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SOILS AND UNDERGROUND WATER QUALITY: A STUDY

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ABSTRACT

Soils basically originate from the rock materials which are supported by the deposits due to transportation by rivers. The weathering factors are climate, vegetation, relief, time and biological orgonisms. Dominance of one or the other weathering factors give rise to soil variations in a particular area. Broadly the soil of Shahpura tehsil form a part of alluvial plain.

Keywords: *Rock Materials, Weathering Factors, Vegetation, Biological Orgonisms.*

Introduction

Soils

Soil is the most valuable asset of any region. One atperrents the prosperity of the people and the productivity of the land. Soil is the top covering of the earth formed from the erosion of rocks and vegetation, a mixture of many substances. It is in the soil that plants grow far it has the necessary compounding of mineral and biological matter which together impart fertility to the land.

There are 4 soil associations in Shahpura tehsil. These associations are distributed from elevation of 330 to 500 metres above mean sea level. Four soil associations are as given below :

- Chomu Dune Association
- Bassi Rajori Association
- Gullied Area
- Hilly Soils.

The descripation of each association is as given below :

Chomu Dune Association

This association dominates the north-western part of the Jaipur district at an elevation ranging from 433 to 553 metres above M.S.L. There are much variations, in the soils within short distances, because of aeolian depositions. These recent aeolian deposits on top of older older soil materials are very common.

Chomu series dominates this association. In between Chomu soils, are found stabilised sanddunes of varying heights, which cultivated during Kharif only. The soils of this association are very deep, dominantly coarse textured, light yellowish, brown to dark yellowish brown, well drained to excessively drained, non-calcareous and non-saline, non-sodic lying on nearly level to moderately sloping lands. These soils are very susceptible to wind erosion.

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Excessive drainage, low fertility and low water holding capacity along with severe are wind erosion the main problems of these soils. Bajra and Kharif pulses are the important crops on these soils, at places Rabi crops are also grown wherever underground water for irrigation is made available.

- **Typical Profile**

The profile was examined in an open dug pit in the west of village Jawanpura (tehsil Shahpura, district Jaipur).

The profile pit was located in a cultivated field.

- **Physical Characteristics**

Horizon Depth (cm)		Description
A_1	0-60	Light yellowish brown (10 YR 6/4), (10 YR 6/4), Yellowish brown (10 YR 5/4) moist, loamy sand, single grained, dry loose, moist very friable, wet non sticky, many very fine and fine roots, moderately rapid permeability and clear smooth boundary (60 cm thick pH 7.6).
C_1	60-106	Dark yellowish brown (10 YR 4/4) moist, loamy sand, massive, moist very friable, wet non sticky, few fine roots, non effervescent, moderately rapid permeability and diffuse boundary (45 cm thick, pH 7.7).
C_2	105-150	Dark yellowish brown (10 YR 4/4) moist, loamy, sand, massive, moist very friable, wet non- sticky, no roots, slightly effervescent and moderately rapid permeability (45 cm thick pH 7.9).

- **Land Use**

Most of the area is unirrigated. Rainfed crops viz. Bajra, Guar, Moth, Moong and Chawala are mostly taken in Kharif, while in Rabi wheat, Barley and Gram are the major major crops grown under irrigated conditions. Fruit orchards of Mango, Ber, Guava and Grapes have also been observed in the vilinity of Jaipur city and Shahpura area. Vegetables commonly grown around the Shahpura are cabbage, cauliflower, chillies, tomatoes, brinjal, bhindi and cucurbits.

Bassi Rojari Association

This association occupies most of the area of the tehsil. These soils are generally encountered at an elevation of 333 to 466 metres above M.S.L. in the southern eastern parts of the tehsil.

The soils of this association are deep to very deep, dominantly medium textured (sandy loam to loam) yellowish brown to dark yellowish brown in colour, well drained, calcareous to non-calcareous, non-saline, non-sodic and moderately eroded lying on nearly level to gently sloping lands.

Low fertility, slight to moderate erosion and non-availability of irrigation water are the major problems of these soils. Simple soil conservation measures like bunding with land levelling and grading may be followed to check erosion and conserve soil moisture. These soils are suitable for almost all the climatically adopted crops of the region.

Gullied Area

These are severely gullied and eroded lands at many places lying on both the banks of seasonal streams and rivers. There are table lands at many places in between these gullies which are used for cultivation.

The gullies are approximately 3 metres deep on average and are severely truncated exposing the sub-soil. The soils of this unit are very deep, medium textured and calcareous having calcium carbonate nodules mixed with sub-soil.

- **Range in Characteristics**

Surface texture varies from sandy loam to loam, whereas the sub soil texture is generally loam with occasional occurrence of sandy loam in lower strata. Structure varies from massive to sub angular blocky. Surface soil may or may not be calcareous but the sub soil is calcareous.

- **Land Use**

The gullied lands are not suited for not suited for agriculture purpose at present and no cultivation is done in this area. This unit is mostly used as pasture land or grass land.

- **General Inferences**

The most serious problem of this unit is severe to very severe water erosion resulting in encroachment of adjoining cultivable table lands every year. Very intensive soil conservation and land management measures like gully plugging with bush, dam, logdom, construction of diversion channels, growing of deep rooted grasses and afforestation controlled and rational grazing are some practices which can be can be followed, wherever economical, levelling of the gullies can also be done for limited area. Overgrazing should be avoided.

Hilly Soils

Mostly, these soils are shallow, muddy and porouseus. This soil is found relatively more deeper near the valley of the river and at the slope of the hill. Various kinds of soil are found in the hill areas. Stony soil is found in the mid area of the tehsil. Such kind of soil is available in the very small area. This soil consists of relatively coarse-grained, gravels and small piece of stones, but this soil is lacking of is lacking of floras, lime floras, lime and iron containts and it is acidic in composition. Therefore, this soil is not good for crops.

Underground Water Quality

Out of the total irrigated areas of 14,470 hectares, 13,601 hectares i.e. 94 per cent of the area is being irrigated by wells. Thus it is evident that underground wells form the main potential source of irrigation in Shahpura tehsil. It is essential to know the quality of well waters in order to assess their suitability for irrigation purposes. The water table level is also important from the stand point of water logging and consequent salinity-alkalinity problem that may arise as a result of rise in water table. The water table in general varies from 10 to 20 metres and fluctuates between 1 to 3 metres from monsoon to summer. Thus the water table in the district is below the critical limit of 3 metres. The recuperative capacity of wells in general is poor as the precipitation is the only source of recharging.

The quality of well waters from Jaipur to Shahpura area in general is good and suitable for irrigation. The results indicate that Shahpura tehsil's water are medium to highly saline alkaline. Sodium is predominant. It ranges from 0.87 to 108.70 meq/litre followed by magnesium varying in concentration from 0.4 to 30.4 meq/litre, which is higher than calcium in all waters. The electrical conductivity varies from 0.40 to 12 m mhos/cm. Carbonates and bicarbonates are usually present in most of are the dominant anions and the waters. Sulphates and chlorides present in 60 to 70 per cent of the samples examined. The boron concentration ranges from 0.05 to 2.5 ppm and in about 64 per per cent of the waters, it is present is present within limits for sensitive plants.

According to classification suggested by Thorne and Patterson (1954), 69 per cent of the waters fall under high salinity hazard and more than 50 per cent under high to very high sodium hazard are not suitable for irrigation purposes. But good groups and thus crop growths particularly of wheat and barley have been observed in soils of Shahpura tehsil irrigated with waters of even 12 mile mhos/cm. With such quality waters, cultivators are usually growing Rabi crop of wheat or barley and keep the fields fallow. The salinity deposited in the soil is washed away by rains during monsson and in Rabi wheat or barley crop is being taken. As the soils of Shahpura tehsil are mostly light to medium textured and well drained such quality waters can successfully be used specially for salt tolerant crops.

Vegetation

The natural vegetation generally consists of Khejri(Prosopis specigera), Babul (Acacia arabica), Ber (Zizyphus spp.), Neem (Azadirachta indica), Pipal (Ficus religeosa), Bad (Ficus bengalensis), and Sisam(Dalbergia latifolia), amongst trees; Ber (Zizyphus jujuba),Aak(Calotropis procera), Ker (Caparis decidua)(Solanum xanthocarpum) amongst shrubs; Dub and KanteliKanteli(Solanum dactylon), Dab or Kans(Saccharum spontaneum), Munj (Saccharum munja), Aristida spp., Cenchrus spp. and Dicanthium spp. amongst grasses.

Land-use and Cropping Pattern

According to 1989, land-use data, total area of the tehsil is 46,491 hectares and the break up is as follows:

- Forest : 7.00%
- Irrigated : 27.00%
- Unirrigated : 35.82%
- Cultivable waste : 16.42%
- Area not available for cultivation : 13.76%

Source : Tehsil Headquarter, Shahpura.

Kharif is the main crop in the in the tehsil. tehsil. Of the total area under crops during 1988-89 the break up is as follows :-

- Cereals and Millets : 46.75%
- Pulses : 30.13%
- Other food crops : 0.16%
- Oil seeds : 6.56%
- Fiber and Fodder crops: : 27.00%

Sowing and harvesting season of different crops are presented in following table:

Table 1: Sowing and Harvesting Season

Name of crop	Period of sowing	Period of harvesting
Kharif		
Guar	Last week of June to midof August	October
Bajra	15th June to 15th July	October
Groundnut	15th May to 15th June	October-November
Moong & Moth	July	October
Rabi		
Wheat	15th November to30th November	15th April to 30th April
Gram	10th October to5th November	25th March to 15th April
Mustard	5th October to20th October	20th March to 5th April

Source: Agricultural Research Centre, Durgapura, Jaipur.

Animal Wealth

Animals play significant role in rural economy of Shahpura tehsil. Animals are the the major source of income in agriculture. The density of working animal is indeed an important indicator of economic development. There is a remarkable consonance among landuse and animal husbandry.

Data on type on type and number of animals of the year 1977, 1983 and 1988 shows significant increase in a short time span of 12 years. The growth rate of different categories in cattles are negative (-18.71%), buffaloes (29.37%), sheeps (30.83%), goats (14.61%), poultry (146.00%) growth rate was observed. Highest growth rate observed in the pigs (352.64%) and highest number of animals category is goats.

Road Statistics

Road statistics are given in detail in the next chapter. In Shahpura tehsil road figures are relatively better in the district. All the big villages of this tehsil have a good network of roads. The following table reveals that Shahpura tehsil is well developed in respect of total kilometres of roads.

Population

Population is an important factor in the development of a nation. The utilization of natural resources, progress in its economy and trade are all dependent on the distribution, density and quality of its people.

According to the 1981 census the total population of Shahpura tehsil was 1,30,357. The average density in this tehsil is 280 persons, whereas the state average is is 100 people per square kilometre. In Jaipur district, density is 215. In Shahpura, 62 per cent are males and 48.38 per cent females. 84.6 per cent population resides in the rural areas. The rural population resides in 70 villages.

The largest percentage of inhabited villages is in the population range of 1000 to 1999. The minimum is in the population range of 5000 to above.

Out of total 73 villages, 9 (0.53%) are of the size of less than 200, 11 villages (2.96%) are of 200-499 size, 14 villages (8.04%) are of 500-999 size, 19 villages (46.85%) are 1000-1999 size, 17 villages (16.05%) are 2000-4999 size and 3 villages (25.51%) of population size 5000 & above category.

Literacy

The percentage of literate persons was 20.04 in 1981. The percentage of literate male and female has 20.54 and 2.09 respectively. Literacy rates are high in urban areas. The following table shows the position of literacy in the area under study.

Table 2: Distribution of Literacy in Shahpura Tehsil

	Persons (%)	Male (%)	Female (%)
Shahpura Tehsil Total	20.05	20.54	2.09
Rural	19.50	19.28	1.95
Urban	28..92	32.99	15.93

Source: District Census Handbook, Jaipur, 1981.

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