



A Study of Irrigation, Cropping Pattern and Ground Water Scenario in Viratnagar Tehsil (Rajasthan, India)

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ABSTRACT

A change in the agriculture land use implies a change in the proportion of area under different crops. The intensity of land utilization is reflected in number of crops raised during the year. Among the various determinants of agriculture, it is assumed that irrigation positively affects the intensity of cropping. The study area has recorded significant increase in residential and agricultural area due to which gained more land from water bodies, barren and vacant lands. It is observed from the study area, there is a greater variation in the cropping pattern. Farmers have adopted modern technologies i.e. fruits and vegetables, drip irrigation facility, variety seed, improving planting technology and micro irrigation, good network of transports and markets, agricultural advisory centers. Therefore, recently cropping pattern is positively increased. Management practices have a major impact on natural resources including water, soil, nutrients, plants and animal.

KEYWORDS : Land use, cropping pattern, crops season, irrigation facilities, ground water.

Introduction:

Agriculture still forms the backbone of Indian economy. Agriculture contributes a high share of net domestic product by sectors in India. Farmers are growing numerous of crops in the field rather than single crop. The distribution pattern of crops in any region is an outcome of predominance of certain crops. Cropping pattern in study has undergone an evolutionary process. The soil and environmental factors, along with the socio-economic factors, affects the cropping pattern in study region.

Cropping pattern is a dynamic concept as it changes over space and time. Cropping 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. The cropping pattern of a region is closely influence by the geo-climate and socio-cultural factors. The agriculture land use is the result of the direct application of efforts related to decisions made by farmers regarding the actual use of land.

There is a vital impact of cultural factors on the development of human. The difference in cultural development is occur due to geographical factors. It finds less development at the origin of the river and much more development at the end of the basin (Das M.M.-1990). Reducing instability in agricultural production has been a major policy concern over the years since the stability and growth in agricultural are vital for providing food and nutrition security to burgeoning population.

The agricultural land in viratnagar Tehsil is 69 percent of the total geographical area which include 39 percent area of the net sown area and 30 percent area, is sown more than once. The food crops cover most of the cultivated area.

The major crops cultivated in kharif season (July to October-November) cereals-bajra, maize; pulses-mug, moth, gram ;oil-seed-groundnut, guar; vegetables- chili, cauliflower etc; rabbi season (October to march) cereals- wheat, barley; oilseeds-mustard, rapeseed; vegetables- onion, methi, carrot; and fodder crops-rajaka, kasani etc grown in the study area. Thus various crops are taken in viratnagar tehsil and its distribution changes because of relief, climate, soil and irrigation.

Main objectives of the study:

1. To find out general land use environment of viratnagar.
2. To search agriculture cropping pattern in the study area.
3. To examine the interrelation between irrigation and cropping pattern.
4. To study the groundwater scenario in the region.

In this context, this study evaluates the performance of agriculture in the viratnagar Tehsil and presents what could be the future options, given our objectives of accelerated growth, inclusiveness and reduction of poverty.

Study Area:

The study area viratnagar is a Tehsil place in Jaipur district, state of Rajasthan in India. Viratnagar with a total geographical area of 482.3 sq km, is located 82 km towards north from district headquarter. Viratnagar Tehsil is bounded by Thanagazi Tehsil towards east, shahpura Tehsil towards west, Kotputli & Bansur Tehsil towards north. It is in the 264 m elevation.



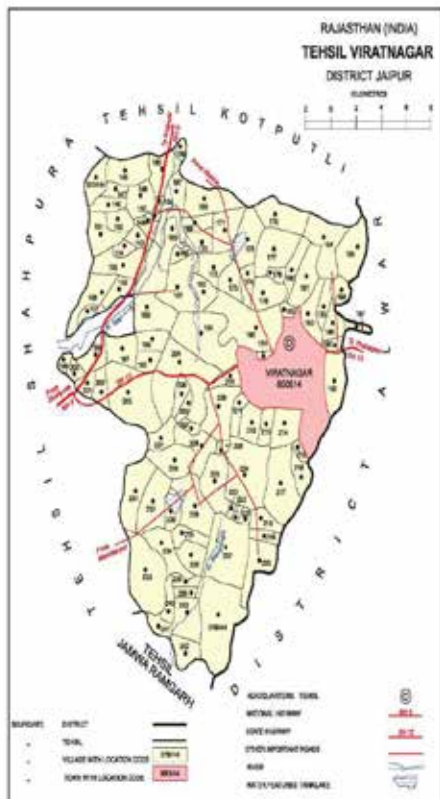
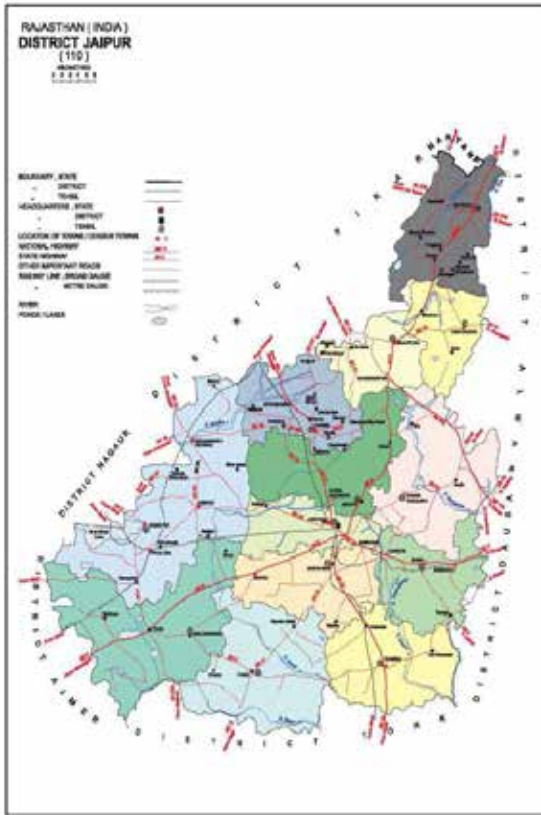


Figure1: Map of study area

As per census 2011, the population of viratnagar Tehsil was 1, 66,087 ,out of which 87.61 percent was rural population. The population density in the region is 344 person/ km sq. and decadal growth is 22.40%.

The overall sex ratio of the population of region (number of females per thousands males) was lower (907.5) than Rajasthan (926) in 2011. The literacy rate of the region was very low 53.72%, of which the male and female literacy rates were 66.53% and 39.61% respectively.

Viratnagar Tehsil is drained by ephemeral rivers banganga, bandi and their tributaries. Sabi River in the northern part of Tehsil flow north-easterly while southwesterly flowing Banganga River passes through shahpura, jamwa ramgarh and contributes water to famous ramgarh lake.

The climate of the Tehsil is semi-arid (steppe). The mean maximum and minimum temperature are 45 c and 23 c respectively. The mean annual rainfall is 640mm.The numbers of rainy days are 36. The co-efficient of variability of annual rainfall is 38%. The natural vegetation of this region is mixed xeromorphic thorn, forest and woodland. Common among species are babul, acacia, Senegal, prosopis spiagera etc. Thus xerophytic plants combat drought with certain devices of water preservation like partial or complete replacement of leaves by waxy leaves, water storing cells, hair on the stalk etc. Soil are light brown and well drained. Some areas is under alluvial soils that are formed through the process of deposition of sand, silt, clay etc. These are found along with courses and in low laying tracts. Due to diversity of parent rock material, variation in climatic condition and soil forming process, soil character varies from region to region.

Methods and tools:

For this study the secondary data of land use and cropping pattern is collected from the statistical review of the district census, crop Khasara register of Tehsil, agriculture, irrigation and forest offices for the year 2012-13. All statistical data is taken from the above information and with the help of tables, maps graphs are use for the analysis of land use environment of the study area.

Result and discussion:

Land use pattern:

The variation in the topographical features in combination with the human and technological inputs have been responsible for a variety of uses of land. Viratnagar Tehsil is the predominantly of agriculture region. The total geographical area is 48,236 Hac. The land uses are different categories- cultivated land, forest cover; pastures and grazing land, barren, fallow land etc.

Table 1: Region wise proportion of area under land use (in %)

S.No.-	Classification of reporting area	Total area (in Hac.)	% of Total
1	Forest cover	19,080	39.55
2	Pasture and grazing land	2112	4.37
3	Agriculture uses	18,760	38.89
4	Barren land	2714	5.62
5	Cultivable waste land	1318	2.80
6	Fallow land	4152	8.60
	Total	48,236	100

Source: Crop Khasara register, Viratnagar Tehsil

The high density of cultivated land in some villages is mostly due to deep alluvial soil, moderated rainfall by hills and good irrigation potentialities. Scrub and grassland is found in small patches in the interiors of the Tehsil with scanty rainfall and thin soil cover. Hill slopes with thin soil cover is the main areas under forest cover.

Irrigation: Irrigation is vital for realizing full potential of agriculture sector and efficient utilization of our water resources, therefore assumed great significance. The distribution of rainfall is not only seasonal but also unequal. Partial failure or delayed arrival of the monsoon may cause extensive damage of crops. Besides, as the winter months are mostly dry, the cultivation of rabbi crops depends largely on irrigation so irrigation is needed.

In viratnagar Tehsil, 14801 Hac. Area is sown more than once. The irrigated area is as under follow-Table 2: irrigation in viratnagar Tehsil 2012-13

	Irrigate(in ha)	Non irrigated(in ha)	Total
Cultivated (Gross sown area)	15351	18201	33552
Sown more than once	2575	12226	14801
Net sown area	12776	5975	18751

Mostly land is irrigated by wells in viratnagar Tehsil.

Cropping Pattern:

Keeping with diverse agro-climate conditions, a variety of crops are raised. The cereal basket of the country is enriched with rice, wheat, barley, oat, maize, jawar, bajra, rye and ragi. About 75 percent of total cultivated land the century are under food crops, of which rice and wheat are the principal crops.

Crop Season's:

Two crop seasons Monsoon season (Kharip crop) and winter Season (rabbi crops) are recognized in viratnagar Tehsil. The extend of rabbi crop is indicative of availability of soil moisture after harvest of Kharip or as in most parts of this region, the available irrigation resources, as many of these are grown under irrigation such as-wheat, barley etc. Wheat to some extent is grown as unirrigated crop, but its major area is irrigated. Kharip in the main crop season where soils are texturally light and utilize rainwater effectively such as- bajra, maize, ground-nut, guar etc.

Cropping Systems:

The farmers decision on choice of crops and cropping systems is governed by several interrelated factors i.e. soil and climate, needs of households, socio economic issues, market infrastructure, post harvest storage, availability of Labour, technological developments etc. There are two distinct seasons. Firstly, Rainy (Kharip) season, period July to October and secondly, winter (Rabbi) season, period October to March. March to June zaid crops growing some area. In the study area, cropping system is mostly double cropping, multiple cropping etc.

Sowing Period:

These are bajra, ground nut, maize, guar which are Kharip crops and wheat, barley, mustard, vegetables which are rabbi crop. The conditions for sowing are not reached uniformly at the same time everywhere and the period extends for nearly a month and more for each crop. Sowing generally begins in the last week of the June and is more or less completed by the last week of July for the crops of guar, ground nut and bajra. Smaller proportions of fields are shown there-after sowing of maize crop, which is concentrated only in kuhada vilage panchayat.

The sowing of wheat is concentrated in the first week of November, with a peak in mid November, which is the recommended sowing time for irrigated wheat. The sowing of barley and mustard are completed little later than wheat.

Harvesting Period:

The harvesting period of maize begins usually in the first week of month August and most of it is completed by the second week of September. The bajra crop is harvested about the same time as maize crop. The peak of harvesting of groundnut and guar are somewhat later than that of bajra and most of it is concentrated between the second weeks of November to the second week of month December. The harvest period of wheat, like it's sowing time is in the month of March and little of the harvest in April and May. Barley is harvested little later than wheat. Rapeseed, mustard and pulses are harvested between February and april.

Table3: Principal cereals in Kharip (rainy/unhalu season) crops

S.No	Cereals	Cultivated area (In Hac.)		
		Irrigated	Non-irrigated	Total
1	Bajra	101	14495	14596
2	Guar	0	940	940
3	Groundnut	726	0	726

4	Maize	445	0	445
5	Vegetable & others	222	1557	1779
	Total	1494	16992	18486

Source: Dept. of Agriculture, Viratnagar Tehsil

Table4: Principal cereals in rabbi (Winter/sialu season) crops

S.No	Cereals	Cultivated area (In Hac.)		
		Irrigated	Non-irrigated	Total
1	Wheat	6671	0	6671
2	Barley	1955	0	1955
3	Mustard Seed	2318	778	3096
4	Rapeseed	26	307	334
5	Pulses	1801	109	1910
6	Vegetable	545	0	545
7	Fodder & other	541	15	555
	Total	13,857	1,209	15,066

Source: Dept. of agriculture, Viratnagar Tehsil

The significant increase of the cultivated area is available irrigation, demands of markets and modern techniques adopt of the Study area.

Major challenges for agriculture sector in the region are: (i) frequent droughts leading to decline in productivity and reduced performance and even death of animals; (ii) climate change and global warming; (iii) strengthening of comprehensive technology based developmental approach to promote dry land/ arid agriculture; (iv) deteriorating soil health including imbalanced use of fertilizers, micronutrient deficiency, lack of organic matter content, inadequate soil microbial flora and fauna etc.; (v) low productivity, unfavorable prices and practically very little value addition, distress sales, rising cost of cultivation; (vi) lack of efforts for stabilization of sand dunes and for greening the desert through agro-forestry programmers; (vii) missing mechanisms of export promotion, adherence to sanitation and photo-sanitation (SPS) standards and measures for minimizing the export rejections; (viii) lack of integrated farming approach; (ix) lack of up-scaling of farm-validated modern technologies and agricultural Innovations; (x) gender mainstreaming in agriculture; and (xi) proper institutional mechanisms and organizational and management (O&M) reforms for overcoming the felt constraints coming in way of the farm prosperity in the state.

Ground water Scenario:

Groundwater resources being dynamic in nature, the depth to water level keep on changing seasonally, annually and on long term basis depending on recharge –discharge balance. Depth to water level in the district during pre-monsoon 2006 ranges from 15.85 to 31.50m. Over-exploitation of groundwater resources have set declining trend in water levels. Even average Premonsoon-Postmonsoon water levels show decline in most of the region indicating significant withdrawal as compared to natural recharge to groundwater.

Table5: Seasonal water level fluctuation-per-post monsoon ,2006

Tehsil	Water level pre monsoon-2006(m)		Water level post monsoon 2006(m)	
	Min	Max	Min	Max
Viratnagar	15.85	31.50	15.80	31.70

Source: central ground water bond, GOI 2007

MAJOR GROUNDWATER PROBLEMS /ISSUES :

- Depleting groundwater resources
- Declining water levels
- Urbanization
- Incidence of droughts
- High salinity in groundwater
- High fluoride content in groundwater
- High nitrate concentration in groundwater
- Industrial pollution

Conclusion and recommendation:

Reducing instability in agricultural production has been a major policy concern over the years. The growth with inclusiveness can be achieved only when agriculture growth accelerates and is also widely shared amongst people and regions of the country. All these factors point to just one thing that agriculture has to be kept at the centre of any reform agenda or Planning process.

There is diversity in land use pattern. Agriculture is main occupation of this region. Crops like food grains and cereals are taken everywhere. Due to road network, fruits and vegetable are also taken largely.

For sustainability and inclusive growth in agriculture, there are the follow suggestions-

- Forest cover and forest density should be increased in the forest land area in plateau and plain region.
- Storage house facility should be available in every village so that farmers can sell their agriculture products according to market rates.
- To increase irrigation facilities is essential.
- Modern cropping pattern and technology should be used.
- As far as possible with mixed farming involving crops, trees and animal.
- Harvesting of rain water to improve the availability to water.

For management of major ground water issues, there are the following recommendation-

- Intensive awareness for water conservation, de-fluoridation etc.
- Promoting techniques of reuse of domestic waste water.
- Scientific studies for formulation of artificial recharge projects on large scale with Public-Private-Community partnership.
- Pollution control measures from industries, urban nasal etc.
- Domestic & community de-fluoridation measures
- Steps for minimizing nitrate pollution in Jaipur Urban area. Integrated Water Resource Management approach involving all the concern Government & Non-Government Organizations, Research Institutes, Industries, Community/WUA.
- Regulatory measures with efficient enforcement of management strategies.

In sort, a small farm management to improve productivity, profitability and sustainability of the farming system will go a long way to ensure the all round sustainability.

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