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Agricultural Development and Its Impact on Environmental Scenario: A Scientific Analysis of Tonk District (Rajasthan)

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Abstract

Agriculture, No Doubt, is the foundation of Rajasthan's Economic edifice. The sector accounted for 27.20 percent of the state's NSDP in 2013-14 (By Industrial original current prices). It provides employment and livelihood to 75 percent of the working population. With the demand for more and more food increasing to satisfy hunger for surging human population, agriculture is becoming more intensive, extensive and commercial input oriented. This has encouraged excessive mining of natural resources like plant nutrients and water and has impoverrished one of the most precious natures gift on this planet. i.e., soil on one hand, and one the other has tempted lot of farmers to dump the chemical input indiscriminately in the form of chemical fertilizers and poisonous pesticides in pursuit of getting more and more from soil and in process polluting and degrading it and making the water unworthy for human and animal consumption. This has also affected adversely the aqua life and disturbed the ecological balance and harmony.

The prevalent emphasis on purely materialistic and short-term development is imbalancing its fragile environmental cycle and eco-systems, making human life still more difficult. For instance, large sums of money as loans and grant to Farmers for well and tubewell irrigation in the research area resulted in sinking of a large number of well during the Past two decades. Consequently, tube wells on every hecter of land exploited the ground water excessively and indiscriminate so much so that today the agricultural development and changing land use system of the entire study area is caught in the grip of a water crisis and environmental degradation and has posed a serious problem before the state government. Therefor there has to be elaborate scientific and technical input in tacking these problems. The present study, an attempt has been made to carry out the implications of new agrarian, technological and chemical inputs on environmental resources in the research area. Details of the study are presented in the paper.

Keywords: NSDP, Eco-System, Environmental Degradation, Indiscriminate, Materialistic.

Introduction

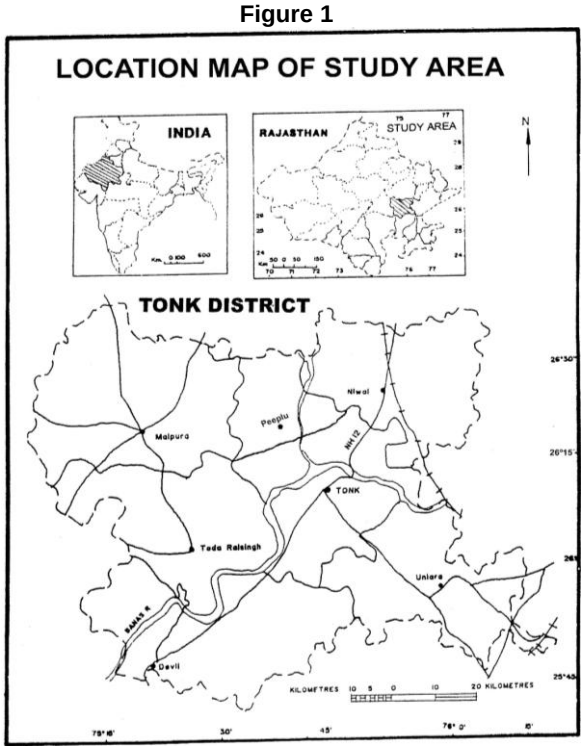
During the last four decades, the output of agriculture and its allied enterprises has grown but only marginally above population growth, even this growth has been at considerable cost to the natural resources stock. Major credit for agriculture development goes to "Green Revolution", which led to a sudden jump in the yield per hectare by adopting high yielding variety of seeds, chemical fertilizers, improved agricultural techniques and practices and use of pesticides. The policies of the govt. (Subsidies on imputs and minimum support price for output), improved marketing network, rural connectivity and development of infrastructure played a significant role in increasing the productivity but simultaneously caused land degradation, salinity, alkalinity, depletion of underground water-table, leading to degradation of ecosystem and there by disturbing ecosystem harmony. The extent and intensity of soil salinity is related with canal irrigation (Aggrawal and Gupta, 1966) and 'Saline soil' refers to a soil that contains sufficient salt to impair its productivity (Dhawan, 1964). Although, agriculture as well as dairy are the major source For economy of the research area even it is not performing as much as should be in other irrigated areas e.g. Shriganganagar District and so on so economic return comparatively is less in this area in comparison to other areas.

The author in this paper has close look on the various aspects of the prevailing systems of cultivation, Agriculture production and productivity, irrigation facilities and cropping pattern, as well as other relative environmental issues, in all the six panchayat samities (Seven Tehsil, 2017) of this research area. We also comes out with important policy issues.

Study Area

Tonk district is located in north-eastern Part of Rajasthan between 24º41' and 26º34' North latitude and 75º07' and 76º19' East longitude.It has a geographical area of about 7194 Sq. km. It is bounded on the north by Jaipur district, South by Bhilwara and Bundi district, West by Ajmer district and east by Sawai Madhopur District (Figure-1). Population of the area was 1421326 (census 2011) in which literate was 61.58% and population density was 198 per sq. km.

Figure 1



The district is flat and having a shape of a Kite, Generally, it has an elevation of about 264.32 metre above mean sea level.The only important river of the district is Banas, which divides into two halves. The soil is some what sandy but Fertile, some offshoots of Aravalli hills are also found scattered here and there. The soils of this study area are greyish brown to brown and yellowish brown with wide variation in texture from sandy loam to loam. Some block like Malpura, Tonk, Niwai have salinity and alkanity problem. Soils of Todaraisingh and Deoli panchayat samities are good for agriculture but the major problem is of these areas Poor availability of irrigation water. The climate of the district is dry and healthy. Monsoon seasonsally starts from the third week of June and lasts upto mid September. Average rainfall of the research area is about 66.83 cm. and actual rainfall was 43.06 cm, (2013) and 46.10 cm, (2016). The research area fall in III-A Agro-climatic region of Rajasthan and groundwater in the area generally occurs under Semi-confined to confined conditions.The area generally fall under overexploited (dark zone) and critical zones. Jowar, Wheat, Bajra, Groundnut and Mustard are predominant crops of the area. The productivity of different crops in area is less than the state average.

The present study was taken up with following stipulated objectives.

Objectives of the Study

The specific objectives of the study included,

1. To identify land use pattern, crop inventory, crop acreage and present agricultural practices of the research area.
2. To identify and suggest measures to increase productivity of land and recommending optimal land use.
3. To highlight the quality of soil and water in different areas of the district.
4. To assess the impact of agricultural development on the environmental scenario.
5. To generate and develop and integrated management strategy for upgradation of soil fertility & ecological balance, maintenance of water level. Soil moisture regime and keeping the insectpests. Plant disease and weed menace below the economic threshold level with a view to reduce the dose of chemical fertilizers, water & pesticides and thus to reduce the cost of production to minimize pollution and health hazards and prepare sustainable action oriented and problem specific plan at micro level for the research area.

Review of Literature

A comprehensive review of literature is an essential part of any scientific investigation. A very limited number of studies have been attempted by the scientists & geographers to study the Agricultural Development and Its Impact on Environmental Scenario.

Bhattacharya (2004) mad a comprehensive study of size, growth and spatial distribution of population and its imprint on the environment.

Choudhary (2006) outlined the quality of soil and ground water in Faridabad. Based on the concentration of different parameters(i.e p pH, DO, BOD,COD, Alkality,Sodium,Potasium,Magnesium and Moisture) collected fromfive sampling stations, he concluded that the ground water of the city is highly polluted and unfit for drinking as the level of all the tested parameters in higher than the admissible limits.

Kalwar (1987) studied the Environmental pollution in Tonk district where disposal of garbage, night soil and poor infrastructural facilities led to the degradation of environment.

Pingali (2014) provide helpful reviews of recent work on the green revolution and HYV crop introduction.

Richard (1954) studied about the diagnosis and improvement of saline-alkali soils.

Office of Environment Heritage (2015) mad a comprehensive study of soil degradation. Soil degradation is the decline in soil quality that can be a

result of many factors, especially from agriculture. Soil hold the majority of the world`s biodiversity and healthy soils are essential for food production and adequate water supply.

This district is subdivided into 6 Panchayat Samities namely: TodariSingh, Malpura, Malpura, Tonk, Deoli, Niwai and Uniara and it comprises 7 tehsils. (including newly formed tehsil peeplu). The study area has 449347 (62.59 percent) hactare Net area sown, of which 217378 hactare has net area irrigated (2013-14).

Data Base and Methodology

The study is based on primary as well as secondary data. Existing data and information were collected by visiting different govt., non govt., organization and other secondary sources. A survey was conducted to collect the soil samples and water samples from different irrigation sources, viz., operational wells, tube wells and hand pumps in which is representing different geomorphic units of the area. About 150 villages were selected on the basis of Random Sampling method. Field survey done during April-June 2016.

The analysis of the samples for various constituents was undertaken following the methods outlined by Richards(1954),Chaudhary (2006) and a pre-tested schedule was used to collect primary data for the important ecological aspects.

Discussion and Results

Land Utilisation

The vital feature of the Tonk district is its agriculture, which is the basic occupation of the majority of people. Comparative land use in the study area years 1982-83, 1986-87, 1990-91, 2010-11 and 2013-14 is given below in Table - 1.

There has been conspicuous increase in actually cultivated area over the years (in the years 1986-87 and 2013-14 it was reduced due to drought). Similarly double-cropped area and forest lands also showed increasing trend. Forestlands constitute about 3.83 percent of the geographical area in the study area (27532 Hectare against 717958 Hectare) 2013-14. The forest lands of the area is less than the state average (9 percent). A majority of the area's Forests are of dry deciduous type. The forest have for the most part been worked for extraction of Fire wood and other forest produce. As a result there are very few pristine or frontier forest in the study area.

Land not available for cultivation, extends over 75881 hectares or 10.57 percent. It includes land which cannot be brought under plough except at an exorbitant cost as well as the land covered by building, roads and railways, rivers and canals or otherwise appropriated for non-agricultural purposes. Besides this, the uncultivated land excludes the follow land. This category of land includes permanent pastures and other grazing lands under miscellaneous tree crops and groves and cultivable waste land not included in net sown area.

Table - 1
Land Utilization in Terms of Percentage

S. No.	Land Use	1982-83	1986-87	1990-91	2010-11	2013-14
1.	Geographical area (Village Record) in Hectare	718043 (100%)	717960 (100%)	717960 (100%)	717958 (100%)	717958 (100%)
2.	Forest	3.22	3.32	3.49	3.77	3.83 (27532 Hect.)
3.	Not Available For cultivation	9.93	9.77	9.47	10.74	10.57% (75881 Hect)
4.	Other uncultivated Land Excluding Follow Lands	17.22	16.09	15.36	12.07	11.95% (85909 Hect)
5.	Fallow Lands	6.66	9.33	6.94	8.50	11.06% (79389 Hect.)
6.	Net Area Sown	50.19	46.48	52.10	64.93	62.59% (449347 Hect)
7.	Area sown more than once	12.70	15.01	12.64	18.02	12.56% (90166 Hect)
8.	Total cropped Area	62.89	61.49	64.74	82.95	75.15 (539513 Hect)
9.	**Total**	**100**	**100**	**100**	**100**	**100**

Source: Rajasthan Agricultural Statistics At a Glance, 2015-16, Commissionrate of Agriculture, Jaipur, Rajasthan.

Major Crops and Cropping Pattern

A simple and convenient method (weaver's 1954) of finding out the 'combination of crops', having significant share in the total cropped area, has been used. According to the weaver's method. As Far as Kharif season is concerned, Kharif Pulses is the major crop is the study area followed by Jowar, Bajra, Maize and Groundnut, i.e., 10.97, 10.84, 9.29, 2.68 and 2.13 percent to the total net area sown during the year 2011-12. After three years of period there is a reduction in the maize and Kharif pulses crops i.e., -12.07 and -17.10 percent respectiely due to lack of irrigation water and erratic rainfall in this area as indicated in the Table - 2. Mustard has remained the main crop in terms of sown area in Rabi season followed by wheat, Gram, and Barley i.e., 51.14, 9.64, 2.43 and 0.81 respectively during the year 2011-12. After three years of period there is an increases in Barley and Gram cropped area. Where as in wheat, Rape & Mustarad, and maizes Linsed cropped area reduced during the year 2014-15 as shown in the Table-2. Highest increse has occured in Gram crop (68.75 percent) followed by Groundnut crop (30.65 percent) and Barley crop (16.57 percent) and Highest decrease (Reduction) has occured in linseed crop (-35.20%). Followed by wheat crop (-25.62%), Rape &

mustard crop (-17.02), Kharif Pulses crop (-17.10%) and Maize (-12.07 percent). Mustard is main Rabi crop which covers more than two fifth of the area whereas the wheat comes next higher rabi crop grown with 8.02 percent (2014-15) area to the total net sown area during Rabi season in 2014-15.

Production and Productivity

The study area as a whole exhibit increase in productivity level of Jowar, Maize, Barley, Wheat, Bajra, Pulses & gram crops etc. Table-3. There is a increasing trend of agricultural production & productivity which can be attributed to increasing area under irrigated Farming, increased use of manure and fertilizers, plant protection measures adopted and efforts made under agriculture extension and research. These beneficial effect of fertiliser and pesticides in increasing agricultural productivity and production are accompanied, unfortunately, be heavier loading of environment with urea, D.A.P., Super phosphate and other nutrients and pesticides residues. Thus, excessive use of some of the fertilisers and pesticides degrades the land, water and air etc.

Production & productivity are reduced in some crops is mainly due to degradation of the land, unavailability of irrigation facilities, land fragmentation in small & marginal land holding has further aggravated this problem, causing less input owing to less investment capacity of Farmers and erratic and ill distributed rainfall. This production and productivity is in the form of grain production and oil seeds. As Far as the trend of production and productivity is concerned it is giving down under the major crops such as wheat, Groundnut, Rape and Mustard crops as indicated in the Table - 3.

Table - 2
Cropped Area under Major Crops and Cropping Pattern

S. No.	Crops	Cropped Area (Hectare)		Increase/ Decrease	Cropping Pattern (%)	
		2011-12	2014-15	(%)	2011-12	2014-15
1.	Bajra	52691	53482	+1.50	9.29	10.55
2.	Jowar	61444	62498	+1.71	10.84	12.34
3.	Goundnut	12076	15778	+30.65	2.13	3.11
4.	Maize	15190	13356	-12.07	2.68	2.63
5.	Kharif Pulses	62211	51572	-17.10	10.97	10.18
1.	Wheat	54647	40643	-25.62	9.64	8.02
2.	Barley	4627	5394	+16.57	0.81	1.06
3.	Rape and Mustard	289770	240420	-17.02	51.14	47.47
4.	Linseed	125	81	-35.20	0.022	0.015
5.	Gram	13805	23296	+68.75	2.43	4.59
	Total	566586	506460	-10.61	100%	100%

Source: Above table compiled and based on the Agricultural Statistics of Rajasthan for the Period (2011-12 & 2014-15)

Table - 3
Production and Productivity of Major Crops

S. No.	Crops	Production (Tonnes)			Productivity (Kg / Hect.)		
		2005 - 06	2008 - 09	Increase/ Decrease (%)	2011-12	2014-15	Increase / Decrease (%)
1.	Jowa	23108	28348	22.67	376	454	20.74
2.	Bajra	31019	74511	140.21	589	1393	136.50
3.	Groundnut	13404	17456	30.22	1110	1106	- 00.36
4.	Maize	12060	14293	18.51	794	1070	34.76
5.	Kharif Pulses	13396	16886	26.05	219	327	49.31
6.	Wheat	138646	105913	-23.60	2537	2606	2.71
7.	Barley	10319	12222	18.44	2230	2266	1.61
8.	Rape & Mustard	295071	221329	- 24.99	1018	921	- 9.52
9.	Gram	7676	17729	130.96	556	761	36.87
	Total	**544699**	**508687**	- **6.61**	**9429**	**10904**	**15.64**

Source: Above table compiled and based on the vital Agricultural statistics of Raj. For the period 2011-12 and 2014-15.

Use of Agro-chemicals

Agro-chemicals, especially fertilisers and pesticides, have been acknowledged as a vital input to achieve higher agricultural productivity and production. The demand for increase in production has led to increased use of chemical fertilizers, pesticides, high yielding varieties and mechanizatioin of agriculture. Comparative consumption of fertilizers in the research area during years 2011-12 and 2012-13 is given below in Table - 4.

P: ISSN NO.: 2321-290X RNI : UPBIL/2013/55327 VOL-5* ISSUE-4* December- 2017
E: ISSN NO.: 2349-980X **Shrinkhla Ek Shodhparak Vaicharik Patrika**

Table - 4
Consumption of Fertilizers in Terms Of Nutrients

S. No.	Type	Consumption (In Tonnes)		Increase/Decrease (%)
		2011-12	2012-13	
1.	Nitrogenious (N)	19878	21256	6.93
2.	Phosphatic (P)	4838	9224	90.65
3.	Potassic (K)	538	469	- 12.82
	Total	**25254**	**30949**	**22.55**

Sources: Above table compiled and based on the Rajasthan Agricultural Statistics At a Glance, 2013-14.

The use of Fertilizers has been steadily increasing as can be seen from data summarised in table no. - 4. It is revealed that consumption of fertilizers has shown increasing trend. Excessive use of some of the fertilisers not only degrades the land, water and air etc. Components of the environment in general but also causes reduction in the agricultural production and productivity both in terms of quality and quantity by their toxic effect on plants and animals. Since most of the chemicals are poisonous in nature, safety regulations are necessary for their use.

Area under Irrigation and Its Intensity

In the study area irrigation by well has decreased by -14.70 percent during 2011-12 to 2014-15 whereas the total irrigated area has decreased by -6.37 percent. The highest growth has been recorded in other sources irrigation i.e., 20.08 percent and second highest growth in canal irrigation i.e., 12.59 percent. Ground water is the main source of irrigation in the area. (Table-5). The main cause of decreasing irrigation by wells is the water table is recending at the rate of 1 to 4 feet annually. Salt rich water (brakish water) drawn from the deeper layers hinders seed germination and crop growth, due to indiscreet use of irrigation water in canal commond areas, water table rises and increases salt concentration in soil. Irrigation practices in the study area deteriorate of soil health.

Table - 5
Source Wise Net Irrigated Area, Intensity of Irrigation And Cropping Intensity

S. No.	Sources	Net Irrigated Area (In Hect.)			Year	Area in Hectatres					
		2011-12	2014-15	Increase / Decrease (%)		Net Irrigated Area	Net Sown Area	Irrigation Intensity (%)	Net sown Area	Gross sown	Cropping Intensity (%)
1.	Wells & Tube-Well	140251	119627	– 14.70	2010-11	127203	456366	27.87	456366	549790	120
2.	Canal	75737	85273	12.59	2013-14	196446	413557	47.50	413557	484100	117
3.	Tanks	7113	1565	– 77.99	2014-15	217378	449347	48.37	449347	539513	120
4.	Other Sources	9088	10913	20.08	–	–	–	–	–	–	–
	Total	**232189**	**217378**	**- 6.37**	**-**	**-**	**-**	**-**	**-**	**-**	**–**

Source: Above table computed and compiled on the based of Rajasthan Agricultural Statistics at a Glance, 2015-16.

Percentage of the net irrigated area to the net sown area is to defined as the intensity of irrigation. The net irrigated area is not so sufficient in the area. The intensity of irrigation in the study area is low as 27.87 percent (2010-11) and 48.37 percent (2014-15). The intensity of cropping implies the degree of cropping or the number of crops grown in the one plot during one agricultural year. It is an indication of the cropped area as distinguished from the net sown area by following formula.

$$1 = \frac{\text{Total Cropped Area}}{\text{Net Sown Area}} \times 100$$

$$1 = \text{Intensity of cropping}$$

Therefore, intensity of cropping is also very low (120 percent) in the study area.

The study area is deteriorating situation of availability of ground water. The quality and patentiality of ground water is poor and level of water resources development is also very low in the Todarai singh, Deoli and uniara tehsils of the study area. Richwater potentiality area extentds in Malpura, Niwai tehsils and a pocket along mashi river in Tonk tehsil of the area. Depth and quality of ground water affects the crop conditions to a considerable exlent of survey (Research) information regarding the depth of ground water, and its seasonal fluctuation was collected. One hundred fifty (150) water samples from wells Tube-wells and hand pump used for irrigation especially from the adjoining area of profile sites were collected. The changes in water level (2012 to 2016) are given in Figure-3.

The study area generally falls under overexploited zone. Study area is divided in to 6 Panchayat samities. Out of one (uniara) have been declared as over exploited (Dark zone) where ground water exploited over 100 percent and five panchayat samities also have been declared as critical categary where ground water exploitation is less than 100 percent (90 to 100 percent) Table - 6.

P: ISSN NO.: 2321-290X RNI : UPBIL/2013/55327 VOL-5* ISSUE-4* December- 2017
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Figure. 2

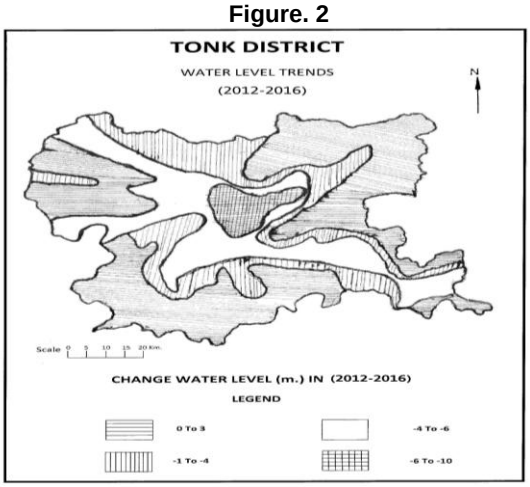

Table - 6
Situation of ground water in Tonk District (2013)

S. No.	Panchayat Samiti	Ground water regeneration (million cubic metres)	Ground water Exploitation (m. cubic metres)	Ground water expolitation (in percentage)	Category ground water exploitatiuon
1.	Uniara	63.94	64.16	100.34	over-exploited more than 100%
2.	Niwai	80.71	78.61	97.39	critical (90% to 100%)
3.	Tonk	83.02	79.41	95.65	
4.	Deoli	68.93	65.91	95.61	
5.	Malpura	59.08	55.73	94.32	
6.	Todaraisingh	35.91	33.65	93.70	

Source: Ground water Dept., Govt. of Rajasthan, Jaipur

The suitability of water for irrigation has been classified based on the electric conductivity (EC), sodium Adsorption Ratio (SAR) and Total Dissolved Salts (TDS). For various crops different properties of EC, SAR and TDS to classified on the tolerance capacity of different crops and soil type.The concentration and composition of dissolved constituents in water is determine its quality for irrigation use. Quality of water is an important consideration in any appraisal of salinity or alkali conditions in an irrigated area. Permissible standards of EC, were devised quantitatively on the basis of soil texture and crop tolerance. The U.S. salinity Lab. divided irrigation water in Four classes on the basis of electrical conductivity : 100 - 250, 250-750, 750-2250 and 2250 - 5000 Hmhos/cm (Rechard's 1954). Gupta (1979) Devised classification on the basis of salinity as having EC, 0.2-1.5, 1.5-3.0, 3.0 - 5.0, 5.0 - 10.0 and greater than 10 ds/m, called as normal, low salinity, medium salinity, high salinity and vary high salinity of ground water (about 90%) have EC less than 5 and 10 ds/m., in semi-arid zones, respectively. The water having EC less than 1.5 ds/m, seldom have problem of SAR, RSC or Toxic Element. In higher EC water (> 5 DS/m), the water have sifnificant problem of SAR and minor problem of toxic element but no problem of RSC (Residual Sodium carbonet).

The ground water in study area is characterized by low to high salinity as viewed from the salinity map in figure 4 and Table 7. It is seen from salinity map - 4 that most part of the area is occupied by ground water of salinity less than 2000 µs/cm. only in North west part covering most of the malpura tehsil, medium to high salinity ground water is observed. In this block nearly 54% ground water have salinity more than 2500 µs/cm. The maximum salinity in the district is observed as 13000 µs/cm. in village Bachhera of malpura panchayat samiti.The concentration of fluride in ground water varies from low to high. Nearly two - third part of malpura tehsil, the northern part of Todaraisingh Central part of Tonk and uniara, northeastern part of Niwai and the lowar part of Deoli tehsil is characterised by Fluride concentration between 1.5 to 3.0 mg/L. The concentration of Nitrate in ground water varies from zero to 1050 mg/letter. Nearly 72 percent ground water have nitrate below 50mg/L and hence most of the area in the district is free of nitrate. The study area is also characterised by low hardness in ground water. On viewing the overall quality of ground water, it is inferred that while the ground water is mostly suitable for irrigation (Table - 7) but the present rate of increase of irrigation development and changes in management practices are resulting in serious quality of water problems.

P: ISSN NO.: 2321-290X RNI : UPBIL/2013/55327 VOL-5* ISSUE-4* December- 2017
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Table – 7
Results of Chemical Analysis Of Ground Water Samples (2016)

S. No.	Location	pH	EC us/cm at 25° C	Value expressed in PPm							Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Value express in mg/L		
				Cl	SO_4	NO_3	PO_4	CO_3	HCO3	Total Hardness as $CaCO_3$					F	B	Fe
1	Jhadali	7.78	5150	1085	400	200	0.2	Nil	650	300	42	50	1040	84	10	1.91	-
2	Nagar	7.7	5001	1070	498	203	0.21	Nil	640	310	39	45	1030	83	9.88	1.9	-
3	Parli	7.75	5200	1080	480	204	0.22	Nil	647	320	28	44	122	81	10.3	1.92	-
4	Pachewar	7.8	5300	1079	485	201	0.22	Nil	645	325	27	42	123	82	9.8	1.89	-
5	Uniara Khurd	7.9	11120	1370	2900	4	0.1	Nil	540	1940	182	362	1840	82	2.32	1.95	-
6	Sunthra	8.5	6085	1092	555	90	0.13	72	1025	490	25	107	1225	13	1.9	0.9	-
7	Swaria	8.4	2230	500	125	100	0.11	-	460	460	56	78	379	4	0.7	0.52	0.23
8	Sohela	7.8	1070	91	25	13	0.75	Nil	450	440	68	67	75	11	0.42	0.16	-
9	Dattwas	7.5	1320	36	116	20	0.56	Nil	732	160	11	31	300	2	7.3	0.63	-
10	Peeplu	8.1	2225	599	127	104	0.12	-	461	465	54	79	378	4.3	0.71	0.53	0.21
11	Pachala	7.9	1490	90	81	20	0.4	Nil	609	150	24	21	300	5	2	0.35	0.5
12	Raholi	8.1	1360	100	101	22	0.11	Nil	510	384	40	70	136	11	1.3	0.6	0.6

Source: Field Survey of the Study Area (2016) and analyzed in the Laboratory, Jaipur (Raj.)

Soil Ecology and Land Degradation

Land degradation has been defined as the process which lowers the current and potential capability of land to produce (quantitatively or qualitatively) goods or services. The processes leading to land degradation are varied and complex and have occurred in all places and times. In study area the problem of land degradation has assumed a serious dimensions. The estimates of degradated land in the district range from 35000 hectare to as much as 40000 hactare due to differences in the concept and source of statistics. According to the figures given by the Directorate of Economics & statistics (Rajasthan) an area of 36761 hectare is suffering from various problems of land degradation like alkalinity (16593 hactare) and salinity (18014 hectare), ravine formation or codification often referred to as waste lands, etc. Giving a total of 36761 hectare degraded land in the study area. Soil salinity and alkalinity developed due to continuous use of brackish ground water irrigation, because the amount of rainfall is very low and irregular in the study area.

The problems of land degradation like alkalinity, salinity, and ravine formation in the study area is mostly observed in malpura, Todarai singh and North-western part of uniara Panchayat Samities. Soils of Deoli Tehsil is good For agricultural crops but the major problem is of this area poor availability of irrigation water.

The above findings and discussion put together clearly illustrate the deteriorating situation of availability and quality of ground water and its use in agriculture at present. (Table 6). The study area has low cropping intensity 120 percent and irrigation intensity 48.37 percent (Table - 5). In the study area of the problem of land degradation has assumed a serious dimension. Degraded soil (36761 hectare) is not suitable for agriculture practices. However, the agricultural productivity has simultaneously increased (Table 3) with the adoption of new agrarian technological and chemical input (Table - 4). Due to this, arise many agronomic problems, such as the improper land-use as well as indiscriminate use of the new agrarian input for the sake of the maximisation of agricultural returns which could be ultimately responsible, by and large the deterioration in agro environment conditions in the study area.

Conclusion and Recommendations

Viewing the human, animal and plant existence and ultimately the environmental safety, the sustainability of agricultural system is non-negatiable. The means adopted to achieve the green revolution about four decades back were good enough for immediate and short time needs. Now with a tremendous increase in human population pressure and the over whelming importance of ecological balance, it has become essential to shift to an agricultural system that is environment. Friendly, potentially capable of meeting human needs and is sustainable. In this regard, ensuring the sustainability of Agricultural system at a higher level of productivity and economic competitive capacity shall be essential not only at district or state level but at national level. For achieving this goal, conservation of natural resources along with maintenance of eco-harmony through practicing Integrated management strategy shall be a necessary requirement.

In this regard, cropping intensity increase is feasible if more irrigation potential is created in the area. Intensive research work on economic usage of various inputs and updating of technology are urgently called For. scientific land-use system will have to be developed for the land-use system will have to be developed for the land degraded area. Dependence on chemical pesticides should be reduced by developing suitable herbal pesticides considering the harmful effect of the former on the environment. Barks seeds and leaves of Neem are pest repellent and droppings of birds and animals are rich in nutrients like nitrogen and phosphorous and are a good natural fertilizer. Therefore, Farmers can use droppings as Fertilizers. Farmers should be educated about the needs and methodology of using irrigation water optimally, as continued use of excessive irrigation, instead of improving, decreases the crop and water productivity and deteriorectes the soil health which

adversely effects the sustainability agriculture and also poses environmental hazards.

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Abbreviation

NSDP - Net State Domestic Product