

SOILS AND THEIR MANAGEMENT REQUIREMENTS IN BAHAWALPUR
IRRIGATED PLANTATION

by

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Abstract

This paper is based on findings of the semi-detailed soil survey of Bahawalpur plantation. Of the total area about 400 hectares are normal silty soils without any problem. Moderately saline-alkali cover an area of 106 hectares whereas slightly saline-alkali occupy 41 hectares. An area of 7 hectares is occupied by moderately deep slightly saline-alkali soils are underlain by fine sand at about. 6 metres depth. A brief description of different kinds of soils and suggestions for their improvement are discussed in this paper. The location and distribution of the various kinds of soils is shown in the attached map. Schematic diagrams of the representative soil profiles are appended to this paper. This information could greatly help in the preparation of the forest working plan.

Introduction

The Bahawalpur irrigated plantation is situated on the left bank of the Sutlej river at a distance of about 6 kilometres, south-west of Bahawalpur city. The plantation covers an area of about 550 hectares. The area forms a part of the Subrecent floodplains of the Sutlej where seasonal flooding from the river ceased longtime ago. General surface of the area is nearly level except in a minor proportion of land which is slightly higher (15 to 30 centimetres) than the surrounding area.

The forest area has been under Shisham (*Dalbergia sissoo*) for the last about 30 years. Natural plants are Jand (*Prosopis spicigera*), Sarkanda (*Saccharum munja*), Farash (*Tamarix articulata*), Karir (*Cappris aphylla*), and some Ber (*Zizyphus jujuba*). Weeds are Dab (*Eragrostis cynosuroides*) and some Kai (*Prosopis juliflora*). A part of the area (compartment No. 2) has been cleared off and is being prepared for planting of Eucalyptus.

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Previously the forest was irrigated by Bahawal canal only. On account of inadequate and uncertain canal water, tubewell water is now being used to meet the irrigation needs of the plantation. Watertable is at about 5 metres depth in the area.

General nature of the soils

The area comprises the following four main kinds of soils:

1. *Deep silty soils.* They are nearly level and homogenized upto 75 centimetres depth. The soils are stratified in the substratum. The homogenization process over the last few hundred years has incorporated some organic matter into the upper 75 centimetres which has improved the physical condition and fertility status of the soil. The soil texture varies from very fine sandy loam to silt loam upto a depth of 1.5 metres. These soils are free from salinity and alkali. The soils occupy 400 hectares. The condition of Shisham crop in these soils is very good.
2. *Deep, moderately saline-alkali soils.* They occupy 106 hectares in the plantation. The soils are silty in texture, homogenized to about 75 centimetres depth and are stratified below this depth. They have about 2 to 5 centimetres thick cover of hygroscopic salt crust containing some specks of gypsum. The pH of the salt crust is about 8.7 but the surface soil and the subsoil has pH ranging from 8.8 to 9.00. Shisham crop has completely failed on these soils. Some Farash, jand and lana (*Salsola feetida*) are the main natural plants on these soils.
3. *Deep, slightly saline-alkali silty and fine silty soils.* These soils are nearly level. The soil texture varies from silt loam to silty clay loam upto 1.5 metre depth. They are homogenized to a depth of about 60 to 75 centimetres and are stratified in the substratum. The soils have patchy salt incrustation at the surface. The pH ranges from 8.6 to 8.8. in the soil profile. The general condition of Shisham crop is poor. However, some natural plants like Jand and Farash are existing on these soils. Their extent is 41 hectares.
4. *Moderately deep slightly saline-alkali soils.* These soils cover 7 hectares only. These soils are silty in the upper 60 centimetres and are underlain by loamy fine sand in the substratum. The sandy substratum may include thin lenses of silty material. These soils have patchy salt incrustation on the surface. The pH of these soils ranges from 8.6 to 8.8 which increases with depth. The general condition of Shisham is poor. Some Jand and Farash are growing on these soils.

Soil problems and suggestions for improvement

There are three main soil problems that adversely affect the use and suitability of the

area for plantation of Shisham and other forest species under irrigation. They are as under:

1. *Salinity and alkali.* As mentioned earlier, about 19 per cent of the area is infested with moderate salinity and alkali problem. Since Shisham is sensitive to the saline-alkali conditions it cannot be established on these soils. Moreover the climate of the area is arid and irrigation water is scarce, the problem of salinity and alkali would remain more or less permanent. Such areas should only be used for salt tolerant species. The other alternative is the use of gypsum and growing of high delta crops such as rice followed by barley for two years and inclusion of deep rooted crops like berseem or jantar in rotation. Jantar should be green manured. After reclamation the soils should be got re-tested and then planted to Shisham. Since this method seems to be expensive, the economics of reclamation should be worked out before undertaking the operation on a large scale.

The slightly saline-alkali soils are relatively easier to reclaim by heavy irrigations and cultivation of rice and barley for about two years. Such areas could also be planted to Eucalyptus provided sufficient irrigation water is made available.

2. *Soil depth.* A part of the area is underlain by fine sandy material which is a common feature of floodplain soils in the Indus plains. The sandy material has very low water holding capacity and is poor in plant-food nutrients. Such areas are relatively more susceptible to droughty conditions. The depth of soil material over sand therefore, is an important factor to be considered for estimating soil suitability for plants. The effective soil depth in a part of the area is about 60 centimetres. These areas, therefore, need to be frequently irrigated for raising successful crop.
3. *Relief and weeds.* The area was not properly levelled before bringing it under afforestation. Generally there are hummocks about .3 to .6 metre high scattered on a considerable part of the area. The high-lying patches are either not covered by irrigation or receive insufficient water. As a result of improper irrigation the higher parts have developed saline-alkali conditions. Shisham has failed to establish on these patches. Kai, Dab and Srakanda are the natural vegetation on the high-lying patches. Moreover the trenches have been dug without much regard to the day of the land which is also responsible for improper irrigation. Under such conditions drought resistant weeds like Dab make relatively rapid growth and obstruct the passage of irrigation water through the trenches. The weeds also rob the soil of its moisture as well as nutrients to the detriment of the main crop. Such areas should be properly levelled so that the irrigation water could be spread more uniformly and efficiently.

Acknowledgements

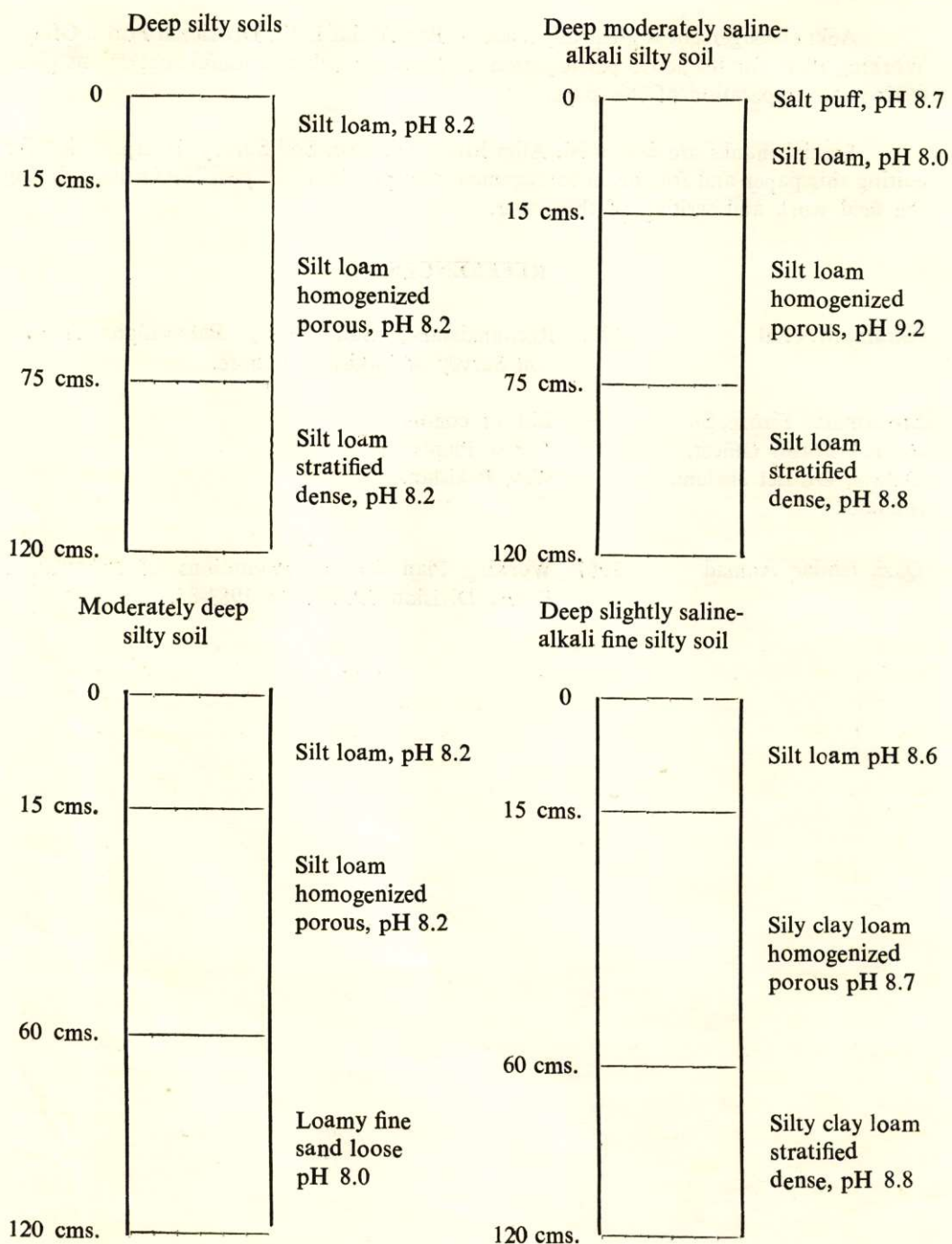
Acknowledgement is gratefully made to Rao Abdul Latif, Divisional Forest Officer, Working Plan, for his active participation in the field work and useful suggestions given during the preparation of this paper.

Special thanks are due to M. Alim Mian, Director, Soil Survey Interpretation for editing this paper and for this encouragement and providing all possible facilities during the field work and writing of the paper.

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Schematic diagrams of representative Soil profile



Vertical Scale 2.5 cms. = .3 metre