

## **Decreasing Fertility of Soil-A Challenge to Sustainable Development (A Case Study of the Northern Cotton Belt of Rajasthan)**

**\*Dr. Shubha Tiwari**

Production is the process of transformation of inputs into output. All the five major factors of production viz. land, labour, capital, organization and entrepreneurship have direct bearing on the production process. Benham (1939) clearly indicates that land and labour are the original means of production (113). Soil, the main component of land, is the focal point of the study as agricultural production and its process to a great extent depends on the nature of soil and the trends of its fertility. Soil is presently losing its fertility due to rise in pollution. This changing composition of soil is adversely affecting the production of various crops and is creating hindrance in maintaining the sustainable development of the economy.

The districts of Sriganganagar and Hanumangarh which constitute the area under study, if viewed geographically, form the part of the Ghaggar plain named after a seasonal stream called the Ghaggar, which is supposed to be the reminiscent of the Vedic rivers Saraswati and Drishadvati (Abichandani and Roy, 1966:37). The area in question is the centre of two of well known civilizations viz. the Indus and the Vedic civilizations (Sharma, 1966:7). Originally the area, being the bed of the river Saraswati was quite fertile and a variety of crops like barley, wheat, pulses, sugarcane and cotton were grown there. Its alluvial soil and temperate climate were fully conducive to different crops including cotton. But due to some geological upheavals the situation was drastically altered and in due course of time the westerly winds blowing from Rann of Kutch transported a lot of sand forming sand dunes every here and there in the entire area. Further, the paucity of rain and salinity of the underground water turned most of the area unproductive and useless. The situation continued to remain grim till the advent of the Gang Canal in 1927 made possible by the far-sightedness coupled with indomitable will and determination of Maharaja Ganga Singh, the ruler of the erstwhile princely state of Bikaner. To add to it, in due course of time a few other irrigation projects like the Bhakra Project and the Rajasthan Canal Project (presently known as the Indira Gandhi Canal Project), were introduced to meet the growing need of the farmers in the area. As a result of this, the area turned out into the most productive and prosperous district of Rajasthan and came to be hailed as the granary of the state. But unfortunately for the last few years the quality of the canal water has been going down due to increasing pollution. Besides this, the supply of water in the canal has also been irregular causing gradual decline in the production of the various crops including cotton.

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The Northern Cotton Belt of Rajasthan, as the area in view of the production of cotton is aptly called, is roughly comprised by two districts viz. Sriganganagar and Hanumangarh. The soil of the area is basically alluvial because it happens to be the bed of the old river Saraswati and the same is quite conducive to the production of cotton. Cotton is a sub-tropical crop which needs a lot of rain water and underground water supplemented by the canal water to support it during the early stages of its growth. As a result of this irrigation support system the districts of Sriganganagar and Hanumangarh have become the highest cotton-yielding area of Rajasthan which account for 90 % of the total cotton produced in the state. But for the past few years the production and productivity of cotton in the area has registered a decreasing trend as is shown in the table below:

**Table Showing Trend of cotton production in the area during 2015- 2021**

Year	Sriganganagar			Hanumangarh		
	Area (in hecets)	Production (in bales)	Productivity	Area (in hecets)	Production (in bales)	Productivity
2015-16	167130	200449	2.15	127400	148995	2.15
2016-17	174690	200125	2.75	88305	110050	2.75
2017-18	135150	400980	5.50	92885	265575	3.70
2018-19	115940	281975	4.75	101000	251750	5.50
2019-20	198000	482500	5.00	151650	407162	5.25
2020-21	120000	349000	5.50	115400	335000	5.00

Note: 1 bale= 170 kg.

Source: Department of Agriculture, Sriganganagar (Raj)

From the above table it is clear that both production and productivity of cotton in the region has shown a fluctuating trend. This is due to the shifting level of pollution and accumulation of harmful elements in the soil.

Besides, the modern methods and techniques of agriculture characterized by excessive use of fertilizers have though helped a lot in boosting the over-all production but the same has resulted in the gradual loss of fertility of the soil. The excessive use of fertilizers, pesticides and weedicides have caused an increase in the level of potassium and nitrate in the soil leading to the rise in pH value due to which the fertility of soil has been further hampered. The pH value is a scale for measuring the chemical composition of soil i.e. it measures the amount of chemical present in the soil. The reasons for the rising pH value of soil are numerous such as inadequate availability of quality water for irrigation, paucity of rain, repeating a crop on the same piece of land, salinity of underground water etc.

As a matter of fact, of late tests conducted by Soil Testing Laboratory of the Agriculture Department

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has comprehensively revealed that the soil all over the country is continuously losing its fertility. This tendency has cost enormous negative impact on the production of cotton. The annual report of All India Coordinated Cotton Improvement Project, Central Institute for Cotton Research Regional Station, Coimbatore, has shown that the net sown area and production of cotton in the country has declined due to rising pH value of soil. The region under study is no exception to it as is shown in the table below about the pH value of the soil of Sriganganagar and Hanumangarh for the past 4 years:

**Table Showing pH Value of Soil of Sriganganagar and Hanumangarh Districts**

Year	Soil Sample Test	Average pH Value
2017-18	17698	7.68
2018-19	23060	7.77
2019-20	30810	7.96
2020-21	12060	8.05

Source: Soil Testing Laboratory, Agriculture Department, Sriganganagar

From the above table it is clear that the samples of soil taken from various places of Sriganganagar and Hanumangarh shows that the average pH value of soil has increased by 0.35 during the period from 2017-18 to 2020-21. It is not gainsaid that if the pH value of soil goes on increasing continuously, it will jeopardize enormously the production of cotton as well as other crops in the area.

To aggravate the situation further, one of the major sources of water, the underground water is impregnated with salt throughout the tract (Sehgal, 1972:7). At present the quality of underground water is deteriorating in the region due to the percolation of toxic affluent from the factories like those of fertilizer, sugar, paper etc. The industrial wastes are highly saline which getting mixed with the soil cause depletion of the soil. In the same way the accumulation of silt in the underground water is also a matter of major concern to the cotton growers of the region.

Apart from the above, the farmers of the area are also facing the problem of water-cess as it impedes the free flow of the canal water and is responsible for the inadequate supply of water through canals. It also causes frequent erosions of the canals as a result of which the precious water from it drains out. This in turn gives rise to the problem of water-logging which adversely affects the fertility of the soil as the productive components lying in the deep layer shoot up to the surface and are washed away by the flowing water.

Thus the above factors have resulted in the decline of the production of crops in general and cotton in particular. In order to protect the soil against the above odds and save it from losing its fertility certain ameliorative measures are required to be adopted. At the first instance the farmers or producers must be encouraged and motivated to use bio-compost instead of chemical fertilizers. The bio-compost includes green compost and wormy-compost which is biologically good and is also

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ecologically favourable to the production process. Secondly, the drip system of irrigation needs to be adopted. Presently in both Sriganganagar and Hanumangarh districts irrigation mainly depends on canals which requires a lot of water whereas the supply of water there is not adequate. Therefore, the drip system which entails less water is most appropriate for the area. Thirdly, proper measures need to be adopted to improve the quality of the underground water. Working in this direction the Central Salt and Marine Chemicals Research Institute has developed some desalination techniques like solar stills and electro-dialysis etc. so as to remove the salinity of the underground water (Rao and Mehta, 1997:150). These efforts are not adequate and some more steps are required to be taken to control the menace of loss of production. But of all the proper 'water management' and 'integrated use of surface and groundwater resources' along with the conservation and efficient use of groundwater is the prime need of the day (Srivastava, 2006:29).

Therefore, in order to sustain the future of cotton in the region among others all these steps must be taken with utmost care and concern. This, without doubt, will help in sustaining the production level and help boost the production of cotton in the region and will restrict the farmers from switching over to less productive common crops.

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