk district is the Aravali system, which starts from Bhilwara district and running along the boundries of Bhilwara and

Bundi districts enters Tonk district in the south near Rajkot and continues in the north eastern direction until it leaves the district near Banetha. A second chain lies in tehsil Todarasingh between the head quarter of the tehsil Rajmahal where the Banas River flows through this hill. Another important hill is near Malpura and a small hillock near the border of tehsil Sarwar of district Ajmer.

The rivers and streams of this district belong to the Banas system, which is more or less nonperennial during monsoon and for a few months thereafter new streams appear and retain water in hollows at some places. Though is not of much use direct irrigation but helps irrigation by raising the sub

soil water level of wells. Banas River enters Tonk district at Nagdia in Deoli Tehsil and from this place it takes a serpentine course, dividing the district in roughly two third to its West and North and one third to its east and south. Its total length is 400 Km. It is fordable during the rains becomes a swift and angry torrent Nagdia, Bislpur, Rajmahal, Deopura, Mahendwas and Shopuri are an important village on the bank this river Manshi the principal tributary of Banas travels along the border of Jaipur and Tonk district between the Tehsil of Malpura and Phagi until it turns south to join the Banas at Gahlod village. The sohadra is another important river as it feeds the Tordi Sager small dem. it join Mashi near village Galod, other small river are khari, Dain, Bandi and Galwa which join Banas and Mashi river at negdia, Bislpur, respectively. Bislpur Dam is a gravity dam on the Banas River near Deoli in Tonk District. The dam was completed in 1999 for the purpose of irrigation and water supply. it also supply drinking water to the Ajmer, Beawar, Kishangad, Jaipur and Tonk districts. The water storage capacity this dam is 315.50 meter. This dam provide irrigation facilities to Deoli, Tonk, Todaraysingh and Uniara Tehsil. Land resources play a strategic role in determination of man's economic, social and cultural progress (Ali,A.2002) According to odum, E.P.(1971) Land-use is every body business and the application of ecological principles of land use planning is undoubtedly, the most important application of enviremental science". M shukla, 2011 has written in his book about a watershed scale using soil hydrology models and addressed the

consequences of the land use and management changes on agriculture.

In order to study the changes in agricultural land use pattern in the Tonk district land data for year 2011-12 to 2015-16 has been compare (Table-I). and 2013-14 are given (Table-II). Areas under non-agriculture use, net sown areas, other uncultivated land excluding fallow land and forest, areas sown more than once all showed increasing trend. Some categories showed decreasing trend in area coverage. Barren and uncultivated land and culturable waste recorded more than 5% , decrease the net area sown in the Tonk district has grown at the expense of net sown area and forest land. This trend is expected as there is a growing demand for land to raise crops to cater to the needs of increasing population.

The agriculture land use pattern of Tonk district has also witnessed a change in it's land use pattern. The total geographical are of Tonk district is 7.18 Lac hectares. but for land utilization purpose the are is reported to be 1.71 lacs hectares in 2014-15 as per land record papers. Tonk district occupies 20th position among the existing 33 district of the state. So far its area is concerned net area shown is 483996 hectares.

Land Use Pattern in the Tonk District

According to village papers the total area of Tonk district comes to 7.17 lac hectares of which the net area sown was 67.41% during 2016-17 the area are sown more than was 12.56% the land use classification is given in the following table.

Land is pattern of Tonk district

Table No. 1.1

S.No.	Total Geographical Area	2011-12	2012-13	2013-14	2014-15	2015-16
1.	Forest	3.78	3.77	3.79	3.83	3.77
2.	Land not available for cultivation	10.68	10.75	10.62	11.03	10.89
3.	Other uncultivated land excluding fallow land	10.68	11.83	11.80	11.61	11.85
4.	Fallow land	6.90	7.75	7.08	7.17	10.52
5.	Net sown area	66.81	65.8	66.71	66.36	62.98
6.	Total cultivated land area	96.36	88.78	92.20	86.93	80.35
7.	Area sown more than once	29.48	23.00	38.21	20.57	17.38

Source land record Tonk district

X = Percentage show net sown area, @ % of total geographical area.

The agriculture land use pattern of the Tonk district has also witnessed a change in its land use pattern. It accounts for about 29.48 % of cultivable area in total area. At year 2011-12 the area under net sown area was 66.81 %, In year 2015-16 area sown more than once land 17.38%. Comparatively area sown more than once land are decrease as 2011-12

to 2015-16. As per above table area under forest was no change and other uncultivated land excluding fallow land are increace because irrigated area are decrease respectively cause. A major change was witnessed in the land use pattern of the district in 2013-14. The area under uncultivated land and fallow land are increase respectively.

Land Use Pattern of Tonk District

Table No. 1.2

S.No	Classification land use	2012-13	2013-14	2014-15
1.	Forest	27063	27189	27464
2.	Land put to non agriculture use Barren and uncultivated land	77203	76343	79183
3.	Cultivated able waste land	55685	50714	51432
4.	Fallow land	41345	40809	40763
5.	Net area sown	472304	478962	476480
6.	Total Geographical area in hectare	717958	717958	717958
7.	Area sown more than once	165132	183042	147614
8.	Other land	44358	43941	42636

Source: Socio Economic abstract Tonk district Govt. of Rajasthan.

As per above table no. 1:2 The forest land are increase since 2012-13 Area of forest was 27063 hectares in years 2012-13 to 27464 hectares in year 2014-15 and net sown have increased to 472304 hectares to 476480 hectares. In this district lack of irrigation facility indicated that percentage of other

uncultivated land is very high lack of soil moisture do not allow farmers to grow crops. more than once. its efficient management is prime and basic need of the present day for sustenance of agricultures in this semi arid region.

Table No. 1:3
Tehsil Wise Temporal Analysis of Agriculture Land Use In Tonk District (2013-14)

S. No	Tehsil	Total Geog. Area In Hect.	%	Forest	%	Uncultivated Land Total	Avalble For Agric.	Cultivated Land				Total
								Canals	Punds	Tube well	Others	
1.	Deoli	65295	9.09	5048	18.57	21647	6004	5069	1445	47	19676	26237
2.	Malpura	148388	20.66	1636	6.04	24638	12244	7137	450	0	22191	29778
3.	Newai	103049	14.35	3260	11.99	20625	10947	413	0	0	34881	35294
4.	Pipplu	68216	9.50	747	2.74	10474	3792	5372	162	0	30524	36058
5.	Tonk	78321	10.90	1648	6.06	14648	3524	25595	0	201	27862	53658
6.	Todaraysin gh	98543	13.72	3360	12.36	20582	6403	13972	327	04	30368	44671
7.	Uniara	98606	13.13	7567	27.85	17269	4371	26036	771	19531	22638	68976
8.	Dooni	57540	8.01	3923	14.43	14458	4382	7788	608	228	19482	28106
Total		717958		27169		144941	51667	91382	3763	20011	207622	322778
Last Years		717958		27063		145611	55638	94238	4251	16088	195880	310477
Pluse or Minus		0		126		-1270	-3971	-2876	-488	3923	11742	12331

Source: Socio-economic abstract Tonk district. Govt. of Rajasthan.

According above table are represent land use Tehsil wise analysis in year 2013-14 Malpura tehsil haves highest geographical area 20.66 percent. Uniara tehsil has geographical area is 13.13 but forest land have highest 27.85 percent. Uniara tehsil have agriculture land more than other tehsil. As 2013-14 68976 hectare. The secondary data of the land use pattern show that the pipplu, Malpura, Tonk, tehsil of the district have negligible area under forest as per above table are 2.74, 6.04 and 6.06 percent only. The maximum area of 27.85 percent under forest was in Uniara tehsil in 2013-14.

Change in Cropping Pattern

Cropping pattern is defined as the spatio-temporal sequence of crops. Basically it means the proportion of area under various crops at a point of time (Hussain, M.1979). George, A.(2011) defined

agriculture geography as the study of spatial variations in agriculture activity land use cropping pattern and attempts to explain then. The cropping pattern is in fact a reflection of the inter Play of the complex physical and creatural factor in a region. These factors include topography, soil and climate conditions, input-output prices agricultural infrastructure and technology form location. from size economical social and political situations. Irrigation is a basic input and an important factore in dry didactic regions and it influences' the cropping pattern of a district. Water being a life giving agent to the plants and therefore assured water supply is must. The availability of water through irrigation in the semi - arid ecosystem of this plateau caused the change in the land use and cropping pattern of this district.

Table 1:4
Area Covered Under Different Crops In Tonk District Year 2013-14

S.No.	Tehsil Name	Kharif		Rabi		Summer		Grand Total		Total
		Irrigate	Unirrigate	Irrigate	Unirrigate	Irrigate	Unirrigate	Irrigate	Unirrigate	
1.	Deoli	630	13590	25451	1526	148	0	26237	1546	41353
2.	Malpura	352	77599	29402	57136	24	0	29778	134735	164513
3.	Newai	116	34430	35131	13215	47	0	35294	47645	82939
4.	Piplu	216	24090	35819	7310	23	0	36058	31400	67458
5.	Tonk	610	18594	52915	895	133	37	53658	19526	73184
6.	Todaraysin gh	295	36559	44097	12545	279	0	44671	49104	93775
7.	Uniara	190	26500	68638	756	148	0	68976	27256	96232
8.	Duni	365	11537	27677	2905	64	2	28106	14444	42550
Total		2774	242899	319138	96288	866	39	322778	339226	662004

Sources: District Land Record, Tonk

Semi arid eastern plain zone III a of Rajasthan have alluvial as well as black soil in district inculding Tonk only 28% area is irrigated and Bajra, Jwar, Moong, Urd, Sesame, Mustered, Wheat, Gram are the main crops of kharif and rabi in this region.

Table 1:5
Area under Principal Crops as on 2004-05 And
2016-17 Tonk District.

S.No.	Crop Kharif	Area (H)	
		2004-2005	2016-2017
1	Jowar	69879	51700
2	Bajra	39817	41900
3	Pulses	71237	64200
4	Groundnut	22337	8800
Rabi			
1	Mustard	95535	299000
2	Wheat	60297	66000
3	Barley	5752	5200
4	Gram	25184	49800

Sources: Revanue Department Tonk.

For assessment of the cropping pattern of the study area. the data from the year 2004-2005 to 2016-2017 were collected and analyzed, Table 1:5 shows the area in hectare various crops kharif and Rabi in the district tonk. District indicated that in year 2004-2005 Jowar production area was 69879 hect. and show year 2016-17 is 51700 hectare. So reduced area in production of Jowar there on Bajara in 2004-2005 year production area was 39817 hect. and show at year 2016-17 is 41900 hect. So that production area is increase equally distressing is the fact that area under pulses has decreased. This show the area under pulses crops has reduced, this can be the result of low rainfall which has depleted the under ground water level. The poor irrigation facilities in this area can also be considered to be significant factor. But equally distressing is the fact that area under mustard to be increased this show the area under commercial crops has increased. This can be result of slow rainfall and limited water supply for irrigation. mustard can be produced only one or two times irrigation and slow rainfall. The framer can be normal labor and mainly due to the higher price of cash crops and dependence on rainfall.

In 2016-17 areas under food grains pulses and oil seeds have increased which showed the increasing performance of farmers for crops other than food crops. The area under mustard crops have increased in other words. The traditional classification between food grains and commercial crops is losing its significance.

Conclusion

This study has brought out that agriculture land-use and cropping pattern in the district have changed significantly. These changes have been affected by climatic conditions physical features and rainfall. Two-third area of the district is non-irrigated and completely dependent on rainfall. Further the physical conditions are not favorable for agriculture. The population pressure is the driving force in determining crop intensity. Net sown areas have increased in the district during the last five years. The growth in area under oil seeds is note worthy as it helps to generate income and contribute to the increased buying capacity of the people. The most importance factor affecting cropping pattern is economic consideration. The study indicates that there is an urgent need to apply the ecological principals for land use planning and rational crop selection strategy for sustainable development of agriculture.

The study demands emphasis on an integrated approach to cropping pattern and agricultural land use management district so agricultural land use management district so that the problems of environmental degradation can be effectively prevented and controlled for protection, conservation and sustainable development.

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