CHAPTER - V

-:- IRRIGATION AND SOIL DEGRADATION -:-

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In the previous chapters an attempt has been made to analyse the positive influence of irrigation on cropping pattern and crop productivity. This chapter proposes to analyse the soils and some negative impacts of irrigation on soils i.e. development of salinity/alkalinity hazards and waterlogged conditions. These two negative effects seems to me very significant, hence, other aspects of degradation are simply omitted.

The region under study have different types of soils. The western hilly area is covered by laterite soil. The laterite soils due to the presence of excessive iron oxide are red to brownish in colour. This group of soils covers about 21% of the total soil cover of the taluka. In the central and eastern part soil is derived from basalt rock. Its black colour is due to humus and clay complexes. It is the single largest soils group of the study region which covers about 72% of the total soil cover of the area (Fig.5.1-A). These soils are deep, mature and are one of the richest in the Krishna Valley of Karad taluka. Soils in valleys and on level plains are much deeper and attain a mature state than soils on slopes (Singh and Dhillon, 1984).

5.1 CONCEPT :

The soil is a natural medium of plant growth and it is a natural body developed by natural forces acting on earth surface. Moreover, it is the medium from which crops draw water

and nutrients. The soil is the most significant resource that provides man's unending needs. Hence, these must be carefully husbanded, so that they are conserved. A proper combination of texture, salt and humus yields good results but some time due to unwise exploitation, misuse of soil and excess use of irrigation and fertilizers results into soil degradation.

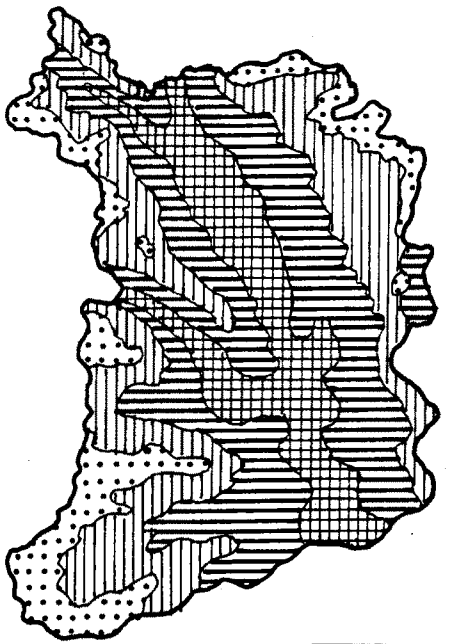
Land degradation is a comprehensive term often used to denote the decrease in productivity, fertility status and property of land in general. Soil degradation may also be caused due to improper management of soil. The degraded land defined by Stamp (1968) as the land which has been previously used but now abandoned and no further use has been found for such land. Land degradation includes soil erosion, salinization, waterlogging and misuse of land. Moreover, it is the land available for cultivation, but not taken up for cultivation after a few years for some reason or other. Degraded land is that land which is not being utilized at present may be called degraded land and includes the lands which are left fallow due to various constaints or whose productivity has declined more than 50% due to misuse and overuse by human and cattle population (Patil,1988).

5.2 SPATIAL DISTRIBUTION OF DEGRADED SOILS :

The negative effects of irrigation are observed in the area with black and deep black soils and inadequate drainage facilities. Excess use of irrigation water and application of

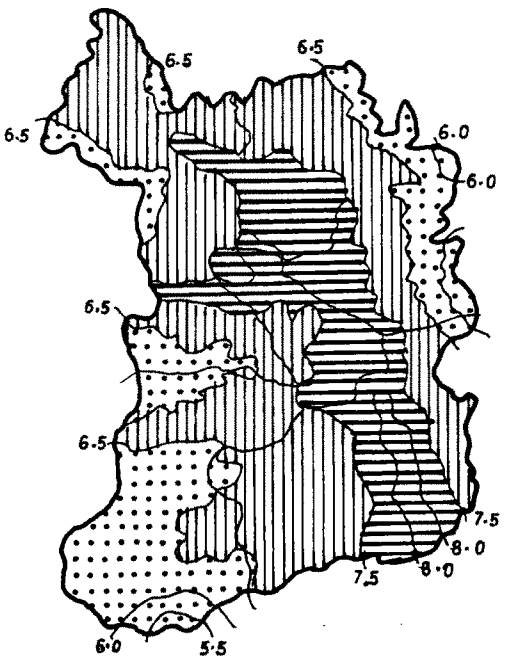
KARAD TALUKA

Ⓐ SOIL TYPES



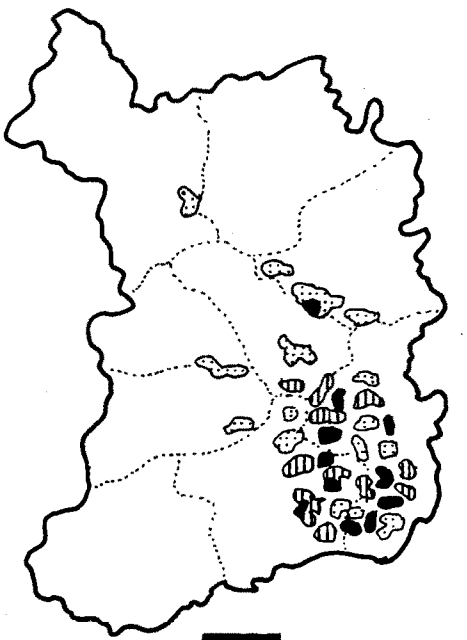
LATERITE
BROWN
MEDIUM BLACK
DEEP BLACK

Ⓑ GENERALISED SOIL REACTION ZONES 1984-87



SALINE SOIL ZONE
6.5 NUTRAL SOIL ZONE
7.5 ALKALI SOIL ZONE

Ⓒ SOIL DEGRADED AREAS 1984-87



WATER LOGGED AREA
FULLY SALT AFFECTED AREA
SLIGHTLY SALT AFFECT-ED AREA

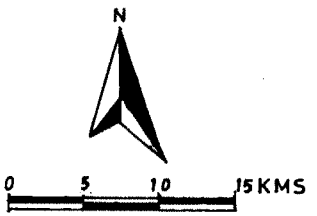


FIG. 5-1

chemical fertilizers have together caused the problem of soil degradation. Here first, an attempt is made to divide the region into generalized soil degradation zones based on pH value as below.

A) Soil Degradation Zones :

The salinity and alkalinity of soil is serious problem as it is a limiting factor with respect to crop productivity. Saline soils are defined as those soils which contain excess of salt and pH 6.5, whereas, soils which contain more exchangeable sodium chlorides, calcium, manganesium and pH 7.5 to 10 are called alkaline soils. The arid and semiarid climate, imporous sub-soil, quality of irrigation water, topographical position, poor drainage, high watertable, inadequate planning of irrigation are some of the factors responsible for soil degradation. The three generalized soil degradation zones recognized are as below.

i) Saline soil zone :

Includes the soils having pH value below 6.5 and it covers about 26.11 percent of western and eastern part of the study region (Fig.5.1-B). This is due to the extent of over irrigation. It raises sub-soil watertable which inturn obstracts drainage where sub-soil water are saline and are within 1.2 metre from the ground. Plant growth is directly affected by the salinity level of the soil.

ii) Neutral soil zone :

Neutral soil zone having pH value ranging between 6.5 to 7.5 covers about 47.13 percent of total area. These soils are noted in north and south Umbraj, Central Masur, Western part of Koparde, eastern part of Supne, Kole and Central part of Kale circles of the study region.

iii) Alkaline soil zone :

Alkaline soil zone includes soils having more than 7.5 pH value. These soils have often been called 'Black alkali' soils because they are black, owing to the effect of the high sodium content which cause the dispersion of the organic matter. The percentage of exchangable sodium saturation in alkali soils is greater than 10. Alkaline soil comprises about 20.16% of the region's area.

B) Soil Degraded Areas :

The last twenty seven years have witnessed significant development in irrigation i.e. gross irrigated area in 1961-64 was about 48,931 hectares which rose upto 60,182 hect. in 1984-87. And about 3.26% of this total irrigated area in the lower course of Krishna basin in Karad taluka has been badly affected by soil degradation.

The empirical study carried out reveals that the soil degraded area is mainly confined to the old canal system in

the region. At present the soil degraded area is about 1965.82 hectares and is confined in the 15 villages of the taluka (Table 5.1). In some parts of villages of Rethare Bk., Rethare Kh., Dushere, Karve, Gondi, Atke and Shere the surface runoff is negligible, drainage is poor and the evaporation of water leaves the salt on surface. This process of evaporation coupled with capillary action from high watertable also bring up the salt from lower horizones. Overuse of irrigation and chemical fertilizer doses are the significant factors responsible for this soil degradation. There are three types of soil degradation in the taluka as below.

i) Waterlogged areas :

Waterlogging is distinct hazards in the development of agriculture. Waterlogging results from the excess use of water in the absence of drainage. Moreover, percolating water from unlined canal accumulates in sub-alluvial soils which assists to rise in underground watertable. When watertable is just below three metres from ground due to capillary action, underground water appears on the surface and do not allow crops to grow. Surface waterlogged land is that land where the water is at or near the surface and water stands for most of the year. It is observed during the field study that about 590.22 hect. of land is waterlogged. Such degradation process have converted large fertile irrigated areas into unproductive barren land. It is recorded that more than 40% land belonging to Rethare Bk. and

Rethare Kh have suffered by waterlogging. Moreover, waterlogged land is also noted in Dushire, Khodshi, Karve, Atke and Shere villages of the study region (Fig.5.1-C).

ii) Fully Salt affected areas :

In poor drained area excess amount of irrigation water results to rise in underground watertable and when it is just below 3 metres from ground surface naturally capillary action occurs which forces water and salt on the surface. It is observed that Kodoli, Shere, Rethare Bk. and Rethare Kh. have fully salt affected soils, covering an area of about 604.47 hectares of land (Table 5.1).

iii) Slightly salt affected areas :

During the field work it is noted that about 852.13 hect. of land is degraded by slightly salt accumulation in the upper layer of soils. Such type of soil is observed in Shere, Gond, Khodoshi, Umbraj, Koparde, Atke, Rethare Kh., Rethare Bk., Kodoli, Karve, Khubi, Goleshwar, Vadgaon and Dushere villages of study region.

The consequences of these problems have declined the farm income and created unemployment of rural labours. Karad taluka has 1113.69 hectares of land producing nothing due to influence of alkalinity, salinity and waterlogging conditions of soils. To overcome evil effects of degraded soils it is necessary not only to reclaim areas that have already been

TABLE 5.1 : Karad taluka - Saline, alkaline and water-logged soils.

Sr. No.	Name of Village	Area in hect.	Percentage
1	Rethare Bk.	265.60	13.53
2	Rethare Kh.	491.62	25.03
3	Atke	151.50	7.73
4	Ceondi	113.28	5.75
5	Karve	66.76	8.19
6	Shere	192.25	9.77
7	Dushere	76.29	3.86
8	Kodoli	69.52	3.58
9	Udgaon Haweli	120.00	6.10
10	Khubi	61.00	3.10
11	Coleshwar	22.00	1.11
12	Khodshi	61.00	8.18
13	Koparde	68.00	3.18
14	Nadshi	87.00	2.90
15	Umbraj	51.00	2.59
	Total area	1,965.82	100.00

SOURCE : Empirical

spoiled, but also to prevent for the ruin. This can be achieved by following methods.

5.3 SOIL RECLAIMATION MEASURES :

Soil is the chief resource of livelihood to farmers and is the basis of national wealth for agricultural development. But the saline, alkaline and waterlogging soils, are regarded as problem soils which require remedial measures. The bringing of degraded soils into productive condition is known as reclaimation measure. Before giving treatment to degraded soils it is necessary to know the degree of salinity and alkalinity. Higher the degree of alkalinisation, the greater will be the difficulties in reclaiming it. Moreover it is also necessary to know the nature of the soil, topography of the land, quality of water. The measures used for reclaimation are as under.

i) Saline soil reclaimation :

Saline soils containing calcium and magnesium may be easy for reclaimation. However, mostly sandy loam saline soils would be reclaimed by flooding the affected land and would support plant growth.

Degraded soils may be reclaimed by scaping surface soils from saline patches and providing artificial drainage to affected area. This second measure is most costly. An attempts are being made by the Directrate of Irrigation Research

and Development, Government of Maharashtra and they have reclaimed 109 hectares of land of Karad taluka. Deep ploughing is used on soils in order to open the soil for the desired downward movement of water and salt also.

ii) Alkali soil reclaimation :

In alkali soils, water would move downward freely, the water alone would not leach out the excess exchangeable sodium. By cationic exchange gypsum is considered to be the best for leaching downward and out of reach of plant roots. Gypsum converts the soil into calcium soil with a desirable lowering of pH. Gypsum is supposed to be the best which helps to reduce soil pH and improve the physical condition of the soil (Pawar,1984).

In area under study gypsum is used by the farmers to turn bad soils into good productive soils. Some rich farmers of Shere, Shenoli, Rethare Kh., Rethare Bk. and Karve villages have used gypsum 2 to 3 tons per hectare and about 68 hectares of area has been turned into productive land.

Molasses is applied to reclaim compounds. In sugar factory areas, molasses is waste byproduct and farmers are using this waste material to reclaim saline soils. Sulphur is also used in reducing the alkalinity.

iii) Salt tolerant crops :

In some circumstances, it may not be fesible to reduce the salt content of soils to permit the growth of sensitive crops. The crops like wheat, rice, barely, cotton, tomato, cabbages, onion and garlic are crops which are tolerant to salt. The salt tolerant crops are cultivated in Rethare Bk., Dushire Rethare Kh., Karve, Shere and Atke village of Karad taluka. These crops have reduced much salts of deteriorated soils. Moreover rotation of such crops reduces salt in the degraded soils.

iv) Waterlogged area reclaimation :

The basic methods of reducing excess water from water-logged area are surface drainage and vertical drainage. Surface drainage is the disposal of excess rain water over ground surface through open drainage system with an adequate outlet. Wells or tube wells from which the underground water is extracted either under pressure or through mechanised lifts defined as vertical drainage (Singh and Dhillon,1984).

The excess and injudicious use of water for irrigation particularly in light texture permeable sandy soil should be avoided to check the development of waterlogging hazards. The irrigation by drip and sprinkler system should be done to control these hazards.

The lining with suitable materials in main canals should be done to check the seepage losses, rise of watertable and

development of salinity. Lining of water channels with concrete bricks and stone is an effective measure in reducing water seepage to a large extent (Priher and Sandhu,1987).

v) Other methods of reclaimation :

Water which is to be irrigated should be of good quality, otherwise it would affect on good soil which will be turned into unproductive. Therefore, it is wise to use good quality of water for irrigation. If good quality of water is not available it can be improved by adding certain substances such as sulphuric acid or sulphur to reduce the pH to desired level (Dastane N.C. and Hukkeri,1987). Irrigated water should be delivered to all part os the cultivated area in amounts needed to meet crop demands during peak periods.

To check the negative effects of irrigation, the unfavourable geographical sites such as the confluences of the burried cources of the prior drainage should be avoided.

In study area farmers are rasing Eucalyptus trees in soil degraded area to reduce salt. It is noted in field trip that farmers of Rethare (Bk.), Rethare (kh.), Dushire, Shenoli, Share and Karve have planted Eucalyptus trees to overcome soil cancer.

However, it is necessary not only to reclaim areas that have already been spoiled but also to prevent further ruin. And this can only be done by a more efficient use of irrigation water.

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